The Green Dividend

Why Sustainability is Ireland's Health and Enterprise Opportunity



Health Innovation Hub Ireland

GreenTech
SUSTAINABLE HEALTHCARE

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Contents

Foreword	4
Executive Summary	5
Introduction	9
Section One: Global Context	11
Section Two: Irish Landscape	17
Section Three: HIHI GreenTech in Healthcare	24
Section Four: Innovation by Regulation	37
Section Five: The Economic Case for Sustainable Products	40
Section Six: HIHI GreenTech in Healthcare Priorities	46
Conclusion and Call to Action	48
Information Note	50
References	51

Health Innovation Hub Ireland

GreenTech SUSTAINABLE HEALTHCARE

Foreword

Health Innovation Hub Ireland (HIHI) was established as a joint initiative of the Department of Enterprise, Tourism and Employment and the Department of Health, delivered through an Enterprise Ireland and HSE partnership.

Sitting at the intersection of health and enterprise, HIHI connects Ireland's innovation capability with the clinical settings needed to test, validate and adopt it, translating research into real-world impact and domestic pilots into international markets.

The environmental footprint of Ireland's health system, including its energy use, reliance on single use products and waste, is a clinical, financial and strategic challenge that demands action. It is also a genuine opportunity. Through our GreenTech in Health programme, HIHI provides the national testbed infrastructure to turn sustainable innovation into procurement-ready, export-competitive solutions. The return on this activity spans economic, health and environmental impact. This report highlights those opportunities, while also identifying the systemic changes needed to ensure sustainable healthcare solutions are properly supported, embedded and prioritised.

When we launched the first HIHI GreenTech in Healthcare call in 2024, we were asking a question the Irish health system had not formally put to market before: which innovations can make healthcare more sustainable and can we prove it in a live clinical setting?

The answer is yes. The innovations exist. The clinical appetite is there. HIHI provided the infrastructure to test them rigorously, though the procurement mechanisms to adopt them at scale are yet to follow.

The regulatory landscape is shifting faster than most Irish healthcare enterprises appreciate. EU legislation is embedding circularity requirements across manufacturing and procurement. Companies that can demonstrate clinical validation and sustainability credentials will gain access. Those that cannot will find doors closing. Ireland has the life sciences sector, the clinical network and the innovation infrastructure to lead this transition. This report makes the case for the investment, procurement reform and policy cohesion required to accelerate it.



Dr. Tanya Mulcahy,
HIHI National Director



Eimear Galvin,
HIHI Regional Manager &
Greentech in Health Lead

Executive Summary

Sustainable healthcare, in Ireland and globally, has too often been framed as a cost, a compliance obligation or a long term ambition deferred to future budgets and future governments. This must change.

Health Innovation Hub Ireland's (HIHI) 'The Green Dividend: Why Sustainability is Ireland's Health and Enterprise Opportunity' presents the opposite—evidence of a return. Ireland is strongly positioned to lead in what is becoming one of the most consequential transitions in modern healthcare.

Healthcare systems worldwide face a paradox: the institutions designed to protect human health are themselves significant contributors to the conditions that undermine it.

5%



Globally, the health sector accounts for an estimated 5% of total greenhouse gas emissions, driven by energyintensive facilities, structural dependence on single-use products, and waste streams routed predominantly to incineration (Health Care Without Harm, 2019)

The 2023 Lancet Countdown identifies climate change as the defining health threat of the 21st century and the sector can no longer treat its own environmental footprint as peripheral to its core mission. The financial and environmental sustainability challenges facing health systems are closely connected, with both requiring that the best possible outcomes are achieved from available resources, wasteful activity is minimised, and prevention is prioritised (Naylor et al., 2026). The OECD's 2025 analysis of health system decarbonisation across member countries identifies healthcare procurement as the largest single category of government procurement, and green procurement policy as the most consequential lever available to health systems seeking to reduce supply chain emissions (OECD, 2025). Ireland's scale of ambition in this area should match this opportunity.

A general assumption that sustainability costs more does not survive scrutiny. This report presents evidence from clinical pilots, international case studies and lifecycle analyses that consistently demonstrate the opposite. The market is moving - EU legislation, from the Ecodesign for Sustainable Products Regulation to the Corporate as compliance requirements, not voluntary commitments. From April 2027, all NHS suppliers, regardless of size, will be required to publish comprehensive Carbon Reduction Plans covering full Scope 1, 2 and 3 emissions. Putting a direct and growing pressure on Irish SMEs and start-ups for whom the UK is a primary export market. Companies that can demonstrate clinical validation, lifecycle evidence, and sustainability credentials will gain access. Those that cannot will find doors closing.

Home to over 450 medtech companies and tens of thousands of life sciences professionals, Ireland has established itself as one of Europe's leading hubs for pharmaceutical and medical technology investment (Ibec, 2025; IDA Ireland, n.d.). It is a natural base for developing the sustainable product alternatives the global market is increasingly demanding. Health Innovation Hub Ireland's GreenTech in Health

programme, delivered in partnership with HSE Climate and Sustainability and the Irish College of General Practitioners, provides the national infrastructure to test, validate and scale those alternatives in real clinical settings.

In 2024, the inaugural GreenTech call identified six high impact innovations spanning reusable devices, waste reduction technologies and circular manufacturing solutions. The subsequent GreenTech in Health Collective, was established in 2025, to drive the sustainable transition in Irish healthcare. Bringing together policy, clinical, academic, state agency and industry partners, it works to build the systemic conditions—across both the health system and the market—that makes the transition possible.

The Irish national policy landscape, shaped by the Climate Action Plan 2024, HSE Climate Strategy 2023–2050, and Whole-of-Government Circular Economy Strategy 2026–2028, provides a strong framework for system wide decarbonisation. The Department of Health's Health Sectoral Adaptation Plan (2025–2030) sets out Ireland's health system response to climate-related risks and provides a framework for accelerating sectoral decarbonisation (Department of Health, 2025). Coupled with the 'White Paper on Enterprise 2022–2030', which aligns decarbonisation, digitalisation and innovation as key enablers of competitiveness and a transition to a circular, low carbon economy, these policy frameworks signal a clear national direction of travel for sustainable healthcare.

The recently published HSE frameworks represent a system decarbonisation strategy for Ireland's health service, aligning healthcare delivery, procurement, infrastructure and wellbeing with climate and circular economy goals. In partnering with HSE Climate and Sustainability HIHI is already supporting delivery in several key areas - Green Procurement (supply chain and supplier standards); Greener Models of Healthcare (clinical products and prescribing); Waste Framework. Simultaneously, HIHI's academic and clinical national network is strategically positioned and already supporting Irish industry to capitalise on emerging market opportunities. By delivering evidence generating pilots, fostering cross sector collaboration and integrating sustainability into healthcare design, HIHI supports a scalable model for decarbonising the Irish health system while advancing commercial leadership in green health innovation.

HIHI GreenTech directly advances multiple strands of Irish public policy, including health, enterprise and climate objectives. It supports delivery of healthcare sustainability from a policy aspiration to a practical, evidence based process for change—measuring clinical, budgetary, efficiency and environmental outcomes.

> "Healthcare systems worldwide face a paradox: the institutions designed to protect human health are themselves significant contributors to the conditions that undermine it."

Aligned with national policy, market opportunity and system needs, six strategic priorities underpin HIHI's sustainable healthcare agenda.

These six priorities are already being advanced through real clinical evidence, cross-sector partnership and a growing national policy architecture.

01
Reducing Health System Emissions

Validating low-carbon products and circular procurement to reduce direct emissions and embedded carbon in the supply chain.

02
Improving Resilience and Lowering Costs

Evidencing the long-term economic benefits of reuse and recycling to guide sustainable procurement and strengthen supply chain security.

03
Circularity in Health

Advancing redesign and reprocessing of medical devices to reduce waste, carbon emissions and long-term costs.

04
Supporting Irish Policy Alignment

Linking health, enterprise and climate policy for coherent national impact across multiple government departments.

05
Driving Export Growth Supporting Irish

Enabling SMEs to meet international sustainability standards through validated clinical testing.

06
Catalyst for Cohesive National Impact

Linking public health, climate resilience, innovation and economic policy in one integrated programme.

Realising the full green dividend demands more than programme delivery. It requires system-level commitment from the partners who hold the levers of change. This report sets out recommendations for each of the four partners best placed to act:

Department of Health

HIHI recommends that the Department of Health explores dedicated funding for green procurement pilots to generate life cycle and circularity evidence, in partnership with HSE Climate and HIHI GreenTech.

An Roinn Sláinte
Department of Health

HSE

HIHI recommends that the HSE supports full Scope 1, 2 and 3 emissions reporting, with data made visible at facility, regional and national level. HIHI further recommends that HSE Procurement works with HIHI GreenTech and HSE Climate to shape green procurement pilots that embed life cycle costing and circularity criteria, generating data to inform future standard requirements within tender frameworks.

Enterprise Ireland

HIHI recommends that Enterprise Ireland and its life science client companies design ahead of the EU regulatory curve—from ESPR product passports to NHS full-scope emissions reporting requirements from 2027—and partner with HIHI GreenTech to develop and scale capability in circular design for export-ready products.

Enterprise Ireland

Department of Climate, Energy & the Environment

HIHI recommends that the Department of Climate, Energy and the Environment includes healthcare as a named priority sector in the next iteration of Ireland's Circular Economy Strategy, and works with HIHI GreenTech to build a shared vision for sustainable healthcare that is funded, measured and scaled.

An Roinn Aeráide,
Fuinnimh agus Comhshaoil
Department of Climate,
Energy and the Environment

> “The GreenTech in Health Collective was established in 2025, to drive the sustainable transition in Irish healthcare. Bringing together policy, clinical, academic, state agency and industry partners, it works to build the systemic conditions—across both the health system and the market—that makes the transition possible.”

Introduction

As a member of the European Union, Ireland has committed to sustainability goals, including the European Green Deal. The healthcare sector plays a crucial role in achieving these targets, by reducing Greenhouse gases (GHGs) and promoting circular economy practice.

The vast majority of medical device waste—estimated at up to 90 percent in some healthcare settings—comprises disposable single use products, contributing significantly to waste generation and with substantial carbon footprint in the manufacturing processes. Embracing circularity must become a guiding principle for health to address these challenges and redefine business models and operations. To ensure the viability of the system, Irish healthcare must prioritise efficient resource use, consider environmental impact of products and reuse where possible. This includes reducing unnecessary single use plastics, minimising water and energy waste, optimising supply chains, improving waste management and sourcing sustainable materials.

Across Ireland and Europe, a clear research and innovation gap persists in sustainable product pathways, particularly in translating policy ambition into scalable, evidence based solutions.

Many healthcare and health tech innovations struggle to move beyond concept due to a lack of pilot data demonstrating safety, clinical performance and environmental benefit. Joint government initiative of the Department of Enterprise, Tourism and Employment and the Department of Health, Health Innovation Hub Ireland's (HIHI) GreenTech in Health is connecting clinical settings with green enterprise innovation to address this challenge.

Piloting products in real clinical settings bridges the evidence gap required for procurement approval, informing life cycle standards and derisking adoption for health systems and suppliers. Building an evidence base through HIHI not only accelerates market readiness of Irish products but also strengthens feedback loops between Irish research and health practice, enabling a faster transition toward truly sustainable product pathways.

“Across Ireland and Europe, a clear research and innovation gap persists in sustainable product pathways, particularly in translating policy ambition into scalable, evidence based solutions.”

By supporting Health Innovation Hub Ireland (HIHI) to develop and test green health products and services, the state unlocks a powerful set of mutually reinforcing benefits—reducing health system emissions and costs, advancing national policy objectives and stimulating sustainable business and export growth. HIHI links Ireland's vibrant health tech industry, strong base of research institutions and an engaged network of clinicians and sustainability advocates—solid foundations for leadership in sustainable healthcare innovation.

Section one of 'The Green Dividend: Why Sustainability is Ireland's Health and Enterprise Opportunity' sets out the global context for sustainable healthcare. Section two details the Irish sustainable healthcare landscape. Section three details HIHI GreenTech in Healthcare. Section four outlines the regulations in sustainable healthcare. Section five describes the economic opportunities. Section six presents HIHI GreenTech in Health priority areas. The report concludes with four specific calls to action.

> "Building this evidence base through HIHI not only accelerates market readiness of Irish products but also strengthens feedback loops between Irish research and health practice, enabling a faster transition toward truly sustainable product pathways."

Section One

Global Context



1.1
Global Frameworks

70%



The global healthcare sector represents almost 10 percent of world GDP, with 70 percent of its emissions arising from supply chain production, packaging and disposal.

The frameworks below have been selected for their direct and combined influence on how health systems are expected to decarbonise—spanning NHS procurement requirements, EU product design legislation and the clinical evidence base that links environmental performance to health outcomes.

Organisation	Key initiative	Focus
NHS England	Delivering a Net Zero NHS (Target: 2045)	Embeds sustainability and carbon reduction across procurement, infrastructure and clinical operations. Climate performance now linked to supply chain contracts and service delivery.
European Union	EU Green Deal - including the Ecodesign for Sustainable Products Regulation (ESPR), Packaging and Packaging Waste Regulation (PPWR), and microplastics	Mandates product recyclability, sustainable design, material traceability via product passports and circular economy alignment across industry and healthcare suppliers.
World Health Organisation (WHO)	Operational Framework for climate resilient, low carbon health systems.	Provides a global blueprint for embedding sustainability and resilience within health systems, focusing on mitigation, adaptation and equity.
Lancet Countdown	Annual Global Health and Climate Report	Synthesises global data linking climate change, pollution and health outcomes shaping policy agendas and public awareness on health system transformation.
Health Care Without Harm (HCWH)	Green Hospitals and Circular Health Programmes	Mobilises hospitals internationally to adopt renewable energy, sustainable procurement, waste prevention and healthy food systems. Supports certification and cross sector case studies.
OECD	Decarbonising Health Systems Across OECD Countries (2025)	Confirms that health-system-specific policy remains at an early stage across many member countries, underscoring the first-mover opportunity for countries with active innovation infrastructure

These frameworks mutually reinforce healthcare's shift towards renewable energy, reduced plastics, circular device design and sustainable procurement criteria.

Countries that adapt early will benefit from reduced costs, improved compliance and leadership opportunities in sustainable healthcare innovation.

1.2
Remanufactured Medical Devices

Remanufactured medical devices offer a proven, safe and economically viable pathway for Irish healthcare to reduce costs, enhance security of supply and meet environmental sustainability targets. For many high value medical devices, particularly complex electrophysiology catheters and surgical instruments, reusable alternatives are not currently available on the market, leaving healthcare providers with a choice between single use virgin devices or MDR-compliant remanufactured versions. In this context, remanufacturing is the only practical option to reduce the environmental and economic burden of single use devices.

Global and domestic evidence assessment: patient safety, economics, environment, supply security and successful case studies

Remanufacturing is currently in practice across Belgium, Croatia, Germany, Ireland (private healthcare), the Netherlands, Spain, Portugal, Sweden, and France. Over 11,900 hospitals and surgical centres globally (Association of Medical Device Reprocessors, 2023).

Patient Safety

Studies from the US Food and Drug Administration (FDA), Canadian Agency for Drugs and Technologies in Health (CADTH) and European clinical trials consistently show that properly remanufactured devices present no increased risk compared to original devices. The FDA requires remanufacturers to meet identical safety and effectiveness standards as original manufacturers, including cleaning validation, sterility assurance, and functional performance testing. In Europe, MDR Article 17 requires remanufacturers to assume full manufacturer liability, ensuring rigorous conformity assessment, quality management, and post-market surveillance equivalent to virgin devices.

The safety evidence is robust across multiple independent sources. A systematic review commissioned by the Department of Health and completed by the Health Research Board found no additional adverse safety events associated with reprocessing across all device risk classes. This is consistent with a 2008 FDA audit covering external fixation devices, laparoscopic instruments, compression sleeves, pulse oximeters, and arthroscopic accessories (McGrath et al., 2023). Subsequent peer reviewed analyses confirmed this safety profile for both high-risk devices and Class I, IIa, and IIb devices specifically (McGrath et al., 2025; McGrath et al., 2026)

Economic Impact

Remanufactured devices deliver substantial cost savings:

30-50%



Cost reduction compared to virgin devices

(Association of Medical Device Reprocessors, 2023)

Revenue generation through collection of used devices; annual savings potential of €150,000+ for electrophysiology labs alone; and procurement efficiency through centralised supply chain models, such as NHS Supply Chain in the UK aggregation of purchasing power across trusts has demonstrated significant cost reduction at scale (NAO, 2024).

Environmental Sustainability

Remanufacturing delivers well-evidenced environmental benefits. Life cycle analysis (LCA) of electrophysiology catheters shows it can reduce CO_2 emissions by 50–60% per device turn, with savings of up to 48% across the full catheter life cycle, equivalent to 1.73–1.92 kg CO_2eq per device (Meister et al., 2023). Independent research from Fraunhofer UMSICHT corroborates this, finding carbon footprint reductions of over 50% and resource consumption reductions of over 28% for single-use cardiac devices (Schulte et al., 2021). Beyond carbon, remanufacturing significantly reduces single-use plastics and medical waste, directly supporting circular economy principles and emerging EU mandates.

These gains are particularly significant given healthcare's broader emissions profile. Supply chains represent the single largest contributor to health sector carbon footprints - accounting for 62% of NHS emissions and nearly four-fifths of total health sector emissions across OECD countries on average (OECD, 2025; Naylor et al., 2026). As an upstream product life cycle intervention, remanufacturing directly targets this dominant emissions category and aligns with the WHO Pan-European Commission on Climate and Health (2026), which explicitly calls on health systems to conduct LCAs for priority products, phase out single-use items where feasible, and co-develop net zero transition pathways with suppliers.

Security of Supply

Remanufacturing provides resilience against supply chain disruptions: Creates alternative supply channels reducing dependence on single manufacturers; Addresses device shortages identified as major stakeholder concern in EU MDR implementation; Enables continued device availability during global supply constraints; Supports healthcare system preparedness and business continuity.

> “Life cycle analysis (LCA) of electrophysiology catheters demonstrates that remanufacturing can reduce CO_2 emissions by 50–60% perdevice turn, with long term savings of up to 48% across the full catheter life cycle. Equivalent to a reduction of between 1.73 and 1.92 kg CO_2eq per device.”

1.3
Successful Case Studies – Ireland, UK, Europe

Case Study:
Bon Secours Hospital, Cork, Ireland

Implementation:
Bon Secours Hospital Cork partnered with Vanguard Medical Devices to establish a collection and remanufacturing programme for single use medical devices. Vanguard operates a CE-marked medical remanufacturing service, collecting used devices from clinical settings, reprocessing them to original specification and returning savings and payments to the hospital.

Results:

- Cost savings via device reuse: 150 remanufactured devices used across 2023–2025 generated €48,015 in total savings for Bon Secours, with the largest return in 2024 (€36,105 across 99 devices).
- Revenue from collection: 416 accepted devices across the same period generated a further €3,328 in direct payments to the hospital from the collection service.
- Waste diversion: An estimated 41.1 kg of medical device waste was diverted from incineration or landfill across the three-year period.
- Carbon reduction: The programme delivered a cumulative 261 kg CO_2 reduction, with 172.3 kg avoided in 2024 alone—the equivalent of driving approximately 1,000 km in a passenger car.
- Safety: All remanufactured devices supplied by Vanguard are CE-marked, processed to regulatory standard, with no adverse patient outcomes reported.

(Data source: Vanguard AG; Bons Secours, 2026)

Case Study:
Stockport NHS Foundation Trust, UK

Implementation:
Stepping Hill Hospital established a comprehensive collection and reuse programme for electrophysiology (EP) catheters and other single use devices.

Results:

- Cost savings: Remanufactured devices cost 30–50% less than virgin devices.
- Environmental impact: 81 remanufactured EP catheters saved 70 kg CO2 emissions (50% reduction).
- Revenue generation: Collection service diverted 102 kg waste and generated £13,000 in 2020.
- Safety: No adverse patient outcomes reported with CE-marked remanufactured devices.

(Data source: Department of Health and Social Care, 2024; NHS London Procurement Partnership and NHS England, 2021; Hospital Healthcare Europe, 2024)

Case Study:
NHS England Device Remanufacturing Programme

Implementation:
Multi-trust initiative supported by NHS Supply Chain with established collection infrastructure and supplier relationships.

Key findings:

- CE-marked remanufactured devices show no clinical difference in functionality or safety.
- NHS Supply Chain gain-share returns 80% of savings to participating trusts.
- Significant potential to scale across electrophysiology procedures and broader device portfolio.
- Collection service model enables revenue generation from used devices.

(Data source: Department of Health and Social Care, 2024; NHS London Procurement Partnership and NHS England, 2021; Hospital Healthcare Europe, 2024)

Case Study:
European Multi-Centre Electrophysiology Study

Research:
Leung et al. (2019) evaluated remanufactured circular mapping catheters across multiple UK centres.

Outcomes:

- Safety: No difference in adverse events between remanufactured and virgin devices.
- Effectiveness: Equivalent clinical performance and procedure success rates).
- Cost: 30–50% reduction in catheter costs with maintained quality.
- Environmental benefit: Life cycle analysis shows up to 60% CO_2 reduction per device life.

Section Two

Irish Landscape



Irish healthcare generates high volumes of hazardous and clinical waste. Incineration is the main disposal route, which is costly and environmentally damaging.

An over reliance on disposable plastics, from gloves to gowns to packaging persists throughout the system. Healthcare specific procurement criteria, lifecycle analysis and dedicated sustainability pathways remain underdeveloped. Ireland has made some progress with the HSE Climate Action Strategy 2023–2050 (net zero by 2050, 51 percent emissions reduction by 2030) and subsequent individual frameworks. However, Ireland's health system does not yet systematically measure emissions across all three Scope areas, leaving a significant portion of its carbon footprint—particularly Scope 3 supply chain emissions—unquantified and unmanaged. This gap is not unique to Ireland. The WHO Pan-European Commission on Climate and Health, publishing its Call to Action in May 2026, found that more than three quarters of countries across the European region still lack clear strategies, timelines, targets and budgets for health system decarbonisation—and that limited emissions data is the primary barrier to progress (WHO Regional Office for Europe, 2026).

The OECD's 2025 analysis of health system decarbonisation across member countries finds that limited data on healthcare-related emissions is impeding progress in health systems globally (OECD, 2025). Encouragingly, the OECD's 2025 cross country analysis places Ireland alongside Australia, Norway and the United Kingdom among the countries that have publicly committed to collaborating on decarbonising healthcare supply chains, with initial discussions focused on joint green procurement standards and public disclosure of supplier greenhouse gas emissions (OECD, 2025).

Ireland's circular economy infrastructure also offers a relevant and largely untapped resource for healthcare sustainability. CIRCULÉIRE, the national platform for circular manufacturing, published a dedicated sectoral guide in 2025 identifying significant circular innovation opportunities in Ireland's MedTech sector and finding that MedTech products contribute approximately one-third of healthcare's carbon emissions.

90%



Single use devices account for up to 90% of medical device waste.

(CIRCULÉIRE and IMR, 2025)

The Department of Health's Health Sectoral Adaptation Plan for Climate Change (2025–2030) sets out a framework to strengthen Ireland's health system resilience to climate related risks (Department of Health, 2025). While the Department of Climate, Energy and the Environment (DCEE) 'Ireland's Whole-of-Government Circular Economy Strategy 2026–2028' will drive innovation, competitiveness and job creation by positioning Ireland as a European leader in circular business models and green technologies.

2.1
Health Climate Change Sectoral Adaptation Plan (2025 – 2030)

The Department of Health's *Health Climate Change Sectoral Adaptation Plan 2025- 2030*, published in August 2025, sets out a pathway to improve the resilience of Ireland's health sector to the impacts of climate change. Building on the first plan (2019–2024), the updated SAP identifies a range of climate risks facing the health sector, makes recommendations, and sets out concrete actions to integrate climate adaptation across relevant health sector policies and programmes (Department of Health, 2025).

The Plan addresses the protection of public health, adaptation of healthcare infrastructure, and cross-sectoral engagement to raise the profile of health considerations in national climate action. For HIHI GreenTech, the Health SAP provides direct policy alignment. By contributing evidence and pilot data on sustainable technologies and low carbon healthcare models, HIHI GreenTech can support implementation of the plan's actions and position innovation as a core enabler of health sector climate resilience.

2.2
Department of Enterprise Trade Employment White Paper on Enterprise 2022 – 2030

The White Paper on Enterprise 2022–2030 sets out Ireland's long term vision for a resilient, innovative, and sustainable enterprise sector, positioning decarbonisation, digitalisation, and innovation at the core of national competitiveness. It emphasises the need to deepen innovation capability across SMEs, leverage research and innovation to tackle societal challenges and foster regional and sectoral clusters in strategic areas such as health and digital technologies. The strategy envisions Irish enterprises achieving a competitive advantage grounded in sustainability, productivity and innovation, ensuring economic growth aligns with climate commitments and global market shifts.

Life sciences and health technology are identified as enabling Ireland to lead in the twin transitions of green and digital transformation. HIHI GreenTech in Health is a direct expression of this ambition—connecting Ireland's life sciences enterprise base to clinical validation infrastructure, and translating the White Paper's twin transition agenda into measurable, exportable outcomes in sustainable healthcare.

2.3
Department of Climate, Energy and the Environment Ireland's Whole-of-Government Circular Economy Strategy 2026 – 2028

In March 2026, the Department of Climate, Energy and the Environment (DCEE) published Ireland's Whole-of-Government Circular Economy Strategy 2026–2028, building on the Circular Economy and Miscellaneous Provisions Act 2022, which established a statutory basis for circular policy in Ireland.

Driving innovation, competitiveness and job creation by positioning Ireland as a European leader in circular business models and green technologies is the central tenet of the Circular Economy Strategy. This new strategy positions the circular economy not merely as a waste management approach, but as a driver of innovation, enterprise and resource resilience, emphasising a shift toward design, durability and reuse.

Of Ireland's Whole-of-Government Circular Economy Strategy's six priority sectors, hundreds of actions and significant funding commitments, healthcare does not feature as a named priority. This is a notable omission.

Ireland's health system is among the country's largest purchasers of single use products, disposables, consumables and medical devices, carrying an environmental and economic cost that is difficult to overstate.

However, an absence from this current strategy does not undermine the opportunity for green health innovators. EU WEEE regulations are already tightening around medical devices, with accelerating requirements on design longevity, repairability and end-of-life management. Funding pathways are identified in the strategy. The EPA's Circular Economy Programme, CIRCULÉIRE, and Enterprise Ireland's Disruptive Technologies Innovation Fund—and the strategy calls explicitly for cross-sectoral research and innovation collaboration. The 2026–2028 strategy is Ireland's first national Circular Economy Strategy. A two year horizon suggests a revised and expanded iteration. The work underway now, across clinical validation, industry partnership, and real world evidence generation, positions health to make a compelling case for priority inclusion next time.

"Of Ireland's Whole-of-Government Circular Economy Strategy's six priority sectors, hundreds of actions and significant funding commitments, healthcare does not feature as a named priority. This is a notable omission."

2.4
HSE Frameworks

Developed under the HSE Climate Action and Sustainability Programme, the HSE frameworks represent a system decarbonisation strategy for Ireland's health service, aligning healthcare delivery, procurement, infrastructure and wellbeing with climate and circular economy goals.

The strongest levers for HIHI supported sustainable product transition sit within:

Green Procurement Strategic Framework

HSE Strategic Priorities:

The Green Procurement Strategic Framework is the core operational driver — embedding sustainability across all HSE tenders through requirements for Environmental Product Declarations, supplier Science-Based Targets aligned to net zero by 2050, extended equipment lifespan, and the reduction of single-use items and packaging. Environmental criteria are to be integrated into all procurement by 2027, with annual reporting through the SEAI system.

For HIHI GreenTech, the strongest levers sit here: sustainable product selection, supplier engagement, life cycle costing (life cycle costing is a procurement methodology that calculates the total cost of an asset or product across its entire lifespan rather than purchase price alone), and the introduction of decarbonisation standards for suppliers.

Greener Models of Healthcare

HSE Strategic Priorities:

Greener Models of Healthcare embeds sustainability across all care pathways—sustainable prescribing, low-carbon inhalers and anaesthetic gases, lean integrated care models, and climate-informed workforce development.

For HIHI GreenTech, the strongest alignment is in promoting low-carbon medicines, reusable clinical instruments and digital health tools that reduce resource intensity, linking clinical decarbonisation directly to the procurement framework.

Sustainable Waste Management Framework

HSE Strategic Priorities:

The Sustainable Waste Management Framework focuses on reducing clinical and food waste, increasing recycling and supporting the circular economy, with clear metrics for waste generation and regional implementation.

For HIHI GreenTech, alignment is in waste prevention, reuse and circular design - linking to procurement through supply chain minimisation

2.5
Enterprise and Climate Risk Frameworks

Ireland's enterprise and climate risk frameworks reinforce this direction. Enterprise Ireland's Strategy 2025–2029 targets €50 billion in exports and a 35% CO_2 reduction across supported firms by 2030, with life sciences and health technology identified as enabling Ireland to lead the twin green and digital transition. HIHI GreenTech directly supports this — converting clinical validation into export-ready competitive advantage. The EPA's National Climate Change Risk Assessment (June 2025) identifies 115 climate-related risks for Ireland, 43 already materialising, reframing climate change as an immediate health-system issue and strengthening the case for proactive investment in sustainable healthcare infrastructure.

Section Three

HIHI GreenTech in Healthcare



Despite national climate strategies calling for low carbon, circular and resource efficient design, many sectors, particularly healthcare face barriers to operationalising these principles

Challenges include fragmented funding for applied research, limited access to test environments, lack of standardised sustainability metrics and uncertainty around regulatory compliance for novel, reusable or reprocessed devices. Consequently, many promising innovations stall before they can demonstrate viability.

HIHI's piloting and evaluation of products in clinical environments delivers a crucial mechanism to close this gap. Through controlled, evidence generating pilots, innovators can test technical performance, patient safety and lifecycle sustainability metrics - producing the robust, comparative data needed to inform procurement, standard-setting and investment decisions. Pilot and evaluation data ensures that environmental claims are verifiable and linked to measurable outcomes: reduced waste, lower carbon emissions, improved cost efficiency.

> "The HIHI pilot of the HaPPE's compostable apron—conducted across hospital and nursing home settings in Cork, Dublin and Donegal—found that replacing standard single-use LDPE aprons with the HaPPE alternative could reduce carbon emissions by over 10.5 tonnes CO_2e per year in a single site alone."

A 75% reduction in carbon footprint per apron. Staff acceptance was high, with users rating the product favourably on durability, fit and ease of use. Evidence that environmental performance and clinical usability are not in tension. Similarly, HIHI's evaluation of EnviroMedical's anaesthetic gas capture and nitrous oxide destruction systems generated structured clinical and technical assessments, confirming safety, compatibility with existing equipment, and alignment with EU regulatory obligations.

In both cases, HIHI evidence generation transforms environmental ambition into verified, site specific data that can support procurement decisions, regulatory submissions and investment cases.

> "Data driven innovation transforms sustainability from an abstract policy goal into a practical, evidence based foundation for systemic change in how products are designed, procured and used across health systems."

This is the mechanism that connects Irish innovation capability to Irish procurement reform and to international market access.

3.1
HIHI GreenTech in Healthcare call with the HSE and the Irish College of GPs

In May 2024, HIHI assembled a GreenTech oversight group of strategic partners and experts to co-design a national GreenTech in Healthcare call, in partnership with HSE Climate and Sustainability and the Irish College of GPs. Three Clinical Sustainability Advisors, Dr Lisa McNamee GP, Dr Cathy Burke (CUMH) and Dr Ana Rakovac (TUH), brought frontline clinical sustainability expertise to the oversight group.

In September 2024, the call opened to market—searching for innovative products and services promoting environmental sustainability in both primary and secondary healthcare, across three focus areas: Production (single use medical products and their resource and emissions footprint); Disposal (waste streams from healthcare items designed for single use); and Decontamination (cleaning, disinfection and sterilisation of reusable invasive medical devices).

HIHI engaged external experts from NCAD and the Centre for Sustainable Health UK to advise on measurement criteria, assessing submissions through both lifecycle inventory analysis (LCI) and circularity lifecycle analysis (CLA).



Dr Ana Rakovac



Dr Cathy Burke



Dr Lisa McNamee



Left to right: Dr Philip Crowley HSE Director, Dr Andree Rochfort ICGP, Eimear Galvin HIHI, Roisin Breen HSE

3.2
GreenTech in Healthcare Call Winners

A competitive pitch process ran from December 2024 to the end of January 2025, including a national desktop review of all submissions by an internal HIHI panel.

The GreenTech oversight group then assessed those put forward and chose finalists to pitch to an external expert panel. The pitches identified six innovative products and services that promote environmental sustainability in both primary and secondary healthcare: Aerogen, Vanguard AG, HaPPE, EccoSpray, Offerre and Medfirst Supplies.

Company	About the Company	GreenTech Project
Aerogen	Irish-based global leader in aerosol drug delivery systems, developing innovative nebuliser technology for critical and acute care settings.	Multi-disciplinary project to transition Aerogen's Solo Nebuliser products to a circular economy model, reducing environmental footprint through sustainable medical device development.
VANGUARD MEDICAL REMANUFACTURING	European specialist in the remanufacturing of single use medical devices, offering proven solutions that extend device life cycles and reduce clinical waste.	Pilot of Vanguard's established single use medical device remanufacturing solution within Irish healthcare, testing feasibility and sustainability impact.
HaPPE	Cleantech company delivering on-site bio-digestion systems that convert compostable materials and food waste into safe, sustainable outputs for healthcare environments.	Full cycle bio-digestion system for compostable PPE and food waste, combining on-site bio-digestion with advanced decontamination technology for Irish healthcare sites.
PoCUS Spray	Irish MedTech company developing an eco-friendly, dry alternative to traditional single-use ultrasound gel, targeting waste reduction in clinical imaging settings.	Sustainability pilot measuring waste reduction, efficiency, and environmental benefits of EccoSpray's eco friendly ultrasound gel alternative across Irish healthcare sites.
Offerre	Irish-led consortium comprising Offerre, Envetec, DeltaQ, and Enva, focused on integrated medical waste treatment, recovery, and resource management solutions.	Multi-faceted medical waste treatment and recovery solution, to be mapped and piloted across Irish healthcare as part of a broader sustainability initiative.
Medfirst Supplies	Irish medical supplies company offering innovative cleaning and decontamination products for reusable invasive medical devices (RIMDs) in clinical settings.	Closed, sealed cabinet system automating pre-cleaning of RIMDs using sodium bicarbonate and low-pressure compressed air. Non-abrasive, non-corrosive, and water-soluble.



Will Hogan, Ecco Spray, Declan MedFirst Supplies, Eimear Galvin, HIHI, Philip Crowley HSE, Roisin Breen, HSE, Conor Connelly, Envetec, Dr. Mary O'Riordan, HaPPE, Oran Murphy, Vanguard

3.3 GreenTech in Healthcare Call Winners Progress

The inhaler take-back scheme pilot in Limerick and Galway with Offerre is scheduled to close end of May 2026, with data analysis commencing. The HaPPE full cycle biodigester at Clonakilty Hospital is scheduled to begin in Q4 2026.
A long-term project supporting indigenous multinational Aerogen is ongoing. The results of two completed pilots are detailed overleaf.

3.4
MedFirst Supplies - Safe Clean Box

Irish company MedFirst Supplies was one of the six winners of the HIHI/HSE/ICGP GreenTech in Healthcare competitive call 2024/25. The company applied with support from the Mater Decontamination Lead and CSSD Manager, following a successful pilot and subsequent purchase at the Mater Misericordiae University Hospital (MMUH). The BICARmed Safe Clean Box is a closed-cabin cleaning system for the pre-treatment of reusable medical devices (RMDs) prior to disinfection and sterilisation.

A pedal-controlled flow of sodium bicarbonate beads, combined with air and water, runs through a handpiece and strikes surfaces uniformly—the beads dissolve as they clean, removing dirt from even the smallest crevices. As a closed cabin with a HEPA 14 filter cartridge, it eliminates the risk of aerosol contamination associated with previous pre-cleaning methods.

Current Practice

Pre-cleaning is labour and resource-intensive—requiring full PPE and manual work in hot, humid environments. It consumes significant energy (hot water, ultrasonic cleaners) and produces high volumes of PPE waste. Methods include rinsing, scrubbing, hot water/detergent and enzymatic soaks.

Safe Clean Box: Key Outcomes at a Glance

50%	Reduction in non-conformances
160 hours	Staff time saved per year
€32k	Annual savings (PPE, brushes, labour)
2 yrs	Payback period on capital cost
82%	Energy reduction vs ultrasonic cleaners
1.2k L	Water saved per day

HIHI Assessment of Safe Clean Box - Health System Impacts

Clinical Pathway

All instruments are fully screened after sterilisation. Any debris triggers a non-conformance and re-cleaning. **With Safe Clean Box, non-conformances halved.** This efficiency reduces staff time and overall costs, contributing to a more effective and streamlined health service for patients.

Workflow

- Reduces time spent on resolving non-conformances (re-cleaning and administration)
- Reduces cleaning time, **saving approximately 40 minutes a day (160 hrs a year)**

Revenue

- Safe Clean Box STK 100 cost: **€60,000**
- Reduced PPE: saves approximately **€20,000 per year**
- Reduced wire brushes: saves **€8,661.50 per year**
- 160 hrs of labour time: saves **€3,211–€3,754 per year**
- Reduced incineration costs: saves approximately **€157.95 per year**
- **Total saving ~€32,000 per year— offsetting full capital cost in just two years**

Interoperability

The system was easily installed, fitting within the footprint of a standard sink after removal of outdated equipment in CSSD.

Sustainability

- Less water used: saves **1,200 litres per day**
- **82% reduction in energy** compared to ultrasonic cleaners
- Less incinerated waste
- Substitution of enzymatic cleaning agents with biodegradable sodium bicarbonate

Staff Experience

Introduction of the equipment had an overall **positive impact on staff —** making their working experience feel more comfortable (less PPE, wet aprons and visors) and safer (protection from fumes and biological aerosols).

Data source: Health Innovation Hub Ireland Impact report - Clinical Evaluation 2025, Mater Misericordiae University Hospital use data.

3.5
Ecco Spray

Ecco Spray is a refillable fine-mist ultrasound gel delivery system. The water-based coupling agent is designed for point-of-care ultrasound (POCUS) examination, replacing traditional single use gel sachets and their associated waste. Previously piloted for efficacy by HIHI at Tallaght University Hospital, this pilot with University Hospital Galway trialled Ecco Spray as a sustainable alternative to traditional five ml single use gel sachets within a high volume urology outpatient department.

Current Practice

Bladder scanning is an essential diagnostic procedure widely performed across outpatient, inpatient, emergency and community healthcare settings. Each scan requires a 5 ml single use gel sachet and several disposable paper towels to manage gel application and clean-up. While these items are small at the individual patient level, their cumulative impact is substantial in high-volume services. Across thousands of scans per year, this results in: significant plastic waste from gel sachets and packaging, large quantities of paper waste from towels used to remove excess gel, gel waste, as sachets frequently dispense more gel than clinically required.

Eco Spray: Key Outcomes at a Glance

95%	Reduction in gel volume per scan
100%	Elimination of plastic gel sachets
€0.24	Saving per individual scan
€461	Annual saving in one department
500k	Ultrasound scans nationwide per year
0	Paper towels for gel (Ecco Spray)

HIHI Assessment of Ecco Spray - Health System Impacts

Clinical Pathway

- **Patient comfort maintained:** patients reported no reduction in comfort levels when Ecco Spray replaced traditional gel sachets, supporting seamless adoption of the sustainable alternative.
- **Enhanced post-scan experience:** reduced gel residue meant less wiping, less lingering discomfort, and a reduced cold sensation, improving overall patient satisfaction while lowering reliance on disposable cleaning materials.

Workflow

- **No change in clinical workflow:** scan protocol remains identical — adoption requires no retraining or disruption.
- **Improved staff efficiency:** refillable bottles eliminate the need to repeatedly open single use sachets.
- **Cleaner, more controlled application:** fine-mist spray reduces excess gel, limits contamination of gloves and equipment.
- **Reduced post-scan waste:** fewer paper towels required per patient, supporting environmental targets.
- **Smoother session flow:** streamlined application and reduced clean-up allows clinics to maintain pace.

Revenue

- Standard scan (sachet): **€0.28 per scan** (€0.18 sachet + €0.10 paper towels)
- Ecco Spray scan: **€0.038 per scan—** saving **€0.24 per scan**
- Across 160 scans/month: **€461 saved annually** in one outpatient department alone
- Applied hospital-wide: savings scale to **several thousand euro per year**
- Nationally: Ireland performs ~500,000 ultrasound scans per year (~10,000/ week). Even small per-scan reductions translate into **large cumulative waste and cost savings at scale.**

Interoperability

N/a

Sustainability

- **95% reduction in gel volume** per scan, dramatically lowering material use
- **Complete elimination of plastic gel sachets** from all scans using Ecco Spray
- **Full removal of paper towel use** for gel management, cutting costs and waste at source
- **Significant reduction in clinical waste** and associated plastic packaging
- **Directly advances HSE sustainability targets** - reduction of single use items, waste generation and carbon intensity in clinical care

Data source: Health Innovation Hub Ireland Pilot report, University Hospital Galway, 2025.

3.6
GreenTech in Action: Building the Evidence Base Through Clinical and Operational Pilots

Both completed pilots demonstrate five consistent findings across the GreenTech in Healthcare programme

Real-world evidence that sustainability works:

Both pilots demonstrate that sustainable alternatives can be seamlessly adopted in live clinical settings without disrupting patient care or clinical workflow.

Clinical outcomes maintained:

No adverse effects on patient care or safety were recorded in either pilot. Patient comfort and care quality were maintained or improved.

Compelling economic returns:

The Safe Clean Box saves €32,000 per year with a two year payback period. Ecco Spray saves €0.24 per scan - scaling nationally across 500,000 annual ultrasound scans represents a transformative cost and waste reduction opportunity.

Environmental impact at scale:

Significant reductions in energy use, water consumption, single use plastics, incinerated waste and carbon intensity, directly support HSE and national climate targets.

Staff experience improved:

Both innovations were positively received by clinical staff, reducing physical burden, improving working conditions and streamlining daily workflows.

The value of this evidence infrastructure extends beyond Ireland. The WHO Pan-European Commission on Climate and Health (2026) identifies the absence of verifiable, site-specific sustainability data as one of the defining barriers to health system decarbonisation across Europe, calling on health systems to embed environmental performance indicators into national assessment frameworks and generate the clinical evidence needed to drive procurement reform. The pilots delivered through HIHI GreenTech in live clinical settings, with measurable outcomes across cost, carbon and staff experience are precisely the model the WHO identifies as missing across most European health systems.

3.7
GreenTech in Health Call 2025 Lessons Learned

There are substantive learnings from the GreenTech in Healthcare Call across four key areas, drawn from programme design, evaluation, and pilot delivery in partnership with the HSE, ICGP and HIHI Clinical Sustainability Advisors.

1. The Value of Co-design

The multi-partner, co-designed structure of the call—developed with both the HSE and ICGP and clinical sustainability advisors—was a defining feature and a source of its strength. Cross-sector collaboration aligned the call with both clinical priorities and environmental goals, ensuring proposals were assessed against real world healthcare needs rather than abstract sustainability criteria.

The use of weighted assessment categories, including Life Cycle Impact (LCI) and Circularity Lifecycle Analysis

(CLA), enabled a genuinely holistic evaluation framework that balanced technical, clinical and environmental considerations.

Feedback from HIHI, HSE and external partners confirmed that this integrated model represented a novel and credible approach to identifying high impact projects.

Future calls would benefit from a longer lead-in and promotional period to expand participation, particularly from smaller vendors who may be less familiar with sustainability assessment methodologies.

2. Market Readiness & Engagement Challenges

Several challenges emerged that are likely to persist in future calls unless directly addressed. High impact sustainability pilots are frequently resource and finance intensive, creating a barrier for smaller companies and early stage innovators.

Multinational companies expressed genuine interest in engaging with HIHI but remained cautious about sharing proprietary data within an open competition process—a tension that will require careful structural consideration in future programme design.

Procurement systems also present a challenge: many current frameworks lack the tools or experience to apply LCI and CLA assessments effectively, though this is beginning to change. NHS contracts, for example, now include sustainability weighting, require carbon-reduction plans from suppliers, and will mandate full emissions reporting and product-level foot printing by 2028—changes that will directly shape innovation incentives across the market.

Future calls should explore direct funding, the inclusion of Regional Health Areas (RHAs) priorities and identified implementation sites from the outset, to ensure pilot readiness and reduce the gap between evaluation and adoption.

3. Structural Barriers to Sustainable Healthcare

Sustainable healthcare innovation underperforms its potential. Financial incentives are misaligned: hospitals are funded for care delivery, not carbon or waste reduction, meaning the business case for sustainability investment is rarely built into core operational planning. These barriers are consistent with broader NHS experience: sustainable transitions are largely driven by motivated individuals without formal project management support and the absence of dedicated leadership roles or integration with quality improvement structures limits continuity and scalability (Mortimer et al., 2025).

Policy momentum toward net-zero healthcare is relatively recent, and the innovation ecosystem is only beginning to respond.

These are not insurmountable barriers, but they require deliberate attention in both programme design and in how HIHI positions its offer to the market.

Growing opportunity: as requirements become clearer and the regulatory environment matures, companies that invest now in understanding and meeting sustainability standards will be better positioned to navigate—and shape—the market that is emerging.

Future calls should explore how programme design can more directly address structural misalignment — whether through revised eligibility criteria, financial supports for smaller innovators, or stronger signalling to procurement bodies on the value of sustainability metrics.

4. Regulation & Market Shift

Despite current barriers, sustainable healthcare is an increasingly active area for both investment and innovation.

Climate regulations, net-zero health system commitments, and procurement policies that prioritise low-carbon and circular solutions are beginning to reshape market incentives.

As regulatory pressure grows and measurement standards improve, sustainability is shifting from a peripheral concern to a core driver of healthcare transformation, attracting new funding, partnerships and entrepreneurial activity in the years ahead.

The GreenTech call confirmed that appetite for sustainable product alternatives, industry capability and clinical commitment exist. What is now needed is continued alignment between environmental goals, clinical needs, procurement frameworks, and strategic investment to turn that readiness into scaled, lasting impact.

Future calls will support HIHI clients to capitalise on this market shift — building a pipeline of companies to develop and scale and grow within sustainable healthcare.

3.8
GreenTech in Health Collective

Established in May 2025, the HIHI GreenTech in Health Collective is a multi-stakeholder systems level collaboration—policy, industry, academia, clinical and state agency—led by HIHI. The Collective advises on the development and testing of sustainable products in healthcare, supports green innovation and aligns with global best practice to address the research and innovation gaps in sustainable product pathways. Chaired by HIHI national greentech in health lead, Eimear Galvin, membership includes policy, industry, academia, clinical and state agency—detailed below:

Name	Position	Organisation
Eimear Galvin	National GreenTech in Health lead/Dublin Regional Manager	HIHI
Colin O'Hehir	Head of Climate Change and Sustainable Development Goals Unit, Health and Wellbeing Programme	Department of Health
Donal Healion	Lecturer and Senior Research Fellow in the Product Design Department	National College of Art and Design
Dr Margaret Brennan	Specialist Registrar in Public Health Medicine and clinical researcher for Irish Doctors for the Environment (IDE)	HSE
Dr Lisa McNamee	GP and Irish College of GPs Programme Lead for Sustainability and Planetary Health	Irish College of GPs
Dr Ana Rakovac	Consultant Chemical Pathologist and member of Irish Doctors for the Environment (IDE)	Tallaght University Hospital, Naas General Hospital & Peamount Healthcare
Roisin Breen	Programme Lead, HSE Climate and Sustainability	HSE
Dr Elisabeth Doran	Consultant Neurologist and Director of the Epilepsy Service; Senior Clinical Lecturer at Trinity College Dublin	St James's Hospital
Gareth Morton	National Director of Procurement	HSE
Dr Tanya Mulcahy	National Director	HIHI

Objectives

The objectives of the Collective are:

- Position Irish healthcare as a facilitator of part of the collective journey to net zero healthcare—through sustainable products.
- Drive engagement on sustainable alternatives in the Irish healthcare system.
- Facilitate bottom-up opportunities for testing products and sustainable alternatives.

While informing HIHI Green Tech focus areas the Collective shares data and insights, identifies opportunities on sustainable healthcare—domestic and global—and is codesigning the second HIHI GreenTech in healthcare call.

3.9
Climate and Health Alliance

HIHI joined the Climate and Health Alliance (CHA) in 2025 and took a seat on its steering committee in 2026. The Alliance is an all-Ireland coalition of twenty-three public health and charity organisations working to address the intersection between climate change and health, lobbying to ensure Ireland's actions reflect best practices transitioning toward net-zero.



Dr Philip Crowley, Dr Ana Rakovac, Eimear Galvin, Dr Diarmuid O'Shea, Louise O Leary, Dr Debbi Stanistreet, Dr Seán Owens, Roisin Breen, Ola Nordrum, Dr Orla Kelly

Section Four

Innovation by Regulation



4.1
Mandatory Sustainability Reporting Standards and EU Regulations

Increasing mandatory sustainability reporting standards and EU regulations are accelerating the shift towards a more sustainable economy. Detailed in the table overleaf, these regulations are reshaping how companies operate, report and design products across all sectors. The Corporate Sustainability Reporting Directive (CSRD) mandates standardised ESG reporting for large and listed firms, while the Corporate Sustainability Due Diligence Directive (CSDDD) requires companies to assess and address environmental and human rights impacts throughout their supply chains.

Product-focused regulations such as the Packaging and Packaging Waste Regulation (PPWR), Electrical Waste and Battery Regulation and the Ecodesign for Sustainable Products Regulation (ESPR) aim to reduce waste and embed circular economy principles in manufacturing. These measures mark a systemic shift toward transparency, circularity and climate accountability, positioning sustainability as a core compliance and competitiveness measure for all EU enterprises.

Directive / Regulation	Purpose	Key Requirements / Scope	Timeline & Applicability
Corporate Sustainability Reporting Directive (CSRD)	Enhance transparency in sustainability reporting and align ESG disclosures with EU standards.	• Mandatory sustainability reporting using European Sustainability Reporting Standards (ESRS). Covers environmental, social, and governance (ESG) issues. • Requires audited, comparable non-financial data.	• Adopted: Jan 2023. • Applies from FY 2024 (reports published in 2025) for large public-interest companies (>500 employees). • FY 2025 for large companies (>250 employees). • FY 2026–2028 phase-in for listed SMEs and non-EU parent companies.
Corporate Sustainability Due Diligence Directive (CSDDD/ CS3D)	Ensure responsible business conduct across global value chains.	• Requires companies to identify, prevent, mitigate, and remedy adverse human rights and environmental impacts. • Applies to own operations, subsidiaries, and suppliers. • Includes civil liability for damages.	• Political agreement reached: 2024. • Expected adoption: early 2025. • Implementation in Member States by 2027–2028. • Applies gradually based on company size and turnover (e.g. >5,000 employees first).

Directive / Regulation	Purpose	Key Requirements / Scope	Timeline & Applicability
Packaging and Packaging Waste Regulation (PPWR)	Reduce packaging waste and promote reusable/ recyclable packaging.	• Mandatory recyclability and design-for-recycling criteria. • Reuse and refill targets for sectors (e.g. food, e-commerce). • Ban on unnecessary single use packaging.	• Final text approved: 2024. • Enters into force 2025 (expected). • Targets apply 2028–2030, with progressive obligations.
Electrical Waste & Battery Regulation (WEEE & Batteries Regulation)	Reduce environmental impact of electronics and batteries.	• Recycling, collection, and recovery targets for e-waste and batteries. • Mandatory recycled content in new batteries. • Carbon footprint and performance labelling required.	• Batteries Regulation adopted: August 2023. • Key rules apply from 2025. • Full compliance (recycled content, labelling) by 2027–2031, depending on battery type.
Ecodesign for Sustainable Products Regulation (ESPR)	Make sustainable products the standard in the EU market.	• Expands ecodesign beyond energy products to all goods (textiles, furniture, ICT, etc.). • Introduces Digital Product Passport (DPP). • Sets minimum repairability, recyclability, and durability standards.	• Political agreement: 2024. • Expected entry into force: 2025. • Phased implementation from 2026 onward depending on product category (first: textiles, electronics, batteries).

4.2 Remanufacturing Medical Devices

EU, Ireland and UK regulatory framework:

Article 17 of the EU Medical Device Regulation (MDR) 2017/745 provides the legal framework for reprocessing single use devices across the EU. Member States may permit reprocessing at national level, with remanufacturers assuming full manufacturer obligations including conformity assessment, CE marking, traceability and labelling requirements.

Ireland permits reprocessing under S.I. 261/2021, implementing Article 17(2) of the MDR. Commercial remanufacturers must register with the HPRA and maintain full manufacturer responsibilities. The UK MHRA has regulated remanufacturing of single use devices since 2016, with CE-marked remanufactured devices accepted on the GB market until 2030 under transitional arrangements.

Section Five

The Economic Case for Sustainable Products



In addition to 'Ireland's Whole-of-Government Circular Economy Strategy 2026–2028', the Circular Economy Action Plan by the European Commission charts a compelling transition to a circular model in which products, materials and waste are kept in circulation as long as possible.

For the HSE and associated providers, it means procurement, design and disposal of medical products must increasingly embed circular economy thinking.

> "Healthcare materials and devices need to be designed for reuse, recycling or refurbishment rather than single use. This shift will reduce waste volumes, lower disposal and landfill costs, and reliance on virgin raw materials. Reducing both environmental impact and operational expenditure."

Care delivery models need to evolve: supply chains for hospitals, clinics and ancillary services developing circular supply chains, secondary material markets and waste-stream recovery. Irish providers have an opportunity to redesign their systems to deliver lower carbon care, enhance resilience (by reducing dependence on single use imports) and contribute to national climate goals.

Recent studies indicate that reprocessing single use medical devices can offer both financial and environmental advantages, though evidence remains context specific.

€330,000

A European case study led by Health Care Without Harm Europe (2024) found that reprocessing programmes at Aarhus University Hospital in Denmark achieved annual savings of up to €330,000 and cost reductions of 30–59 percent for ultrasound catheters, alongside a 56 percent reduction in CO_2 emissions.

(Health Care Without Harm Europe, 2024)

UK NHS evidence reinforces this: reusable slide sheets at one trust saved 4,204 kgCO2e and £10,000 annually, while reusable patient warming devices saved a further 3,536 kgCO2e and over £10,000 per year (Mortimer et al., 2025). Analyses by McGrath et al. (2023) and McGrath et al. (2025) confirm that reprocessed device safety is comparable between new and reprocessed items, caveating that implementation should remain targeted, evidence based and device specific. Critically, the 2023 evidence base directly informed Ireland's regulatory position on single use medical device reprocessing under the EU Medical Devices Regulation emphasising both policy relevance and timeliness of action in Irish healthcare. Evidence from comparable health systems further confirms that a shift to reusable and remanufactured products could generate millions in annual savings, with the scale of opportunity increasingly well-documented in peer-reviewed and policy literature (Naylor et al., 2026).

Ireland's public health, enterprise and environment policy landscapes converge on the matter of circular supply chain. Adoption of circular-economy principles in healthcare supports Ireland's commitments under the Climate Action Plan 2024, the national waste/circular economy programme EPA Ireland, and the EU's Green Deal agenda. For healthcare innovators and businesses in Ireland this means regulatory, investment and procurement will favour sustainable, circular-model products and services. Aligning with both national and EU strategy allows Irish start ups and SMEs to place themselves in export markets where circular design credentials are required.

Realising these circular design opportunities requires a fundamental shift in commercial model, from linear product supply to Product-as-a-Service (PaaS), where manufacturers retain responsibility for a device across its full lifecycle. Europe's medical technology market, valued at approximately €170 billion in 2024 and accounting for over a quarter of the global market has traditionally operated on a linear model of product sale and disposal (MedTech Europe, 2025). The circular transition demands new financing structures, contract frameworks and procurement approaches that currentmarket conditions do not readily support. Enterprise Ireland has a role in enabling this shift for Irish companies, through targeted supports, including feasibility funding, business model development grants and export market guidance. Supporting firms to move from volume to value based commercial models. The commercial model shift required is significant, but it is not without precedent. Across Europe, governments and state agencies have actively co-funded the transition from linear supply to service-based models in healthcare, demonstrating that public intervention is both necessary and effective in creating the conditions for circular medtech to scale.

Netherlands

The Dutch government has been the most systematic. Through its National Circular Economy Programme, it has directly co-funded PaaS pilots in healthcare, including instruments and imaging equipment. The Netherlands Enterprise Agency (RVO) provides specific circular business model transition grants.

EU level

The European Innovation Council and Horizon Europe have both funded circular medtech business model development. The EIC Accelerator in particular has backed several companies developing reusable/service-based device models.

Denmark

The Danish Business Authority has funded circular medtech transitions. The Aarhus University Hospital reprocessing programme was partly enabled by public health system procurement policy that created the demand signal for circular models to be commercially viable.

Germany

The Federal Environment Agency (Umweltbundesamt) has funded lifecycle assessment work for medical devices specifically and KfW development bank has circular economy financing instruments that medtech companies have accessed.

France

ADEME (the French environment and energy agency) has co-funded reprocessing and remanufacturing pilots in hospital settings.

Ireland's health SMEs and start up sector, supported by HIHI, is strategically placed to develop and scale circular economy health solutions. Testing products in live healthcare settings generates the safety, performance and sustainability data that procurement systems and investors require. For the Irish health system this creates the dual benefit of supporting domestic innovation while enabling cost-effective, lower carbon supply options.

> "The EU circular economy strategy is not just an environmental agenda but a strategic lever for Irish healthcare driving lower waste, smarter procurement, greater resilience and innovation led growth in the supply chain."

5.1
Opportunities for Irish Enterprise

The global healthcare industry is undergoing a profound shift toward sustainability, accelerating market opportunity for innovation and enterprise to develop sustainable product alternatives from recyclable medical plastics and low-carbon packaging to reusable medical devices and circular supply systems. As hospitals and health systems face growing regulatory and policy pressure to decarbonise, demand for greener, validated alternatives is increasing sharply.

Ireland's health SMEs and start-ups sector, supported by HIHI, is strategically placed to develop and scale circular economy health solutions. The EU circular economy strategy is not just an environmental agenda but a strategic lever for Irish healthcare - driving lower waste, smarter procurement, greater resilience and innovation-led growth in the supply chain. In April 2027, the NHS, a major export market for Irish healthcare SMEs, will require all suppliers to publicly report targets, disclose full greenhouse gas emissions and publish a comprehensive Carbon Reduction Plan covering all global Scope 1, 2 and 3 emissions. Companies that can demonstrate sustainability credentials will gain access. Those that cannot will find doors closing.

"As hospitals and health systems face growing regulatory and policy pressure to decarbonise, demand for greener, validated alternatives is increasing sharply."

Winners HIHI/HSE/ICGP sustainability call: Declan Lacy, MedFirst Supplies, Will Hogan , Ecco Spray, Dr Mary O'Riordan, HaPPE Earth, Conor Connolly, Envetec, Oran Murphy VanGuard



NHS Net Zero Supplier Roadmap

From April 2022

Net Zero and Social Value

All NHS procurements include a minimum 10% net zero and social value weighting. The net zero and social value guideline for NHS procurement helps to unlock health-specific outcomes (building on PPN 06/20). Net Zero and Social Value will be applied via the Evergreen assessment for NHS England Medicines tenders.

From April 2023/24

Carbon Reduction Plan

All new contracts above £5 million per annum, the NHS requires suppliers to publish a Carbon Reduction Plan for their UK Scope 1 and 2 emissions and a subset of scope 3 emissions as a minimum (aligning with PPN 06/21).

From April 2024, this requirement is proportionately extended to cover all new procurements.

From April 2027

Carbon Reduction Plan for all emissions

All suppliers will be required to publicly report targets, emissions and publish a Carbon Reduction Plan for global emissions aligned to the NHS net zero target, for all of their Scope 1, 2 and 3 emissions.

From April 2028

Product-level requirements

New requirements will be introduced overseeing the provision of carbon footprinting for individual product supplied to the NHS. The NHS will work with suppliers and regulators to determine the scope and methodology.

Hospital decarbonisation targets, lifecycle costing requirements and public sector net zero commitments are driving a shift in market opportunity. For Irish companies, particularly in life sciences and advanced materials, this represents a high-growth, export-oriented opportunity. The Table below summarises the breadth of opportunity available to Irish enterprise across five key areas: circular medical plastics, reusable devices, sustainable packaging, low-carbon manufacturing, and digital health for efficiency.

Across each, the value potential is clear, from reduced lifecycle costs of 20–40% through reusable devices, compliance advantage, to carbon-credit and export premium value from low carbon manufacturing. For Irish life sciences companies, these are not marginal sustainability gains. These are emerging procurement requirements and competitive differentiators in international markets.

“For Irish life sciences companies, these are not marginal sustainability gains. These are emerging procurement requirements and competitive differentiators in international markets.”

Opportunity Area	Example	Value Potential
Circular medical plastics	Recyclable blood-collection tubes, IV sets, syringes	Lower waste fees; secure EU procurement
Reusable devices	Sterilisable surgical tools, diagnostic devices	Reduced lifecycle cost (20–40% savings)
Sustainable packaging	Compostable or recyclable pharma and health tech packaging	Compliance with EU single use plastics ban
Low-carbon manufacturing	Renewable energy and green logistics for health tech production	Carbon-credit and export premium value
Digital health for efficiency	AI-enabled logistics and waste-tracking	10–15% cost reduction in consumable management

Irish government support of research, development and validation of sustainable healthcare products through HIHI not only accelerates the transition to sustainable healthcare but stimulates green growth, export competitiveness and job creation within Ireland's life sciences ecosystem.

> "Ireland's health SMEs and start up sector, supported by HIHI, is strategically placed to develop and scale circular economy health solutions. Testing products in live healthcare settings generates the safety, performance and sustainability data that procurement systems and investors require."

Section Six

HIHI GreenTech in Healthcare Priorities



Investing in HIHI's capacity to develop and test green health products bears multiple benefits for Ireland.

It enables a cleaner, more cost efficient and resilient health system, positions Ireland as a European leader in sustainable healthcare innovation and supports the growth of export ready Irish start-ups and SMEs. Aligned with national policy, market opportunity and system needs, six strategic priorities underpin HIHI's sustainable healthcare agenda:

01 Reducing Health System Emissions

Validating low-carbon products and circular procurement to reduce direct emissions and embedded carbon in the supply chain.

02 Improving Resilience and Lowering Costs

Evidencing the long-term economic benefits of reuse and recycling to guide sustainable procurement and strengthen supply chain security.

03 Circularity in Health

Advancing redesign and reprocessing of medical devices to reduce waste, carbon emissions and long-term costs.

04 Supporting Irish Policy Alignment

Linking health, enterprise and climate policy for coherent national impact across multiple government departments.

05 Driving Export Growth Supporting Irish

Enabling SMEs to meet international sustainability standards through validated clinical testing.

06 Catalyst for Cohesive National Impact

Linking public health, climate resilience, innovation and economic policy in one integrated programme.

Conclusion and Recommendations

Sustainable healthcare is not a cost to be managed. It is a return already being earned and Ireland is positioned to lead.

The institutions designed to protect human health are among the most significant contributors to the conditions that undermine it. That paradox is no longer financially, environmentally or politically sustainable. The global regulatory response is reshaping the market. The NHS Net Zero commitment, the EU Green Deal, the Ecodesign for Sustainable Products Regulation and the Corporate Sustainability Reporting Directive are embedding circular economy and carbon reduction requirements into procurement, product design and supply chains as legal obligations. From April 2027, all NHS suppliers—a primary export market for Irish healthcare SMEs—must publish comprehensive Carbon Reduction Plans covering full Scope 1, 2 and 3 emissions. The direction is clear:

> “Companies that can demonstrate clinical validation, lifecycle evidence and sustainability credentials will gain access. Those that cannot will find doors closing.”

Ireland’s policy architecture is aligned. The HSE Climate Strategy, Green Procurement Framework, Greener Models of Healthcare and Sustainable Waste frameworks together provide the operational infrastructure for system-wide decarbonisation. The Health Sectoral Adaptation Plan 2025–2030, the Whole-of-Government Circular Economy Strategy 2026–2028 and the White Paper on Enterprise collectively signal a shared national direction across health, climate and enterprise policy.

That healthcare is currently absent from Ireland’s Circular Economy Strategy is a notable gap and one the evidence now being generated through HIHI GreenTech is directly positioned to close. Two completed pilots from the inaugural 2024 GreenTech call demonstrate that sustainable alternatives can be adopted in live clinical settings without disrupting care, while delivering measurable financial and environmental returns. The remanufacturing evidence base, including the Vanguard programme at Bon Secours Cork, consistently demonstrates cost reduction and CO_2 reduction per device lifecycle, with no adverse patient outcomes. Across all pilots, clinical outcomes were maintained, staff experience improved and the business case for sustainable procurement was validated in real-world conditions.

Ireland’s life sciences sector is a natural base for developing the low-carbon, circular product alternatives the global market is increasingly demanding. Early clinical validation through HIHI confers credibility in international markets. It converts sustainability from a regulatory compliance challenge into a competitive export advantage. The economic opportunity spans circular medical plastics, reusable devices, sustainable packaging, low-carbon manufacturing and digital health, each representing growing procurement requirements in markets that are hardening their sustainability criteria year on year. The green dividend is not theoretical. It is already materialising: pilots, partnerships, evidence, aligned health, enterprise and climate policy Ireland has the infrastructure, the sector strength and the early proof points to lead in one of the most consequential transitions in modern healthcare.

Programmes and mechanisms alone are insufficient without visible leadership and prioritisation at the highest levels—a commitment to act at the pace and scale the opportunity demands.. The green dividend cannot be claimed through aspiration. It is claimed through procurement frameworks that reward lifecycle evidence, through Regional Health Areas that embed validated innovations into their operating models, through ring-fenced funding that closes the gap between regulatory compliance and market readiness, and through policy coherence that puts healthcare at the centre of Ireland's circular economy ambition. The green dividend has a condition: it must be claimed. The four recommendations in this report offer a starting point for the system partners best placed to act:

Department of Health

HIHI recommends that the Department of Health explores dedicated funding for green procurement pilots to generate lifecycle and circularity evidence, in partnership with HSE Climate and HIHI GreenTech.

An Roinn Sláinte
Department of Health

HSE

HIHI recommends that the HSE supports full Scope 1, 2 and 3 emissions reporting, with data made visible at facility, regional and national level. HIHI further recommends that HSE Procurement works with HIHI GreenTech and HSE Climate to shape green procurement pilots that embed life cycle costing and circularity criteria, generating data to inform future standard requirements within tender frameworks.

HSE

Enterprise Ireland

HIHI recommends that Enterprise Ireland and its life science client companies design ahead of the EU regulatory curve—from ESPR product passports to NHS full-scope emissions reporting requirements from 2027—and partner with HIHI GreenTech to develop and scale capability in circular design for export-ready products.

Enterprise Ireland

Department of Climate, Energy & the Environment

HIHI recommends that the Department of Climate, Energy and the Environment includes healthcare as a named priority sector in the next iteration of Ireland's Circular Economy Strategy, and works with HIHI GreenTech to build a shared vision for sustainable healthcare that is funded, measured and scaled.

An Roinn Aeráide,
Fuinnimh agus Comhshaoil
Department of Climate,
Energy and the Environment

Information Note

The Green Dividend: Why Sustainability is Ireland's Health and Enterprise Opportunity **was authored by Eimear Galvin, HIHI National GreenTech in Health Lead, with review by Dr Tanya Mulcahy, HIHI National Director and members of the HIHI GreenTech in Health Collective.**

The report draws on multiple evidence sources. Clinical pilot evaluation data was generated through HIHI's structured GreenTech in Healthcare programme, delivered in partnership with HSE Climate and Sustainability and the Irish College of General Practitioners, including completed pilots at the Mater Misericordiae University Hospital and University Hospital Galway. Remanufacturing evidence was drawn from the Vanguard AG programme at Bon Secours Hospital Cork and from international case studies across NHS England and European health systems.

The report is further informed by: desk research across Irish and international policy, economic, regulatory and academic literature, advisory group engagement through the HIHI GreenTech in Health Collective; and the structured competitive evaluation process of the inaugural HIHI GreenTech in Healthcare Call 2024/25.

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