



Department for the  
**Economy**  
[www.economy-ni.gov.uk](http://www.economy-ni.gov.uk)

# MEASURING SUCCESS

## 10X METRICS TO ACHIEVE A 10X ECONOMY

ANNUAL REPORT 2023

NOVEMBER 2023



INNOVATION



**NORTHERN IRELAND'S DECADE OF INNOVATION**

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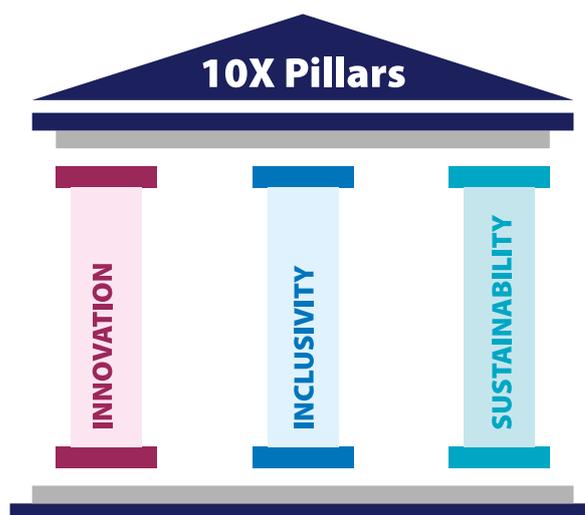
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# **INTRODUCTION**

## 1. Introduction

In May 2021 the Department for the Economy (DfE) published its 10X Vision, for Northern Ireland to achieve a ‘Decade of Innovation’.<sup>1</sup> This means a Northern Ireland that has better jobs with better wages for all our people, with a more flexible working environment and a better overall quality of life.

Innovation, inclusivity and sustainability are the three core pillars within a 10X economy. Innovation plays a central role in driving economic growth and it is important that this innovation creates opportunities for people and communities across Northern Ireland. We must ensure we are taking the necessary steps to encourage innovation in a manner that will drive better social outcomes and promote opportunity for all. These decisions should be taken with a view of environmental sustainability and living within our planetary boundaries.



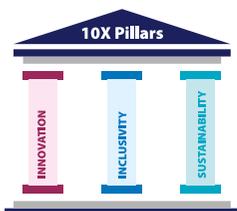
Measuring progress on the delivery of this ambitious vision is vital to success. In October 2022, the Department published its 10X Metrics Baseline Report.<sup>2</sup> It set out an initial snapshot of Northern Ireland’s performance when compared to a group of 16 other small advanced economies, across a number of globally recognised indicators. This report builds on that analysis.

These Tier 1 International Metrics are backed up with a comprehensive set of Tier 2 Underpinning Metrics and Tier 3 Programme-Level / Policy Metrics and Key Performance Indicators (KPIs). The Tier 3 Metrics have yet to be fully developed and determined across DfE and its partner organisations.

The three pillars of innovation, inclusivity and sustainability guided the development of our 10X Metrics. A summary of the approach is illustrated on the next page.

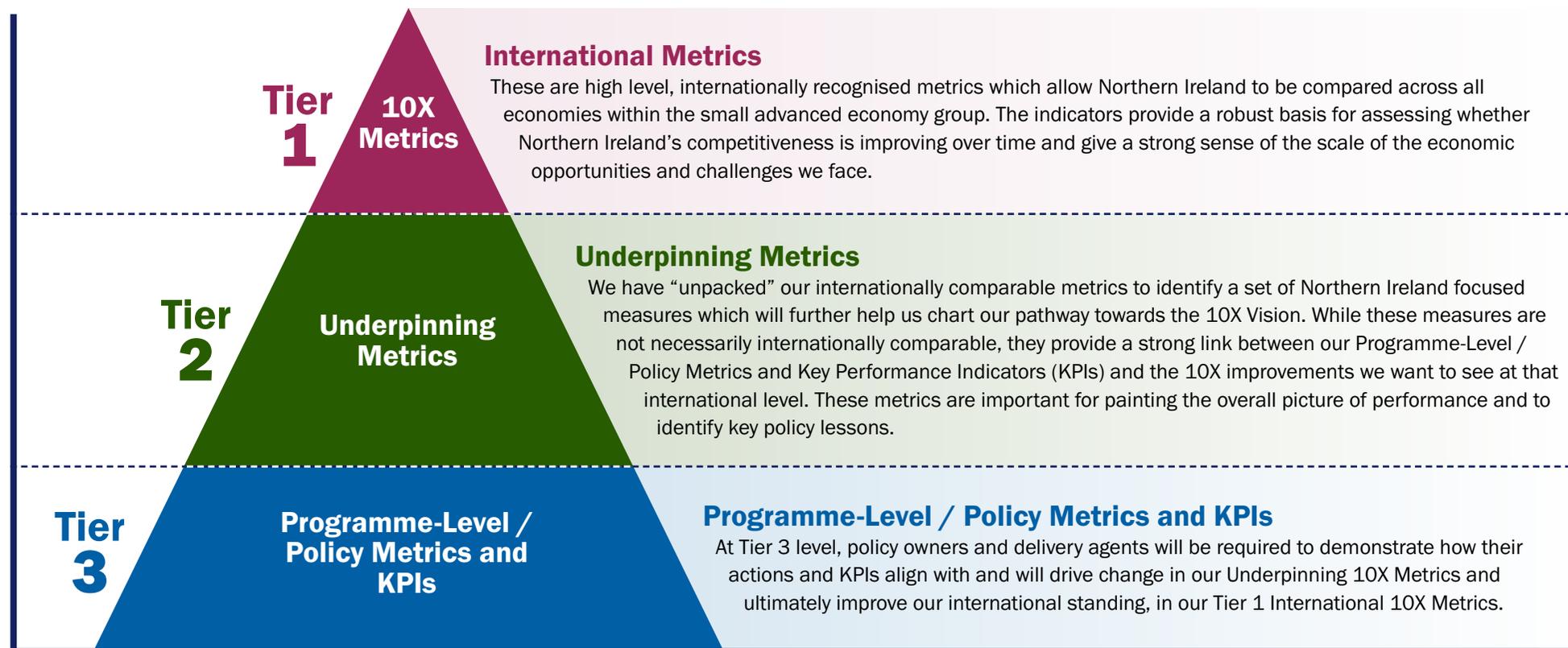
1 [10X Economy - an economic vision for a decade of innovation | Department for the Economy \(economy-ni.gov.uk\)](https://www.economy-ni.gov.uk/10x-economy)

2 [Measuring Success - 10X Metrics to achieve a 10X Economy | Department for the Economy \(economy-ni.gov.uk\)](https://www.economy-ni.gov.uk/measuring-success)



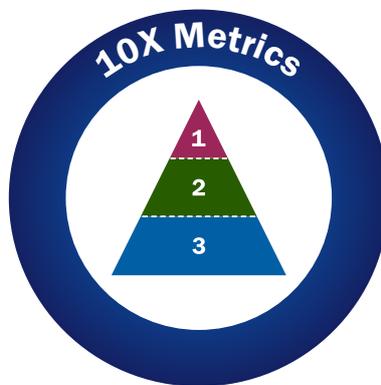
Metrics under each tier cover the three pillars of innovation, inclusivity and sustainability

## Three-Tiered Approach to 10X Measurement



These metrics provide the basis for the Department’s performance measurement framework which will shape all Departmental activities, the activities of our Arm’s Length Bodies (ALBs) and those of wider delivery partners. They sit alongside numerous 10X Actions as detailed within the 10X Delivery Plan 2023-24.<sup>3</sup>

The Department published the 10X Delivery Plan 2023-24 in July 2023. This forms the Department’s business plan for the year, embedding 10X in the fabric of everything we do. For the first time this also incorporated inputs from our partner bodies. While we will be able to report on the performance of each 10X Action, the totality of our performance should be gauged in terms of performance against the 10X Metrics and the 10X Objectives.



3 [10x Vision - Next Steps for Implementation | Department for the Economy \(economy-ni.gov.uk\)](#)  
[10x Delivery Plan 2023/24 | Department for the Economy \(economy-ni.gov.uk\)](#)

The 10X Objectives have specific long-term goals to meet. Many of these 10X Objectives flow from the Tier 1 and Tier 2 Metrics.

10X Objectives - by 2030 <sup>4</sup>	
<p><b>Innovation</b></p> 	<ul style="list-style-type: none"> <li>• Increase total R&amp;D expenditure by 55%</li> <li>• Increase the number of R&amp;D performing businesses by 450</li> <li>• 55% of NI businesses surveyed in the UK Innovation Survey to be innovation active firms</li> <li>• 10% of NI businesses receiving Innovation Recognition</li> <li>• Increase proportion of individuals leaving NI HE institutions with first degrees and post-graduate qualifications in narrow STEM subjects from 24% to 27%</li> </ul>
<p><b>Inclusivity</b></p> 	<ul style="list-style-type: none"> <li>• Increase Northern Ireland Household Disposable Income above the small advanced economy average while maintaining NI as one of the top performing small advanced economies in relation to the Gini Coefficient (a measure of income equality)</li> <li>• Close the employment gap between men and women; people with disabilities and people without; and most deprived area of NI and the least deprived area of NI</li> <li>• Increase the proportion of the working age population with qualifications at level 3 and above from 57.2% (2020) to 70%-75%</li> </ul>
<p><b>Sustainability</b></p> 	<ul style="list-style-type: none"> <li>• 80% electricity consumption from renewable sources</li> <li>• Greenhouse gas emissions 48% lower than baseline</li> <li>• Double the size of NI's low carbon and renewable energy economy to more than £2bn turnover</li> </ul>

The approach is driven by an awareness that transparency is vital when operating without a Minister or Executive. That is why we published our 10X Delivery Plan 2023-24 in the way we did. Furthermore, we are following up on our intention as outlined in the May 2021 10X Vision, to publish updated reports on our performance against our 10X Metrics. While we are unlikely to see significant differences over any one year, by continual monitoring and focusing consistently on our performance we can better drive the level of achievement we need.

This report therefore provides an update on Northern Ireland's 10X performance, first outlined in the 2022 10X Metrics Baseline Report, but expanding further on Tier 1 and Tier 2 performance than the previous publication.

<sup>4</sup> [10x Vision - Next Steps for Implementation | Department for the Economy \(economy-ni.gov.uk\)](#)  
[10x Delivery Plan 2023/24 | Department for the Economy \(economy-ni.gov.uk\)](#)

Due to time lags in data feeding through, coupled with an economy that is recovering from Covid-19 and restrictions, it may be too early to draw definitive conclusions about 10X performance. The 10X Vision was published in May 2021 and it takes time to implement strategies, policies and programmes to drive change. Furthermore, we expect short-term variability in the data, for Northern Ireland and the other 16 small advanced economies.<sup>5</sup> These small advanced economies may improve over time, thus creating, in effect, a ‘moving target’.

In summary, this report shows that Northern Ireland is within range of the other small advanced economies across many of the Tier 1 Metrics, although there is substantial scope for improvement:

- **Innovation** – Northern Ireland is below the small advanced economy average across all four Tier 1 Metrics in the innovation pillar. Even with Gross Expenditure on R&D being revised upwards by ONS, there is still a material gap to the top performers.
- **Inclusivity** – In terms of income equality, Northern Ireland is still better than the small advanced economy average, but lags behind in terms of Household Disposable Income levels and Educational Attainment at Levels 3-8. The employment rate has recovered somewhat since declining markedly as a result of Covid-19 and restrictions, but is 9-13 percentage points behind Iceland, New Zealand and Switzerland for example.
- **Sustainability** – Over the last decade Northern Ireland has rapidly increased the amount of Electricity Generated from Renewable Sources. Both its Energy Intensity levels and its CO<sub>2</sub> Emissions per Capita have seen moderate improvement over the last ten years, and are at relatively similar levels to many of its comparators.

Overall, performance is mixed at Tier 1 level. On many indicators Northern Ireland performs at a level comparable to a number of the small advanced economies, but there is room for advancements across the board. This is why the various strategies, policies and programmes on 10X are so important, focusing on improving the economy in terms of innovation, inclusivity and sustainability.

With 10X driving ambition at the macro regional level and councils leading economic development at a local level in partnership with organisations such as Invest NI, the Department is considering the sub-regional approach and how these three levels can link together to strengthen the economy.

“Place 10X” is the start of a conversation that will lead to a strategic approach to determine what intervention and support is required within the economic remit, and to determine what role the Department for the Economy can and should play in places across Northern Ireland.

<sup>5</sup> Data for 2020 and subsequent years may be impacted by Covid-19 and restrictions.

In May 2023 the Department requested a “Call for Evidence” which sought views on what a sub-regional economic approach should look like. Responses are currently being considered. These responses will help create a body of information to inform policy makers and a future Minister in the Department for the Economy of what central intervention and support is needed or wanted.<sup>6</sup>

Some of the metrics illustrated in this report are available at a more granular local level, including sub-regional or council. In our future annual reports we will look to present some of the metrics at a sub-regional level, while mindful that smaller geographies tend to mean results are based on smaller sample sizes.

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6 [Place 10x | Department for the Economy \(economy-ni.gov.uk\)](https://economy-ni.gov.uk)



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**FURTHER  
DEVELOPMENT  
OF 10X  
METRICS**

## 2. Further Development of 10X Metrics

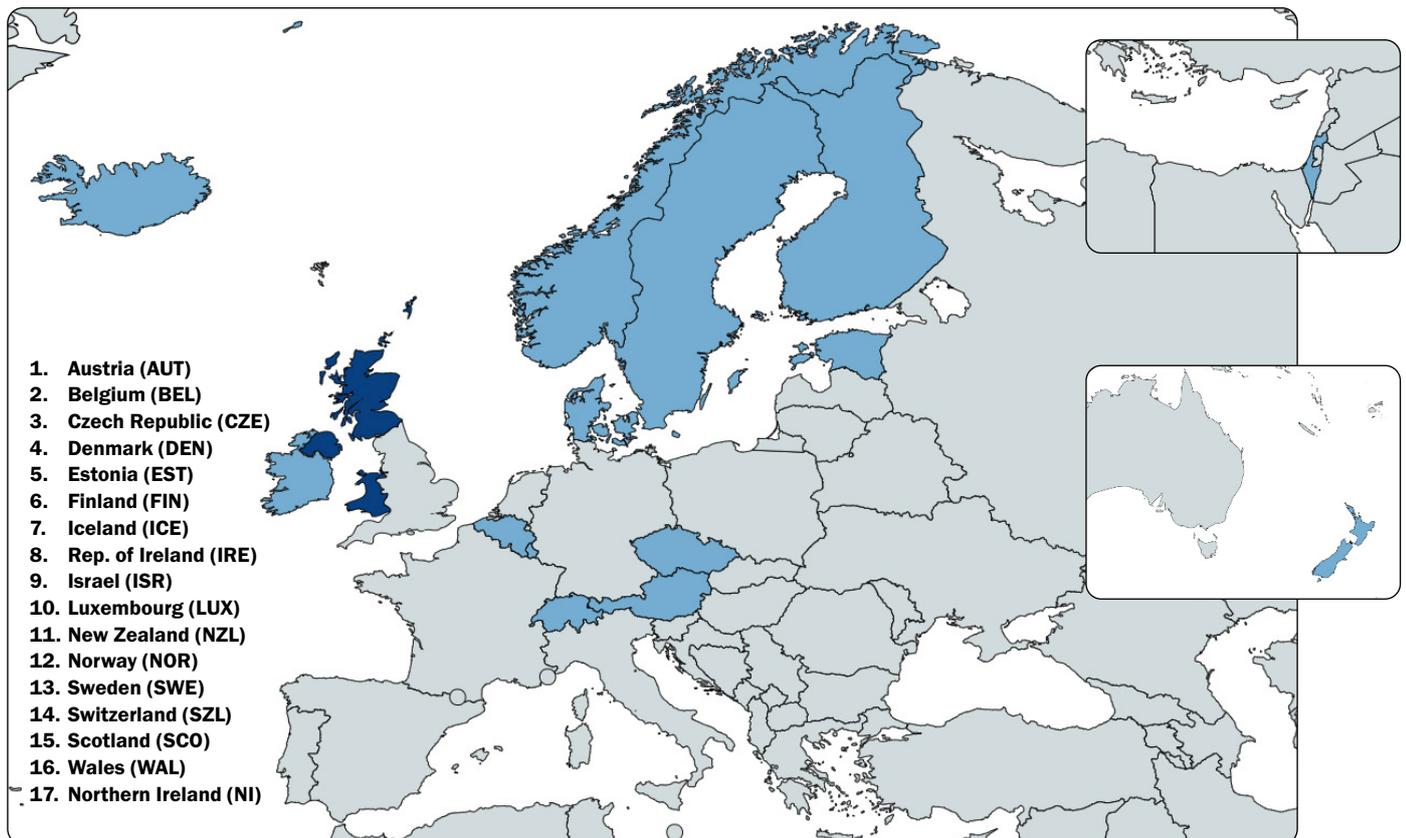
### Tier 1 Developments

The 2022 10X Metrics Baseline Report set out how Northern Ireland was performing on ten Tier 1 International Metrics relative to a selected group of small advanced economies (SAEs). This section of this report will examine any further developments in the 10X Metrics adopted for measuring success.

#### Small Advanced Economy Group

The 10X Vision aspires to not only improve our position from a Northern Ireland perspective, but to be positioned amongst the most competitive small advanced economies in the world. The small advanced economy group consists of 16 countries and regions against which Northern Ireland can be compared and benchmarked. The selection process is set out in the 2022 10X Metrics Baseline Report and the final list of economies is unchanged from that publication.

#### Map of the Small Advanced Economy Group



It is important for DfE to learn lessons of what works well elsewhere and consider if it can be applied in Northern Ireland. Therefore, under the 10X Research Programme for 2022-23 & Beyond<sup>7</sup> a number of research pieces have been published over the last number of years which helped identify relevant policy lessons from across the globe.<sup>6</sup> A few of these are highlighted below, including work undertaken by Dr David Skilling (Landfall Strategy) and other authors:

- Learning from Small Advanced Economies, to Drive 10X Performance – Landfall Strategy<sup>8</sup>
- Integrating Sustainability into the 10X Agenda – Landfall Strategy<sup>9</sup>
- Small Advanced Economy Insights on Innovation Policy for NI – Landfall Strategy<sup>10</sup>
- Exports, Innovation and Productivity in Small Advanced Economies – Landfall Strategy<sup>11</sup>
- The Circularity Gap Report Northern Ireland – Circle Economy<sup>12</sup>
- Closing the Skills Gap – Work+<sup>13</sup>
- Independent Review of Invest NI – Independent Review Panel / Technopolis<sup>14</sup>

Research on international best practice will continue during 2023-24 and beyond. In addition to enhancing understanding and our evidence-base, it is also important to feed lessons learned into policies, decisions, economic advice and expenditure / programmes.

### Data Issues

We have given careful consideration to the data we have drawn upon, basing our findings on the best available data for the small advanced economy group, but international benchmarking can be complex, and such comparisons should be interpreted with some level of caution. The following are some common issues:

- Challenge in achieving availability of comparable data across a wide range of countries;
- Difficulty in measurement using a common methodology across statistical authorities in different countries - even when economic data are organised by internationally agreed statistical standards, it should be noted that their implementation at national level can vary;<sup>15</sup>
- Figures for each indicator can fluctuate year-on-year due to a variety of reasons (and we should therefore not be overly concerned about short-term variability in some cases);
- Different areas of the world may experience different timings of economic cycles;
- Data can be patchy, and some countries can have data missing in various years. Where appropriate, our graphs may interpolate between values; and
- Issues relating to timeliness and lags in reported data – the latest data may be available for Northern Ireland before other economies, or vice versa.

Covid-19 and restrictions may have impacted on economic performance over a number of years, from 2020. Furthermore, it may have impacted on the availability of data across selected metrics, as well the reliability / robustness of the data provided.

7 [10X Economy Research Programme 2022-23 and Beyond | Department for the Economy \(economy-ni.gov.uk\)](#)

8 [Research Bulletin 22/1 - Learning from Small Advanced Economies, to Drive 10X Performance](#)

9 [Research Bulletin 22/8 - Integrating Sustainability into the 10X Agenda \(economy-ni.gov.uk\)](#)

10 [Research Bulletin 23 -1 - SAE Insights on Innovation Policy for NI \(economy-ni.gov.uk\)](#)

11 [The relationship between exports, innovation and productivity in small advanced economies](#)

12 [The Circularity Gap Report Northern Ireland | Department for the Economy \(economy-ni.gov.uk\)](#)

13 [Closing the Skills Gap | Department for the Economy \(economy-ni.gov.uk\)](#)

14 [Independent Review of Invest Northern Ireland \(InvestNI\) | Department for the Economy](#)

15 [WDI - Economy \(worldbank.org\)](#)

These types of caveats should be kept in mind when interpreting relative performance and change over time.

### **Changes to Tier 1 10X International Metrics**

Following publication of the 2022 10X Metrics Baseline Report there have been a number of changes to the Tier 1 International Metrics. A public consultation was carried out in October 2022 seeking views on the 10X Performance Management Framework, including on the 10X Metrics.<sup>16</sup> We have considered the responses from this consultation, reviewed the Tier 1 Metrics and adopted some new indicators.

### **Innovation Pillar**

Innovation policy has always been a central part of economic strategy, including in small advanced economies. Differences in innovation capabilities and outcomes explain why small advanced economies have a performance edge over their larger counterparts, as well as helping to explain the variation across small advanced economies.<sup>17</sup>

Specific feedback from the public consultation, highlighted that two Research and Development (R&D) expenditure measures at Tier 1 level may be somewhat duplicative, especially as Business Expenditure R&D is a component of Gross Expenditure R&D. In response to this it was decided that Business Expenditure on Research & Development (BERD) would be better captured under the Tier 2 Metrics. This metric was then replaced at Tier 1, with a more activity-based innovation measure, capturing the **percentage of innovation active businesses**.

### **Sustainability Pillar**

The 10X Metrics Baseline Report 2022 included two sustainability metrics at Tier 1 level, namely Electricity from Renewable Sources and Carbon Dioxide Emissions. The Department was aware that further metrics would be needed to broaden the sustainability pillar.

In considering a third sustainability metric, it is important to be mindful that the Department for the Economy has lead responsibility for the development of energy efficiency policy and legislation in Northern Ireland, working with other departments and public bodies. In this regard, the Department's work focuses on the following areas:

- Development and implementation of new policies aimed at improving the energy performance of domestic and non-domestic buildings, in the context of the Energy Strategy;
- Co-ordinating policy development with other public bodies whose functions impact on energy efficiency policy;
- Ensuring interested stakeholders have a clear direction of travel linked to government priorities; and
- Ensuring the legislative framework governing energy efficiency continues to operate following UK withdrawal from the EU.<sup>18</sup>

16 <https://www.economy-ni.gov.uk/sites/default/files/consultations/economy/Report-on-Consultation-Responses-10x-Performance-Management-Framework.pdf>

17 [Research Bulletin 23 -1 - SAE Insights on Innovation Policy for NI \(economy-ni.gov.uk\)](#)

18 [Energy efficiency | Department for the Economy \(economy-ni.gov.uk\)](#)  
[Economy Minister welcomes energy efficiency for Northern Ireland businesses following Covid scheme](#)

To capture this important activity, and to compare it internationally, **Energy Intensity** has been selected as a further Tier 1 sustainability metric.

Energy intensity is an indication of how much energy is used to produce one unit of economic output (typically GDP). A lower ratio indicates that less energy was used to produce one unit of output. This metric is considered advantageous in monitoring performance at a macro level, towards greater energy efficiency. However, while this is a useful indicator, it is important to be mindful of its limitations, as it can be affected by a range of factors, perhaps not necessarily linked to pure efficiency (such as climate).

In considering a fourth and final Tier 1 sustainability metric, we followed on from the direction provided within the 2022 10X Metrics Baseline Report:

*“... in future iterations of this work we plan to include at least one further Tier 1 sustainability indicator which will capture the strategic ambitions of the Department in relation to the circular economy. Work is ongoing to ensure that, whatever additional measure is chosen, it is possible to compare our performance on an international stage.”<sup>19</sup>*

The DfE draft Circular Economy strategy<sup>20</sup> explains that if we do not transition to a circular economy, by 2050 our existing natural resources will be depleted and our economic growth ambitions will be increasingly constrained. The transition to greater circularity will help us decouple economic growth from resource use, which creates prosperity without the negative environmental impacts that can be associated with growth. Goal 12 of the UN Sustainable Development Goals requires more sustainable consumption and production patterns.<sup>21</sup> One way of measuring Northern Ireland’s progress against this is to measure our material footprint. Material footprint is essentially the quantity of material (in tonnes) needed to meet demand, typically expressed on a per capita basis.

Therefore, we consider **Material Footprint** would have distinct advantages as a Tier 1 International Metric, and will explore this further. Ideally, this consumption based metric will chart material use over time and be comparable against other small advanced economies.

Section 5 of this report provides a high level commentary on the Material Footprint measure. However, it does not include a detailed analysis comparing Northern Ireland’s performance against the performance of the other 16 small advanced economies. The metric falls under a ‘data gathering and comparison agenda’ for further work to take place, before such data and benchmarking can be shown.

19 [Measuring Success - 10x Metrics to achieve a 10X Economy | Department for the Economy](#)

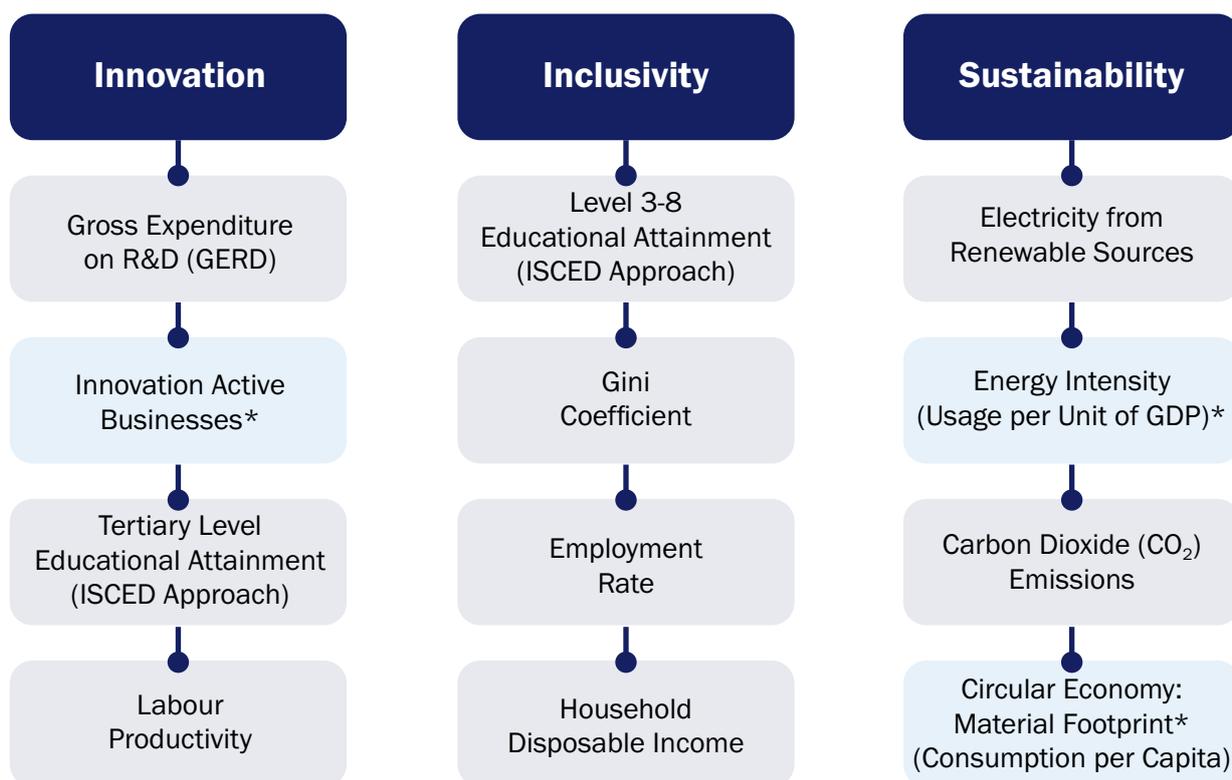
20 [Draft Circular Economy Strategy for Northern Ireland \(economy-ni.gov.uk\)](#)

21 [Sustainable consumption and production \(un.org\)](#)

## Summary of Tier 1 10X International Metrics

The figure below sets out the 12 Tier 1 10X International Metrics. Our analysis on these metrics will involve two primary methods. Firstly, we chart Northern Ireland’s historic and current performance, tracking this over time (i.e., baselining / time-series analysis) and in future years when more outturn data becomes available. Secondly, we compare Northern Ireland to the 16 small advanced economies, measuring any performance gaps and establishing relative rankings (i.e. benchmarking analysis).

### Tier 1 10X International Metrics



\*Three of the Tier 1 Metrics highlighted in blue above are newly selected measures.

## Tier 2 Developments

In October 2022, the Department for Economy released a consultation document seeking views on the 10X Performance Management Framework.<sup>22</sup> That set out the necessary performance measurement structures with an emphasis on the change in focus and performance required to achieve the 10X Vision.

In relation to the performance measurement aspect, 51% of respondents agreed that the right metrics were selected to take forward 10X; 13% disagreed; 28% selected don’t know and 8% gave no response. In addition, respondents were asked if they had any other views on these important metrics, summarised in a DfE Report of Consultation Responses – 10X Performance Management Framework.<sup>23</sup>

22 [10x Performance Management Framework | Department for the Economy \(economy-ni.gov.uk\)](#)

23 [Report on Consultation Responses - 10x Performance Management Framework \(economy-ni.gov.uk\)](#)

Taking on board the responses to the consultation exercise, the Department has further developed the Tier 2 10X Metrics. Performance against a number of these Tier 2 Metrics is shown within this report. A comprehensive list of Tier 2 indicators can be found in the Annex to this report.

Tier 2 Metrics can provide more detail and disaggregation than at Tier 1 level. Furthermore, Tier 2 indicators tend to avail of more recent data than the International Metrics. In this report, at Tier 2 level we have focused more on showing detailed breakdowns of data, rather than performance over time.

### **Tier 3 Developments**

This report is focussed on the Tier 1 and Tier 2 Metrics only. At the Tier 3 level, policy owners and delivery agents will be required to demonstrate how the projects, programmes and policies for which they are responsible (and the actions and KPIs contained within these) align with and will drive change in our Underpinning 10X Metrics. It is that activity and strong performance at that level that will ultimately improve our international standing, in our Tier 1 International 10X Metrics.

At this juncture, the Tier 3 Metrics are at different stages of development across the Department and its partner organisations.



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# **INNOVATION METRICS**

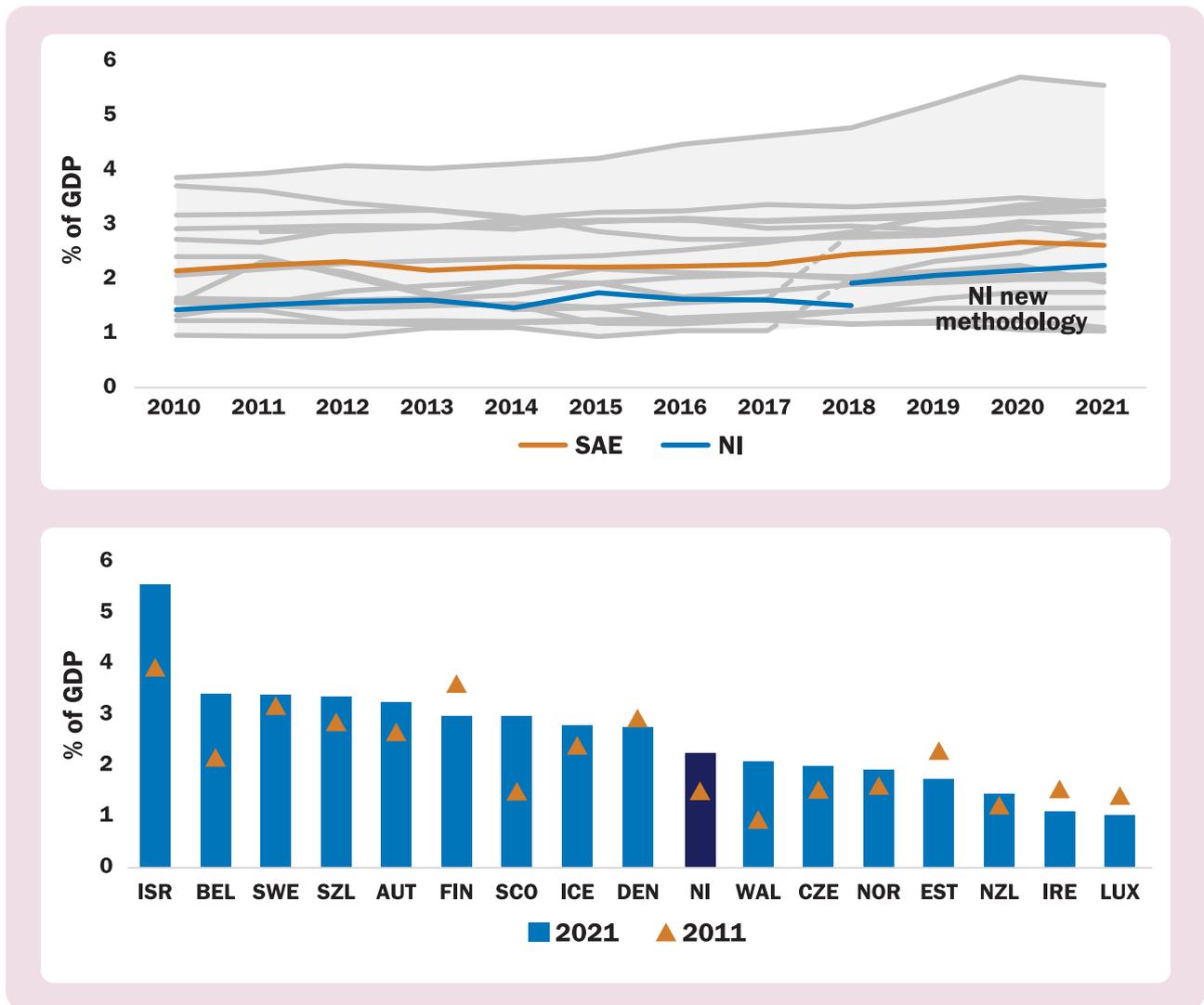
### 3. Innovation Metrics

#### Tier 1 Innovation Metrics

##### Gross Expenditure on Research and Development (GERD)

With Gross Expenditure on R&D in 2021 equating to around 2.3% of GDP, Northern Ireland lags behind the small advanced economy average of 2.6%. ONS and NISRA have upwardly revised R&D estimates for the UK regions, with a new methodology.<sup>24</sup> Data for 2021 shows Northern Ireland ranked 10th on this measure when compared to the small advanced economy group, outperforming economies such as New Zealand, Wales and the Republic of Ireland.<sup>25</sup> Israel, Belgium, Sweden, and Switzerland perform well on this measure.

##### Gross Expenditure on R&D as a % of GDP



Sources: OECD, ONS, NISRA

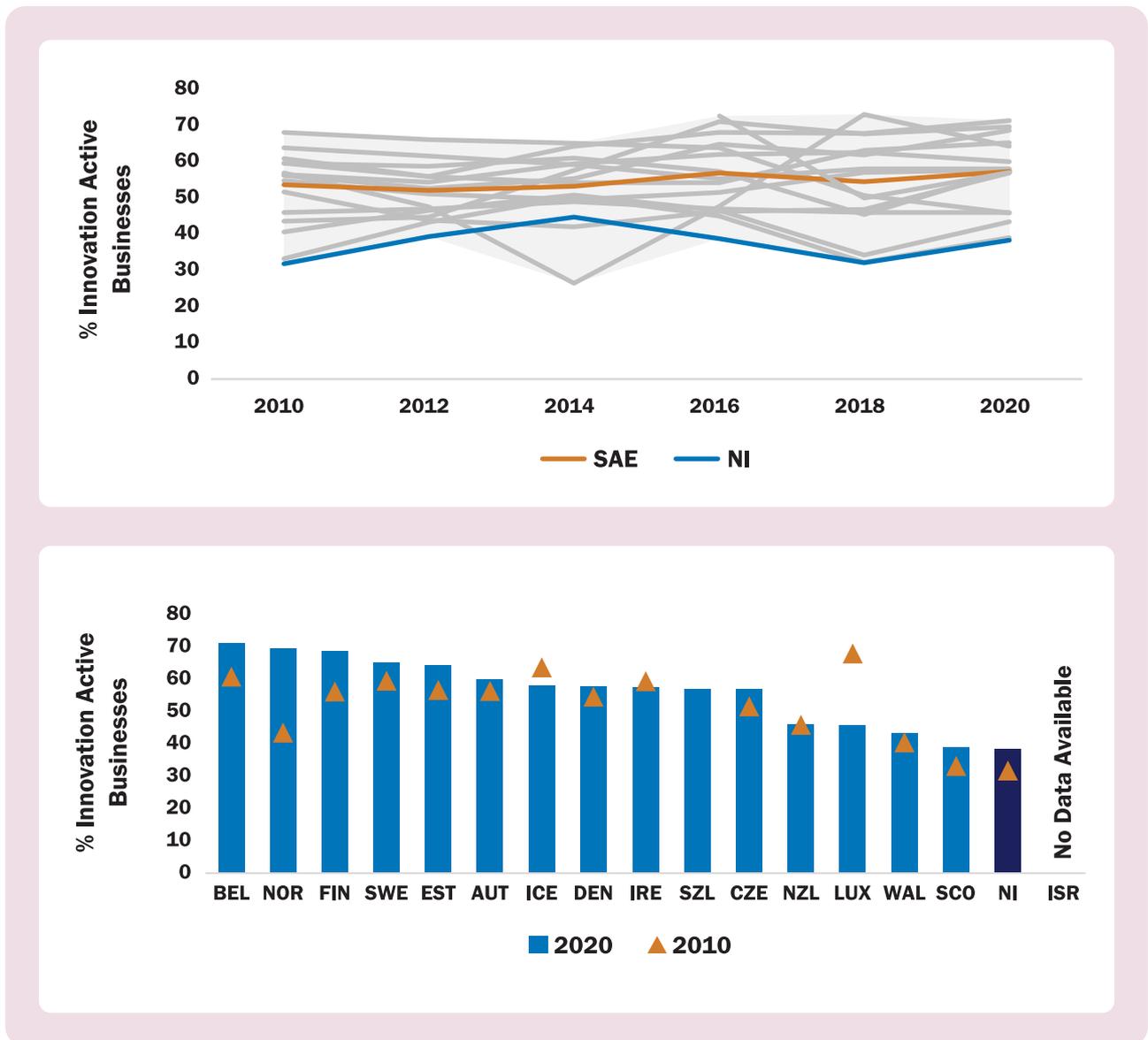
24 The significant increases for Northern Ireland, Scotland and Wales over the last decade are partially / fully due to methodological reasons (namely upwards revisions to recent data by ONS) - [Comparison of ONS business enterprise research and development statistics with HMRC research and development tax credit statistics - Office for National Statistics](#)

25 The Republic of Ireland is somewhat disadvantaged on this metric with its relatively high GDP levels (due to the presence of large multinationals and their impact on the output figures).

### Innovation Active Businesses

This new 10X Tier 1 metric is based on the Eurostat Community Innovation Survey and the UK Innovation Survey (carried out every two years).<sup>26</sup> The results can exhibit some volatility over time. However, we can clearly see below that Northern Ireland has consistently underperformed on this metric. Only a relatively small percentage of surveyed businesses reported innovation activity in 2020 in Northern Ireland (38%), when compared to the small advanced economy average (57%).<sup>27</sup> It is acknowledged that comparability issues exist between figures for the UK regions (DSIT / ONS data) and other small advanced economies (mainly taken from Eurostat data). However, it is worth noting that Northern Ireland lags behind Scotland and Wales, when comparing figures and results from the same UK Innovation Survey.

### Innovation Active Businesses



Sources: Eurostat, ONS UKIS, Statistics Iceland, Statistics NZ

26 Data captures only those businesses with 10+ employees.

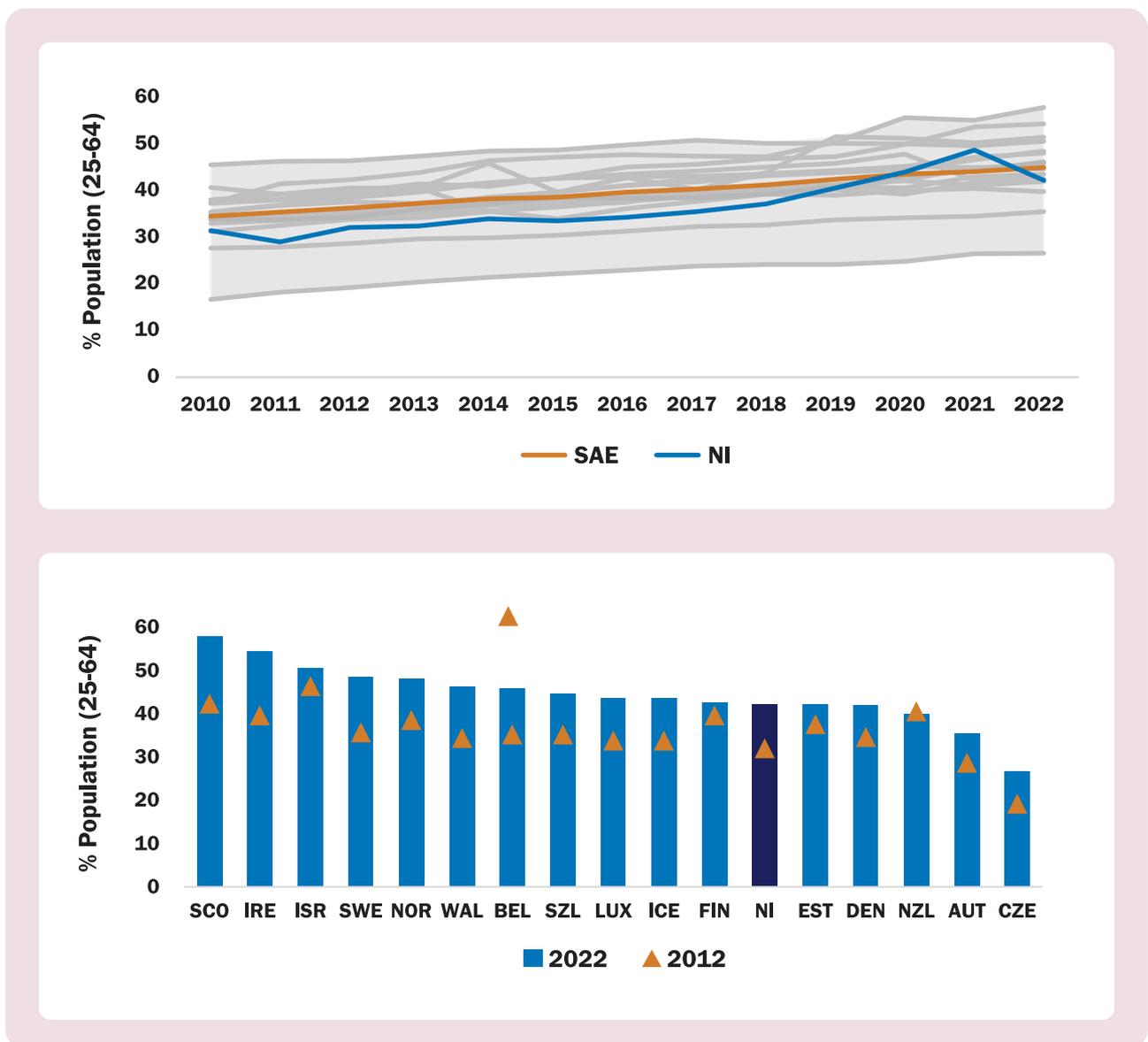
27 No data are available for Israel; therefore SAE average is based on 15 economies.

### Tertiary Education Attainment Levels

Small advanced economies have tended to improve gradually on this indicator over the last decade, with Northern Ireland also following this upwards trend. The percentage of the population (aged 25-64) with tertiary level education in Northern Ireland, increased from 32% in 2012 to 42% in 2022.<sup>28</sup> Scotland, Republic of Ireland and Israel are the best performers on this measure.

All figures have been taken from OECD, including Northern Ireland. Some caution should be exercised when using these data, especially for the time period 2020 to 2022.

#### Percentage of Population (25-64) with Tertiary Level Education (Level 5-8) [ISCED]



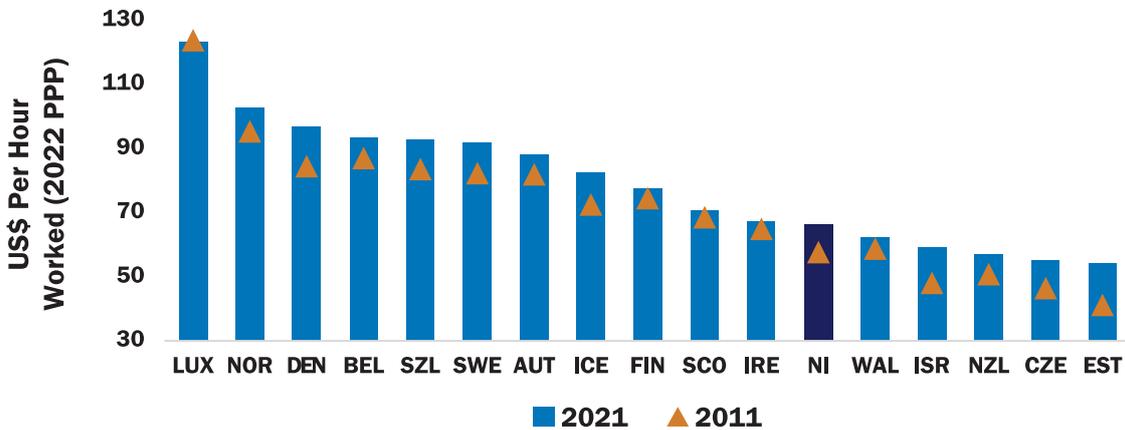
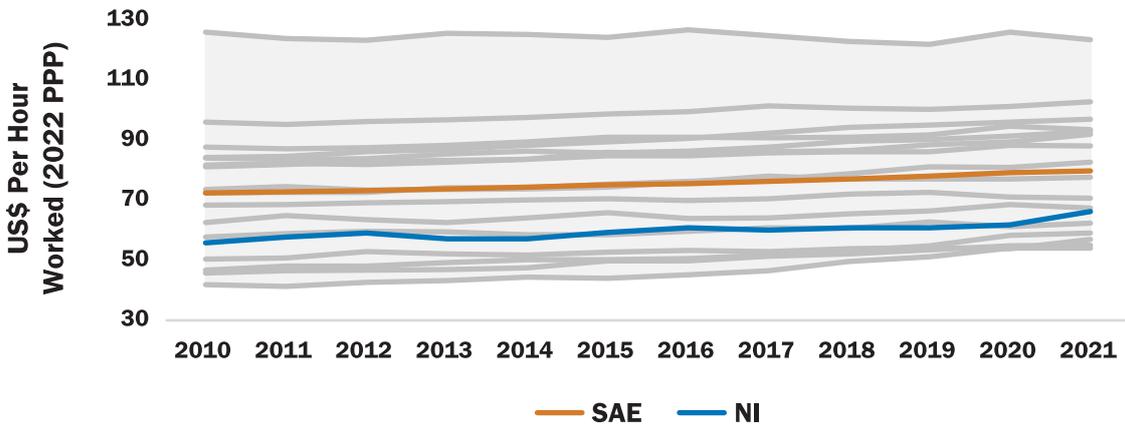
Source: OECD

28 These figures are reported by the OECD and may differ to those published by ONS and NISRA.

### Labour Productivity

Over the past decade Northern Ireland productivity has been consistently below the small advanced economy group average. Data for 2021 shows Northern Ireland at 83% of this average. Luxembourg, Norway and Denmark are the best performers on this measure, with output per hour worked much higher than Northern Ireland.

### Labour Productivity



Sources: Conference Board, Total Economy Database, ONS

## Tier 2 Innovation Metrics

### Research and Development

The intended outcome of any research and development activity is new knowledge. New knowledge can give rise to more efficient methods of production or enhanced or entirely novel products and services meaning that R&D is an important contributor to growth in long-run living standards. Gross expenditure on R&D (GERD) is made up of three components, according to the particular sector of performance. Spend by each of these sectors are important indicators of performance in their own right, in the context of the 10X Vision.

Government departments and affiliated bodies support research and development by other sectors through the provision of funding. Governments can also undertake R&D directly, either in-house or purchased from external providers. According to the NISRA R&D Survey, in 2021, **government expenditure on R&D**<sup>29</sup> in Northern Ireland was £26.5m, roughly 2.4% of total spending on R&D.<sup>30</sup>

Research and development activity by **Higher Education Institutions** (HEIs) typically accounts for around a fifth (£219.5m in 2021, as per the R&D Survey) of total R&D expenditure in NI. HEIs have large accumulations of specialised resources which are integral to R&D activity such as experienced researchers and specialist facilities and equipment. Higher Education expenditure (HERD) offers a measure of how extensively these resources are employed both in terms of the direct contribution of HEIs to total R&D activity and in their ability to support such activity in other sectors.

**Business Expenditure on Research and Development** is sub-divided into three measures. **BERD by Company Size** measures total R&D expenditure by small, medium and large firms. **BERD by sub-region** measures spend by the district council area and **BERD by sector** tracks expenditure by the assigned industry of performing firms. These sub-metrics serve the following purposes:

- BERD by Sub-Region: Positive spillovers associated with R&D activity can be relatively localized so understanding the geographic dimensions of R&D activity can help us understand its likely impact on local economies and the wider business base.<sup>31</sup>
- BERD by Sector: Different sectors will have different incentives to invest in R&D and may face industry specific barriers to such activity.
- BERD by Company Size: Smaller firms are more likely to be affected by adverse conditions to investment or market failures.<sup>32</sup> Tracking business expenditure by firm size can help inform whether interventions are optimized to meet the specific needs of different types of R&D active businesses.

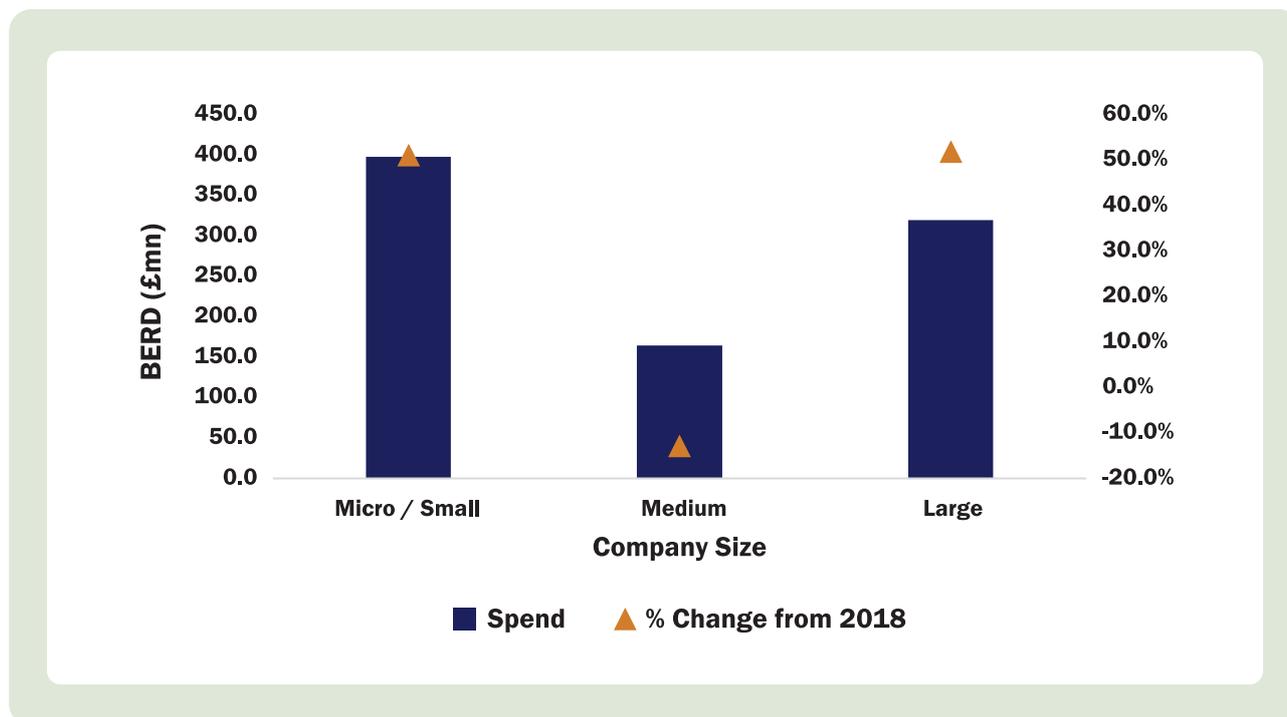
29 GovERD includes the value of funding administered by Research Councils and Higher Education Funding Councils (UKRI in England). Funding for higher education research administered by the Department for the Economy including Quality Related Research is classified according to sector of incurrence (i.e. Higher Education R&D spend).

30 NISRA [Research and Development Survey](#), 2021

31 Localised Knowledge Spillovers; Evidence from the spatial clustering of R&D labs (2020); Regional Science and Urban Economics; Buzard K. et al.

32 Department of Business Innovation and Skills; SMEs; The Key Enablers of Business Success and Rationale for Government Intervention (2013)

*Business Expenditure on R&D in Northern Ireland, 2021*



In 2021 almost £400m of business expenditure on R&D was incurred by small and micro firms (45.1% of total BERD). Large firms were the next most significant contributor at £319m (36.2% of total BERD). Small and large firm spending on R&D has increased broadly in proportion to one another from 2018 and spending by these businesses represents the primary driver behind increased levels of NI R&D expenditure overall.

In 2021, the services sector accounted for almost half (49.0%) of all BERD while manufacturing accounting for 37.2%. The Information and Communications sub-sector made up almost half of all BERD within services. The Chemicals and pharmaceuticals, computer and optical products and transport equipment sectors collectively made up around 61.1% of all manufacturing R&D expenditure in 2021.

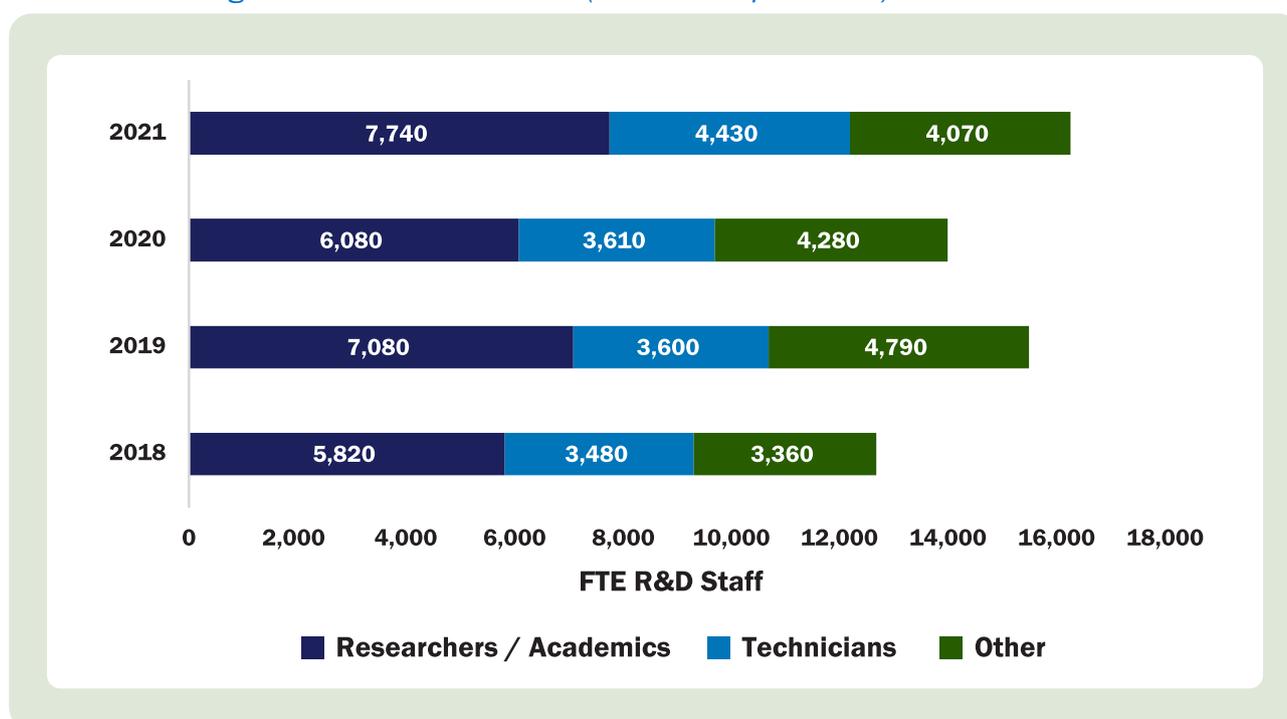
Expenditure based indicators approximate the level of R&D activity being undertaken within a particular sector, place or type of performer over a period of time. Other indicators can provide insight into the capacity of the economy to generate new knowledge in the future.

The **number of R&D companies** is the estimated total of ‘R&D active’ firms as per the NISRA Research and Development Survey. This indicator provides an insight into the breadth of the R&D / Knowledge economy as well as the forward potential for increased R&D investment. The 10X Vision – Next Steps For Implementation report<sup>33</sup> outlines a target for an additional 450 R&D active firms (relative to 2020 levels; 1684 companies) by 2030. In 2021 there were an estimated 1,709 R&D active firms in NI, a small improvement on the 2020 target baseline and an increase of 12.4% on 2018 levels.

33 Department for the Economy, 10X Vision – Next Steps for Implementation (2022)

**Staff counts of employees involved in R&D activity** include professional researchers (i.e. principal researchers, scientists, engineers etc.) as well as supporting technical and administrative staff. Employee figures are expressed in full-time equivalent terms which provides a better indication of total labour input than raw headcounts. The level of specialised R&D labour input is an important determinant of the potential of an economy to generate new knowledge. In 2021, businesses employed an estimated 14,080 FTE staff specifically for R&D activity, an increase of just over a third from 2018. Researchers and technicians make up around 75.0% of all business R&D staff with non-specialist support workers accounting for the remainder. A further 2,160 FTE R&D staff were employed by NI Higher Education Institutions, primarily academics and researchers.

*Business and Higher Education R&D Staff (Full-Time Equivalents) 2018 - 2021*



**Innovation Driven Enterprises** are firms that are founded on the basis of high impact innovations with global market potential. The type of innovation that these firms pursue typically requires an initial period of significant investment (e.g. in research and development) and comparatively limited revenue. If successful, IDEs can eventually realise rapid firm growth and make outsized contributions to output and employment growth. IDEs represent a highly distinct sub-population of firms with distinct challenges and specialised needs. This specificity demands a more tailored policy response in addition to actions designed to improve overall rates of innovation performance within the wider business base.<sup>34</sup> Extant data sources on NI IDE numbers remain limited but the Department is exploring a number of potential identification methods. These include an analysis of Accelerator Programme attendee firm characteristics mapped to the NI VAT / PAYE business population.

34 [Research Bulletin 23/6 - Innovation Driven Entrepreneurship and Northern Ireland \(economy-ni.gov.uk\)](#)

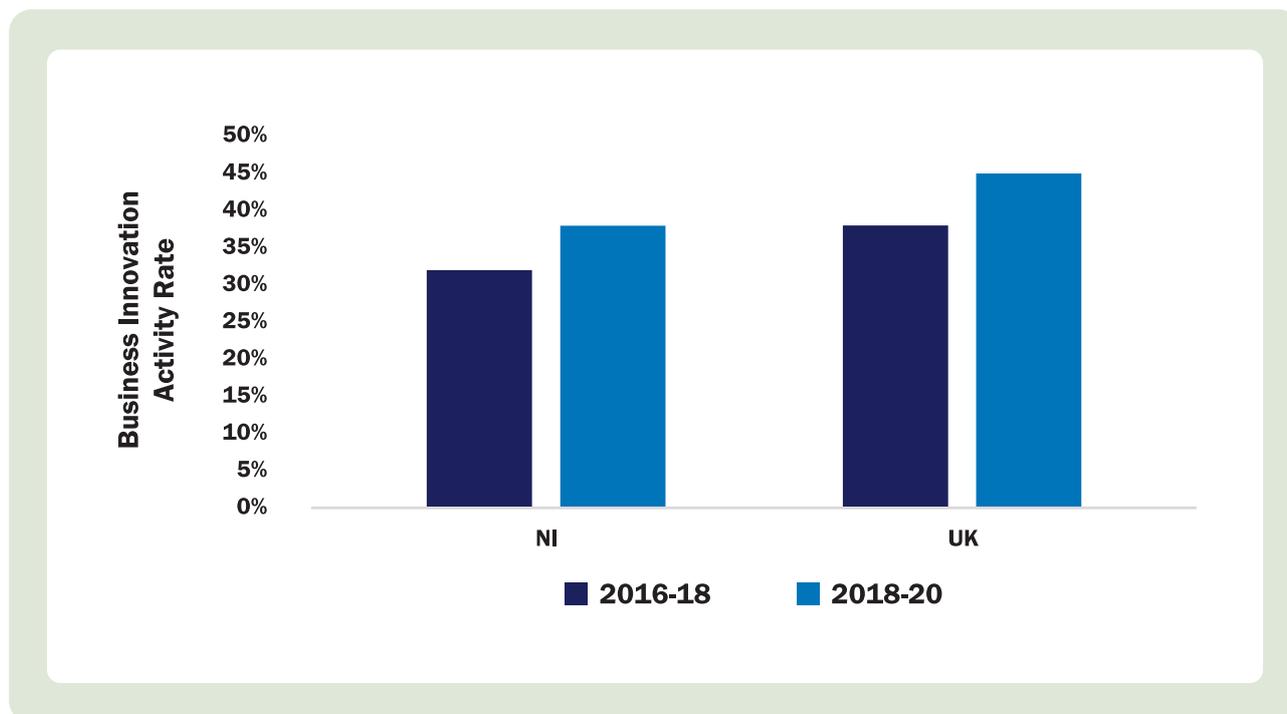
### Innovation Activity

The process of innovation describes the adoption, development or introduction of novel practices, products and methods of organisation. Innovation is distinct from R&D in that it does not necessarily entail the generation of new knowledge.<sup>35</sup> Innovation is also broader in nature and not as restricted to a select group of performers in the way that R&D tends to be. The 10X Delivery Plan outlines a multi-stranded approach to innovation which emphasises the need for both increased rates of activity amongst the business base as a whole and the facilitation of high-impact innovation by a smaller number of specialised firms.

**Innovation Active Firms** refer to businesses that have developed new or significantly improved products, services, production processes or organizational structures and strategies. Higher levels of business innovation activity suggest greater economic dynamism and responsiveness to competition, factors which are conducive to long term output, productivity and wage growth. It is therefore desirable that innovation is as widespread across the NI business base as possible.

According to the UK Innovation Survey, from 2018 to 2020, 38% of Northern Ireland firms (with more than 10 employees) were innovation active<sup>36</sup>, a 6pps increase from 2016-18 levels. Despite this, Northern Ireland’s innovation activity rate remains below the UK average rate of 45%. The 10X Vision has a target rate of 55% of businesses surveyed being innovation active by 2030.

#### Business Innovation Activity Rate in Northern Ireland, 2016-18 vs 2018-20



35 NISRA, [Innovation Survey](#) (2021)

36 Only firms with ten or more employees are included within the scope of the Community Innovation Survey.

The 10X Delivery Plan 2023-24<sup>37</sup> identifies Comprehensive Innovation as a key area of focus for policy development. Comprehensive Innovation describes the need to expand innovation activities beyond traditional innovative / knowledge intensive sectors into segments of the economy that have historically seen weaker productivity growth and lower propensities to innovate. In light of this policy focus, business innovation activity will also be tracked according to sector of performance and type of activity (e.g. process and / or product innovator).

Over the period 2018 to 2020, 46% of NI businesses in the Production and Construction sectors were innovation active compared to 52% for the UK as a whole. 35% of NI businesses in Distribution and Services industries were innovation active over the same period. The individual sub-sectors with the highest recorded rates of innovation activity in NI were electrical and optical equipment manufacturing (75%), manufacture of transport equipment (58%). NI sectors such as wholesale, retail and hospitality have typically recorded lower levels of innovation activity and have tended to lag behind equivalent UK sectoral averages.

***Innovate NI awards recognitions*** to businesses that can demonstrate innovation activity. There are four tiers of recognition, each corresponding to a stage in a typical innovation process from initial conception to final implementation. A contributing objective of the 10X Vision is to ensure that 10% of all Northern Ireland businesses have received an innovation recognition by 2030 to build awareness of the importance of innovation amongst the NI business base and to direct firms towards tailored support.

### ***Higher Education: Generated Income from Collaboration and Business / Community Interaction***

HEIs generate income through commercial interactions and collaboration with a variety of external clients and partners. The amount of income generated from these sources indicates how effectively HEIs contribute to the generation and exchange of knowledge with other parts of the economy. Higher rates of knowledge exchange increase the likelihood of subsequent innovation by businesses and other economic actors. Data on Higher Education Income from business and community interaction and collaboration is produced by the Higher Education Statistics Agency (HESA).

- **Income from Collaborative Research:** Income from publicly sponsored research projects that involve at least one non-academic collaborator. These can be businesses, charities or non-profit organisations. Total NI HEI income from collaborative research was £50.8m in the 2021-22 academic year<sup>38</sup>, a modest increase (6.7%) on 2019-20 levels.
- **Income from Business Interaction:** Income from consultancy, contract research, facilities / equipment rental and continuous professional development services where clients are commercial (for profit) enterprises. Total income from this source was £22.4m in 2021-22<sup>39</sup>, an increase of 43.6% from 2019-20.
- **Income from Community Interaction and Other:** Income from consultancy, contract research, facilities / equipment rental and continuous professional development services where clients are non-commercial organisations, such as charities or non-profits. The total value of this income source was £47.4m in 2021-22, an increase of just over a fifth (20.7%) since 2019-20.

37 Department for the Economy; 10X Delivery Plan (2023)

38 Higher Education Statistics Agency; Business and Community Services; Income from Collaborative Research Involving Public Funding (2023)

39 Higher Education Statistics Agency; Business and Community Services; Income from Business and Community Interaction and CPD (2023)

## Labour and Skills

The wider impact of research, development and innovation (RDI) is influenced by absorptive capacity. Absorptive capacity refers to the ability to understand, utilise and integrate new knowledge for productive applications.<sup>40</sup> A more skilled workforce will generally be able to make better use of the outputs of RDI activity. In turn, this upwardly affects labour productivity which contributes to sustainable growth in the value of output, a proportion of which accrues to workers in the form of higher wages.

Scientific, technical and engineering skills make outsized contributions to absorptive capacity. **The number of STEM Graduates** tracks the number of first degree graduates and postgraduates (from NI HEIs) in Narrow STEM subjects in each academic year. Narrow STEM subject disciplines are based on Higher Education Statistics Authority (HESA) subject classifications. The annual inflow of such skills into the labour force enables us to assess movement in absorptive capacity<sup>41</sup> and with it, the ability of NI economic actors to make maximal use of the outputs of R&D and new innovations.

There were 4,405 NI students with Narrow STEM qualifications in the 2021-22 academic year (around 24% of all first degree and postgraduate qualifications). The 10X Vision outlines a target to increase the proportion of HE leavers in Narrow STEM subjects to 27% of total by the 2029-30 academic year. The number of Narrow STEM graduates has risen steadily in recent periods, increasing by almost a third from 2017-18. Despite this, the proportion of all HE leavers with Narrow STEM qualifications has remained stable, in part due to a large increase in the number of non-NI domiciled graduates.

**Labour productivity** is a measure of the rate at which firms, sectors and economies can convert input into output and is the principal influence on long-term living standards. Measuring change in productivity on an industry by industry basis allows us to assess whether the benefits of innovation are as diffuse across the economy as possible and identify potential bottlenecks.

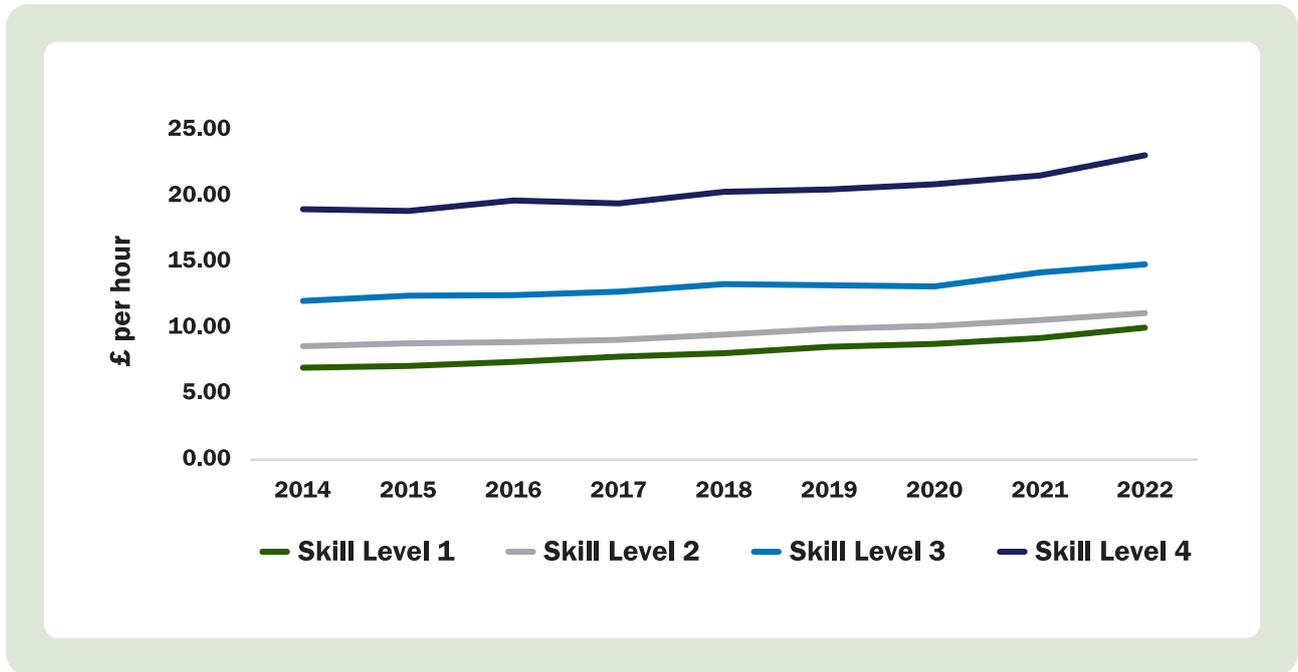
Wages represent the value of production that accrues to labour (workers and employees).

**Median wages by occupational skill level** allows us to gauge how much employees and workers benefit from increased levels of innovation in the economy and whether this benefit is concentrated within particular segments of the labour force.

40 Innovation and Learning; The Two Faces of R&D (1989); The Economic Journal; Cohen W. & D.A. Levinthal

41 Cohen and Levinthal (1990); 'Absorptive Capacity; A new perspective on learning and innovation', Administrative Science Quarterly

Gross Median Hourly Wages by Occupational Skill Level (2014-2022)



Over the period 2014 to 2022, median hourly wages for Skill Level 1 (predominantly elementary occupations) employees has increased by 43.5%, compared to an increase of 22.8% for Skill Level 3 and 21.5% for Skill Level 4 employees. The observed increase is likely a function of increased National Living Wage rates given that lower skilled groupings will be composed of a larger number of employees paid at minimum wage rates.

In recent periods, the pay growth of Skill Level 4 employees (composed of occupations requiring significant formal education, analogous qualification or high amounts of professional experience) has outpaced that of other skill groupings. Between 2021 and 2022 median hourly wages for Skill Level 4 employees increased by 7.0% compared to 4.2% for Skill Level 3 employees. This may be a function of superior bargaining power amongst skilled workers, who are increasingly able to demand a larger proportional share of output in the form of increased wages.

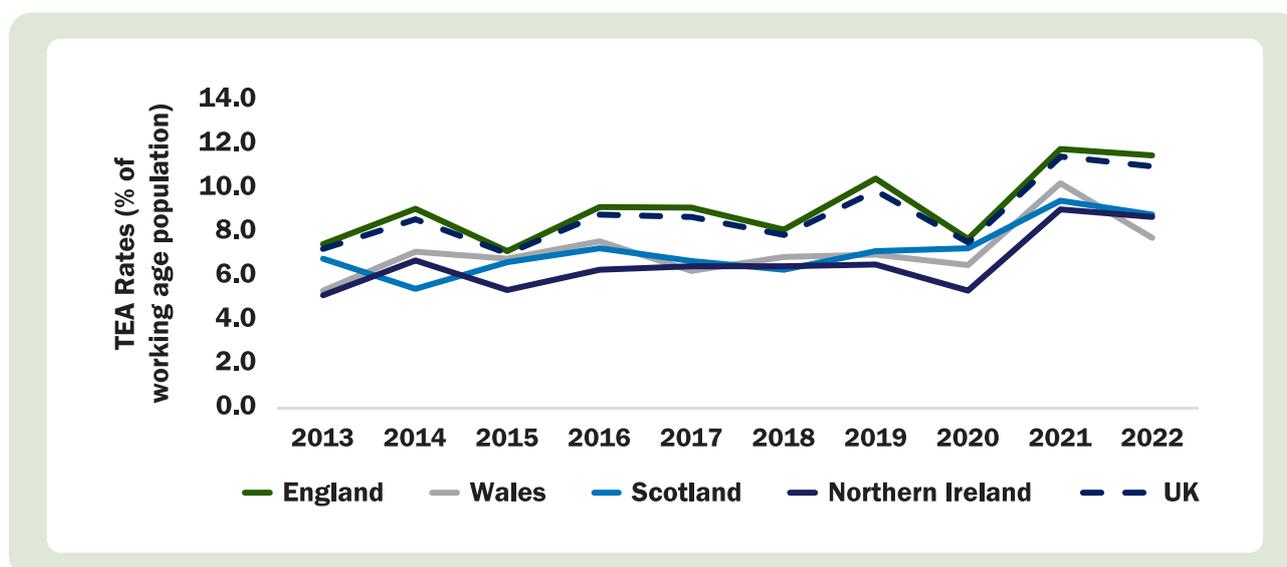
**Business**

Entrepreneurial activity is an important contributor to innovation through new businesses introducing novel products in response to market demand and through increased competitive pressure on incumbent firms. Metrics related to business growth can indicate whether increased rates of innovation translate into higher levels of output and net growth in employment.

In addition, other business related behaviors and activities are generally conducive to (or a product of) increased innovation within an economy. Greater engagement with external markets exposes firms to international competition and opens new opportunities for knowledge exchange with a wider base of suppliers, customers and competing firms. Foreign direct investment is also associated with a number of positive spillovers<sup>42</sup> that are conducive to productivity and innovation.

**Entrepreneurship** is measured using Total Early-Stage Entrepreneurial Activity (TEA) rates and the count of business births. TEA rates are the proportion of the working age population that are in the initial stages of founding a new business or that own / manage a new business that is less than 3.5 years old.<sup>43</sup> The propensity of the working age population to engage in entrepreneurial activity is an important determinant of growth in the business population.

*Total Early-Stage Entrepreneurship Rates (2013 – 2022)*



In 2022, the NI TEA rate was 8.7% of the working age population, comparable to Scotland’s rate and almost 1pps higher than the equivalent figure for Wales. However, early stage entrepreneurial activity remains well below the UK average (11.0%).

**High Growth Firms** are firms (with ten or more staff) that have experienced a 20% annualised increase in (either) employment or turnover over a 3-year period compared to a reference year. Previous research has shown that High Growth Firms make outsized contributions to UK net employment growth.<sup>44</sup> Over the period 2019-22, an estimated 645 businesses (employing 10 or more staff in the base year) experienced a 20% annualised increase in turnover.<sup>45</sup> The number of high growth businesses has increased over the last ten years with there being an estimated 455 equivalent firms over the period 2010-13.

42 When does FDI have positive spillovers? Journal of Comparative Economics; (2014)  
 43 Global Entrepreneurship Monitor; Northern Ireland Report 2022-23  
 44 Moving on from the Vital 6%; Enterprise Research Centre Insights; Anyadike-Danes M. & Hart M. (2014)  
 45 Department for the Economy; Northern Ireland’s High Growth Firms (2022)

The 10X Performance Management Framework outlines a series of **export indicators**. These include the total value of all exports and external sales as well as the total number and proportion of firms engaged in exporting and external selling. External sales refer to sales to clients outside of NI while exports concern sales outside of the UK (including the Republic of Ireland). According to the Northern Ireland Economic Trade Statistics (NIETS) report<sup>46</sup>, the value of NI external sales in 2021 was £24.9bn, an increase of 13.2% on 2017 levels. The value of NI exports increased from £10.3bn to £12.2bn (18.4%) over the same period.

In 2021 there were an estimated 19,980 firms engaged in external selling, an increase of 45.0% on 2017 levels. The number of NI exporters has increased at a more rapid pace with there being around 16,430 firms in 2021 compared to 10,040 in 2017. Estimates of exporters as a proportion of all firms are subject to uncertainty due to disruption caused by Covid-19 but in 2021 it is estimated that exporting firms made up 27.8% of all businesses within scope of the NIETS survey.<sup>47</sup>

Increased rates of **foreign direct investment** are associated with positive spillovers in relation to productivity and innovation. Multinational enterprises may enjoy technological or knowledge advantages over native firms which serves to directly, upwardly affect productivity. These advantages may also have an indirect effect on productivity and innovation by diffusing to domestic firms through a number of possible mechanisms (e.g. supplier networks or subcontracting arrangements). According to Department of Business and Trade statistics, 29 new FDI projects landed in NI between 2020 and 2021, supporting 1,326 new jobs.

The Export Forum agreed, in the vision statement, that by 2030 we should aim to increase external sales as a proportion of GDP (external sales intensity) to 60% from 45% in 2019, which will see our business base become more internationally engaged and therefore more innovative. This is now included as a Tier 2 metric under the Department's 10X monitoring processes.

46 NISRA; Northern Ireland Economic Trade Statistics, 2021

47 The NIETS Survey excludes agricultural businesses and public sector organisations.



4

# INCLUSIVITY METRICS

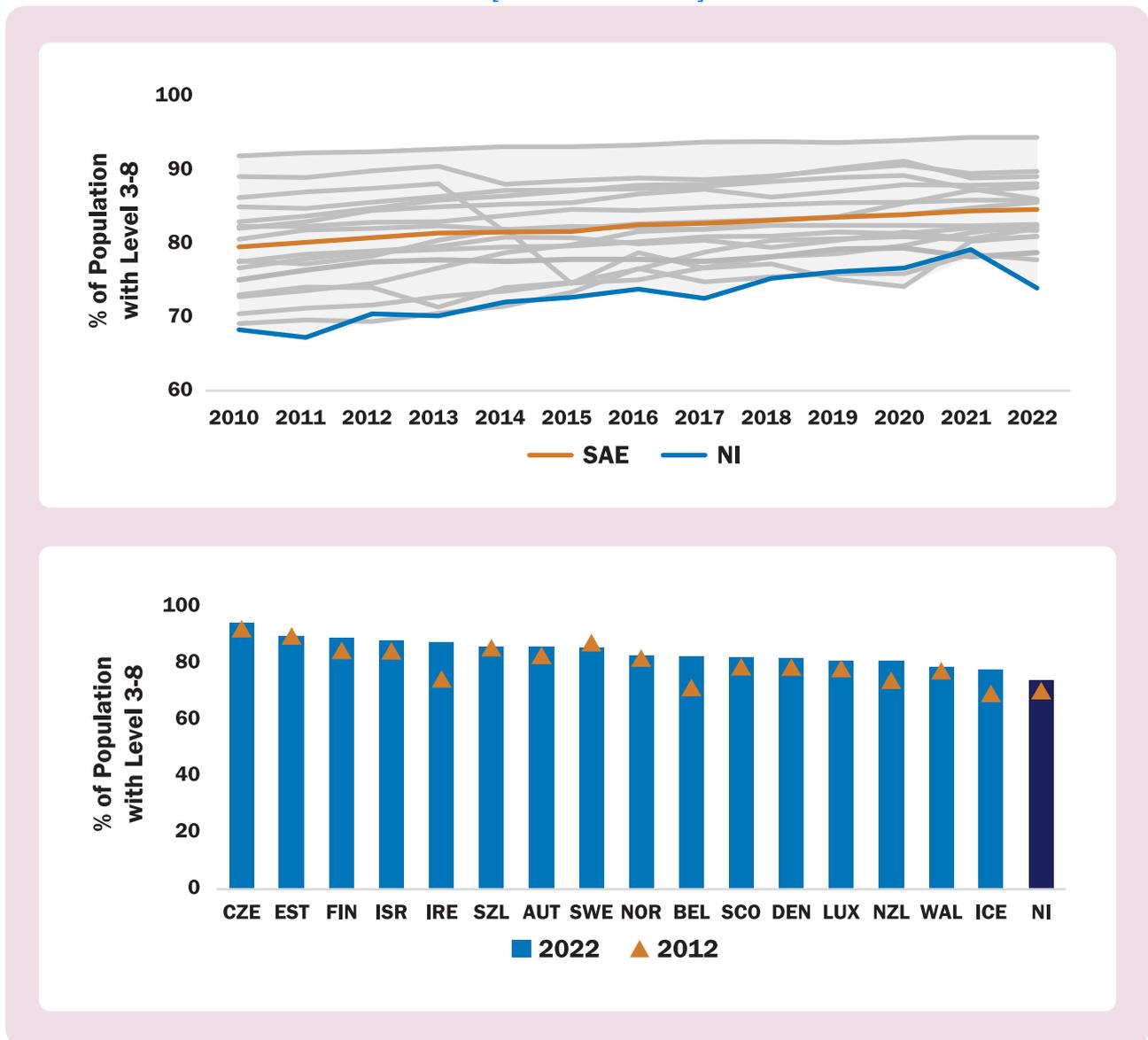
## 4. Inclusivity Metrics

### Tier 1 Inclusivity Metrics

#### Percentage of the Population (25-64) with Level 3-8 Educational Attainment

The percentage of the population (aged 25-64) with at least upper secondary, post-secondary or tertiary education (levels 3-8) in Northern Ireland was around 74% in 2022.<sup>48</sup> It is apparent the small advanced economy group, with an average of 85% in 2022, outperforms Northern Ireland on this metric. The Czech Republic, Estonia and Finland all have educational attainment at around 90% of the population (aged 25-64) for levels 3-8. All figures have been taken from OECD, including Northern Ireland. Some caution should be exercised when using these data, especially for the time period 2020 to 2022.

#### Level 3-8 Educational Attainment Levels [ISCED levels 3-8]



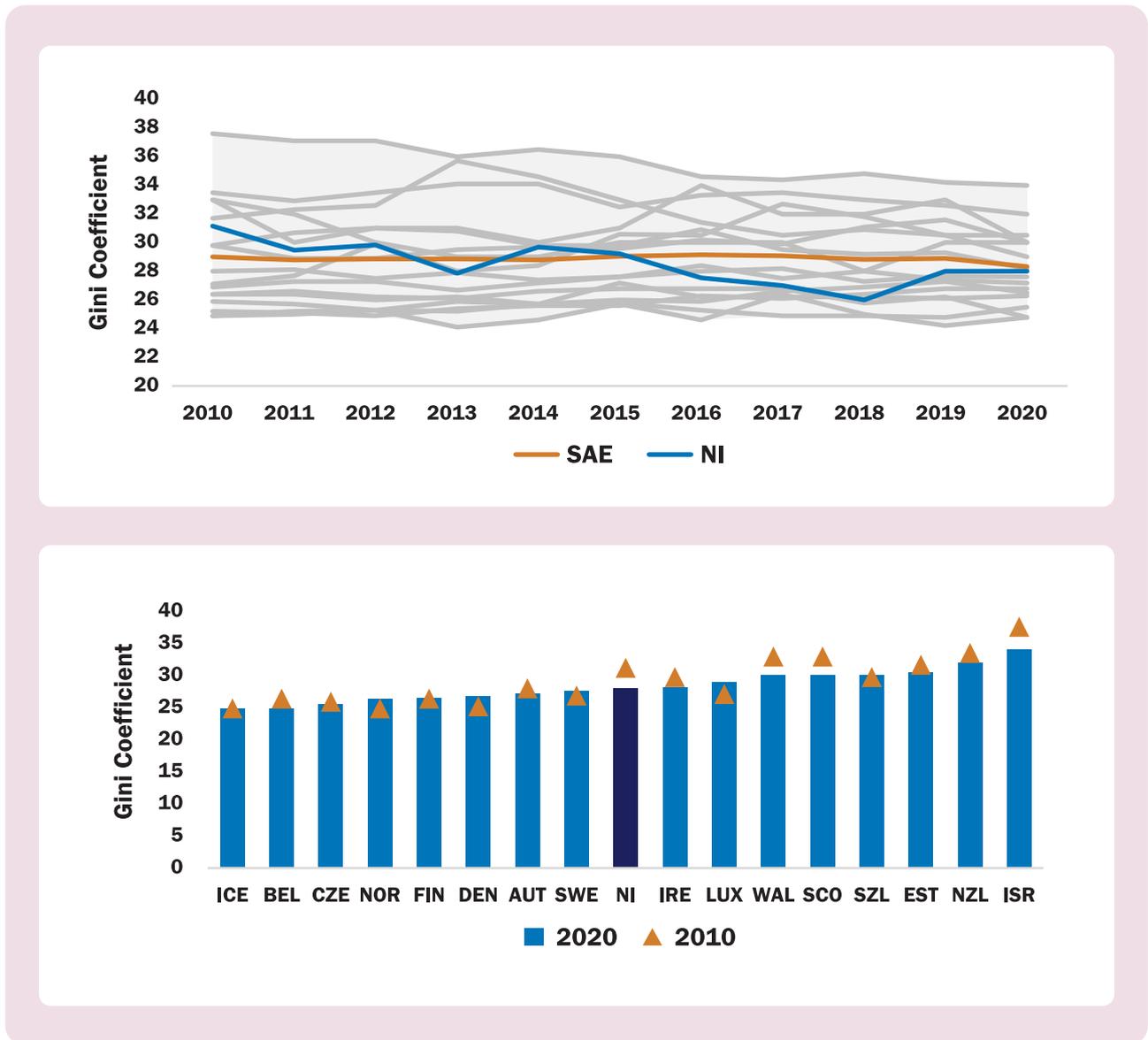
Source: OECD

48 These figures are reported by the OECD and may differ to those published by ONS and NISRA.

### Gini Coefficient

The Gini Coefficient measures inequality in incomes. A Gini coefficient of zero means there is an equal distribution of income, whereas a number closer to one hundred indicates greater inequality. The graphs below show Northern Ireland’s income inequality has generally been trending downwards over time, i.e. exhibiting more equal income levels. With a Gini Coefficient of 28 in 2019-20, Northern Ireland performs relatively well on this metric, slightly better than the small advanced economy group average.<sup>49</sup> Iceland, Belgium and the Czech Republic perform best on this metric.

### Gini Coefficient



Sources: OECD, Scottish Government, DfC, Statistics Iceland, Switzerland FSO

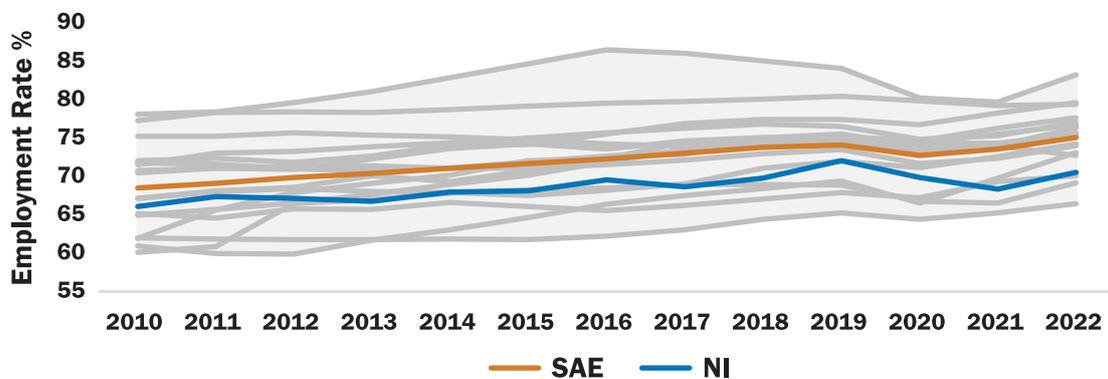
Note: A reduction / fall in Gini Coefficient means improvement over time (i.e. greater income equality).

49 Latest data shows that Northern Ireland had a Gini Coefficient of 27 in 2021-22. [Northern Ireland Poverty and Income Inequality Report 2021-22 \(communities-ni.gov.uk\)](#)

### Employment Rate

Over the past decade, the percentage of the working age population in employment in Northern Ireland has lagged behind the small advanced economy group average and most recent data shows this trend has continued. Many economies experienced a decrease in employment rates due to Covid-19; however, most have rebounded somewhat. With an employment rate of 70.6%, Northern Ireland ranked 14th out of the 17 small advanced economies in 2022. Iceland, New Zealand and Switzerland perform well on this metric, with their employment rates approximately 9 -13 percentage points higher than Northern Ireland.

### Employment Rate

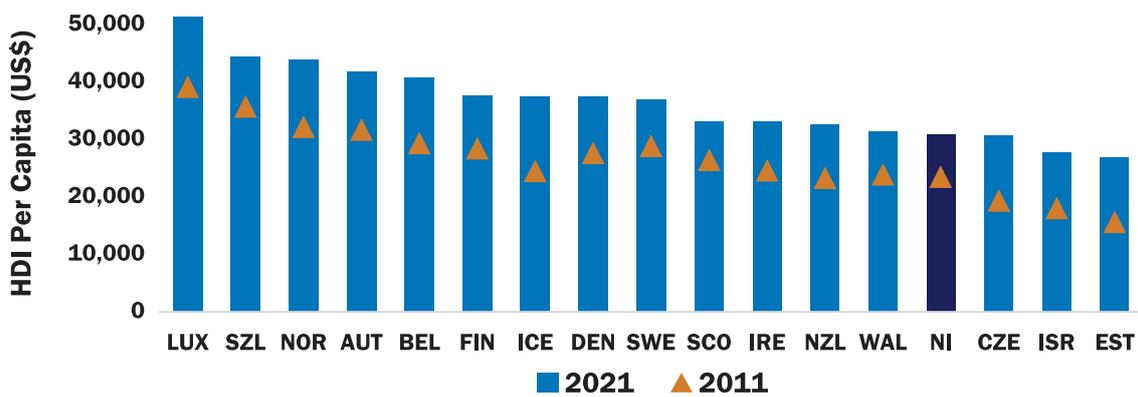
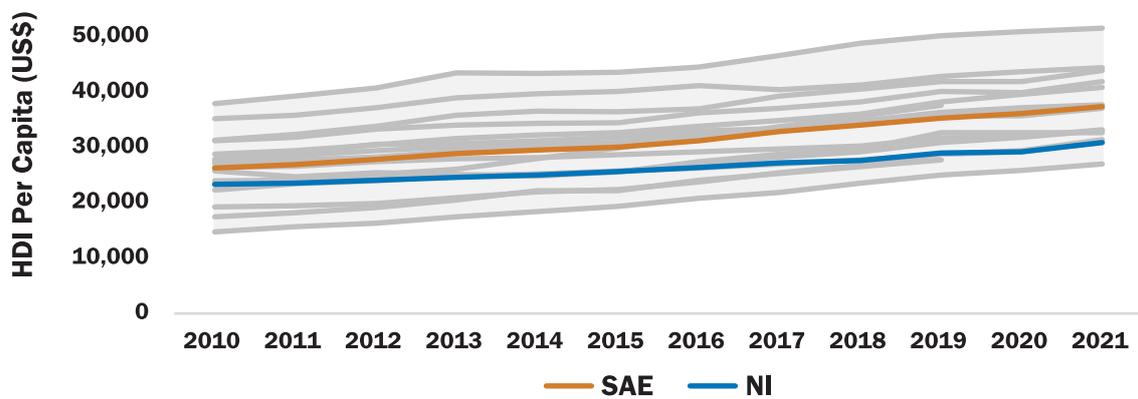


Sources: OECD, ONS

### Household Disposable Income

Since 2010, household disposable income (per capita) in Northern Ireland has gradually trended upwards. Recent data show household disposable income in Northern Ireland at 83% of the small advanced economy group average in 2021.<sup>50</sup> Looking at the most recent data available for each country, Northern Ireland places 14th in terms of ranking on this metric, but above economies such as Estonia and the Czech Republic.

### Household Disposable Income



Sources: OECD, ONS

Note: Most data in the bar chart relates to 2021, or 2019 for some economies

50 No data are available for Israel and Iceland for 2021; therefore SAE average is based on 14 economies.

## Tier 2 Inclusivity Metrics

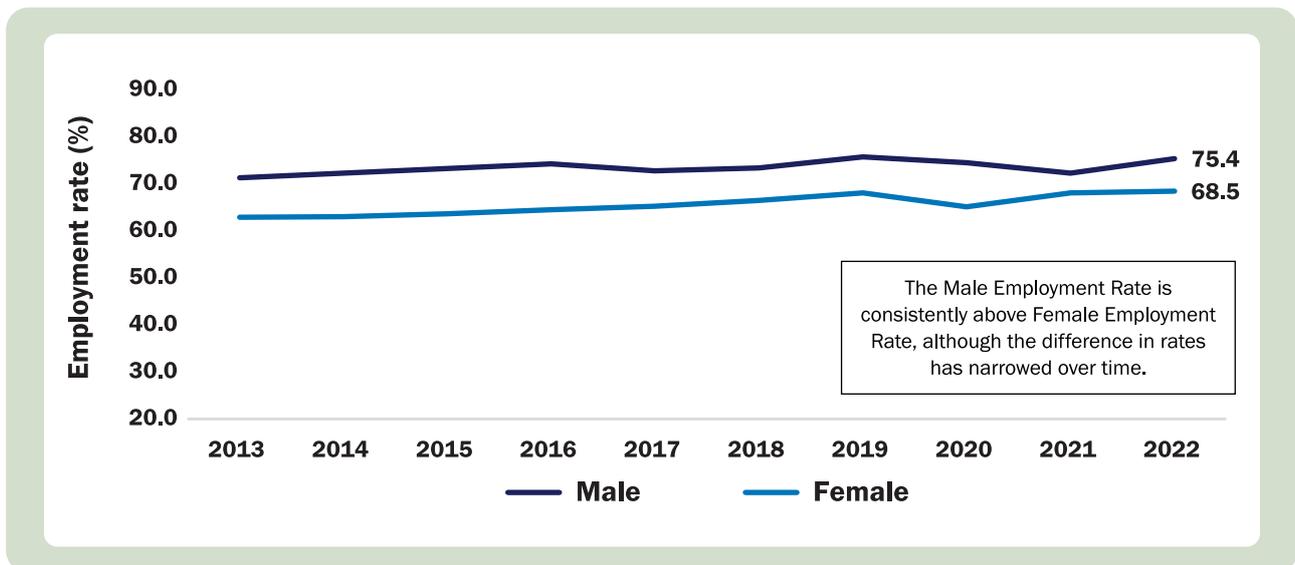
Measuring Success<sup>51</sup> set out the scale of the 10X challenge to close **employment gaps** between **males and females, people with and without a disability, and those from the most and least deprived areas** to ensure that growth is distributed evenly across society.

An examination of updated data within the longer time trend shows the persistence of these gaps, with only the gender employment gap showing evidence of narrowing over 10 years to approximately a 7 percentage point difference while the disability employment gap has remained at over 40 percentage points and the deprivation employment gap has increased to over 20 percentage points.

Gender Employment Gap (2022)	Deprivation Employment Gap (2021)	Disability Employment Gap (2021)
<b>6.9pps</b>	<b>21.5pps</b>	<b>42.3pps</b>

Although the employment gaps and trends have been presented separately it is important to note the overlap and interaction between the categories identified. For example in 2021 while the disability employment gap is over 40 percentage points, the difference in employment rate between disabled people living in the most deprived areas compared to the employment rate for non-disabled people living in the least deprived areas was approximately 60 percentage points for men and 50 percentage points for women.<sup>52</sup>

### Male and Female Employment Rate (16-64 year olds), 2013 - 2022

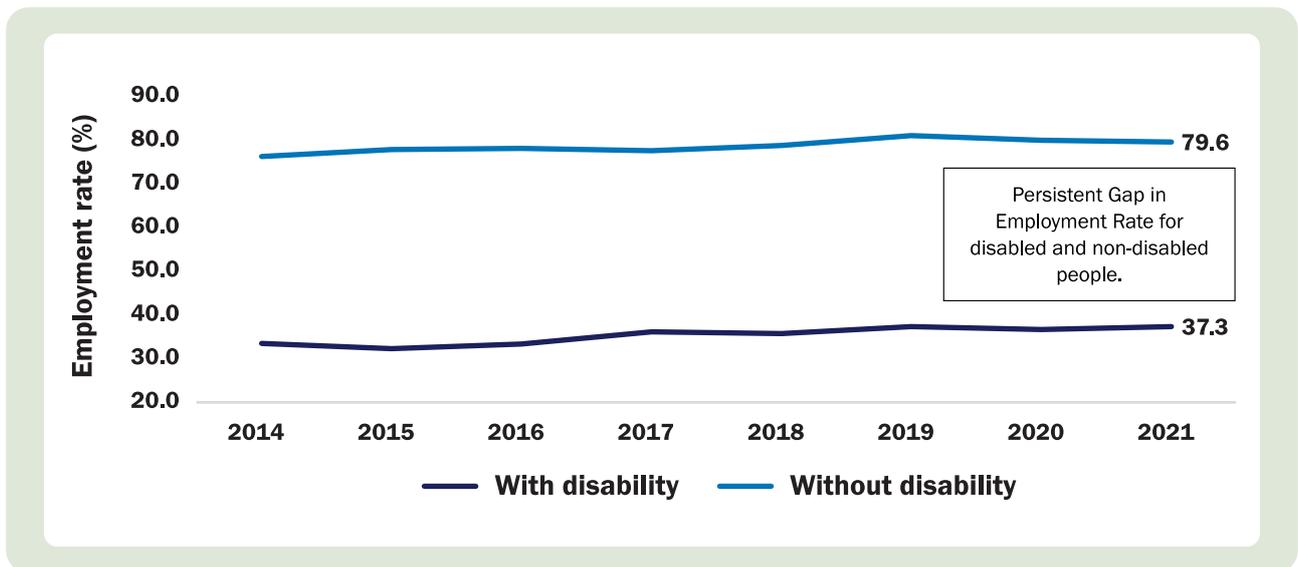


Source: Labour Force Survey, NISRA

51 [Measuring Success - 10x Metrics to achieve a 10X Economy | Department for the Economy \(economy-ni.gov.uk\)](#)

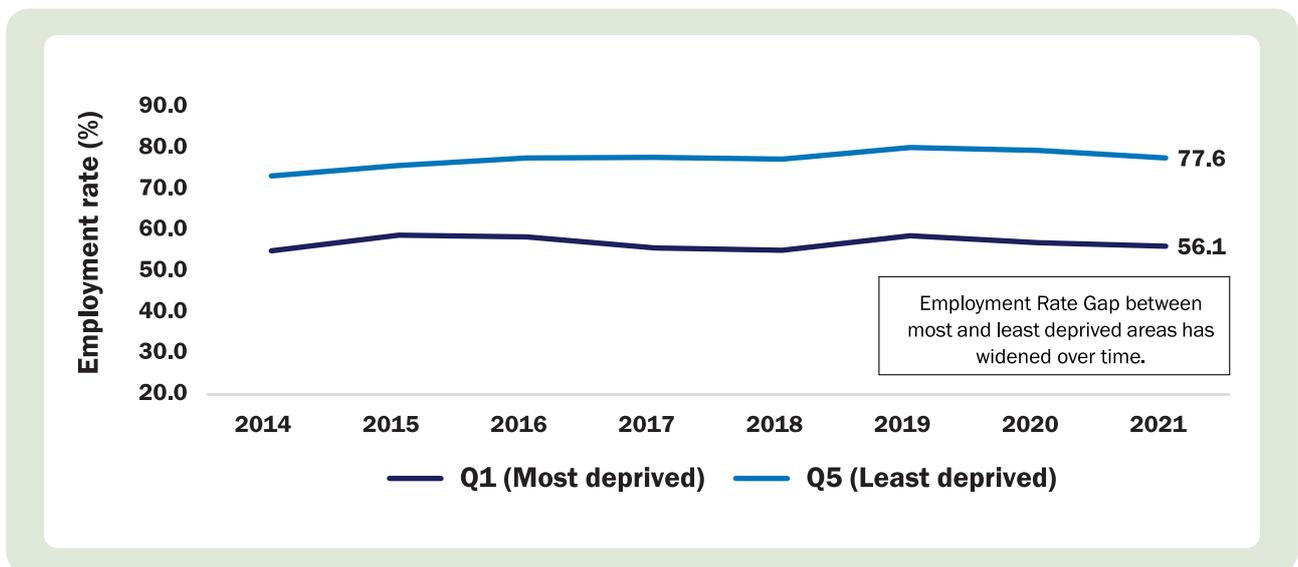
52 Labour Force Survey User Requested data [TbILFS2237](#)

*Employment Rate (16-64 year olds) for disabled and non-disabled people, 2014 - 2021*



Source: Labour Force Survey, NISRA

*Employment Rate (16-64 year olds) in most deprived 20% of areas compared to least deprived 20% of areas 2014 - 2021*



Source: Labour Force Survey, NISRA

Although helping people from underrepresented groups gain employment is a key step to improving levels of household disposable income and delivering inclusive growth it is important that the **quality of work** and returns to work are evenly distributed.

An examination of **earnings data**<sup>53</sup> shows that the gender pay gap in Northern Ireland in 2022 was 8.4%, meaning average hourly earnings for female employees were 8.4% lower than average male earnings. Within this the **gender pay gap** was more pronounced for employees over 40 years; the median hourly earnings of female employees aged 50-59 was almost £3 an hour less than males, the largest difference and equivalent to a gender pay gap of 18%. The smallest gender pay gap at 12p per hour and the only pay gap in favour of women, was for the 30-39 cohort.

Central to the gender pay gap is the combined effect of the difference in hourly pay for part-time and full-time workers and the larger proportion of females in part-time employment than males (40% and 15% respectively). In 2022, based on hourly rates the part-time to full-time pay gap in Northern Ireland stood at 28%, meaning average part-time hourly pay was 28% lower than average hourly full-time pay.

#### Impact of Parental Leave on Labour Market Outcomes<sup>54</sup>

Research by Queen’s University Belfast found that older mothers and mothers with higher pay are less likely to switch from full-time to part-time employment after **parental leave**. They conclude these findings point to women with more career progression choosing to continue in full-time employment after leave, and women with greater financial resources.

The gender difference in earnings appears consistent with the data emerging from work quality indicators<sup>55</sup> where, compared to females, males report higher opportunities for career progression, involvement in decision making, secure work and that the number of hours of work available are suitable.<sup>56</sup> Females are more likely than men to report being satisfied in their work, carrying out meaningful work and working in a flexible job.

#### Proportion of Employees by Work Quality Indicator

<b>Secure Employment</b> <b>96%</b>	<b>Neither Under/Over Employed</b> <b>87%</b>	<b>Meaningful Work</b> <b>86%</b>	<b>Earnings above Real Living Wage</b> <b>85%</b>
<b>Job Satisfaction</b> <b>80%</b>	<b>Involvement in Decision Making</b> <b>58%</b>	<b>Career progression</b> <b>58%</b>	<b>Flexible Work</b> <b>54%</b>

53 [Employee earnings in Northern Ireland \(nisra.gov.uk\)](https://www.nisra.gov.uk/employee-earnings-northern-ireland)

54 [The Impact of Parental Leave policies on Labour Market Outcomes: Summary \(economy-ni.gov.uk\)](https://www.economy-ni.gov.uk/the-impact-of-parental-leave-policies-on-labour-market-outcomes-summary)

55 [Work Quality in Northern Ireland - July 2021 to June 2022 | Northern Ireland Statistics and Research Agency \(nisra.gov.uk\)](https://www.nisra.gov.uk/work-quality-northern-ireland-july-2021-to-june-2022)

56 Neither time related over nor underemployed.

When comparing the quality of work of people with and without a disability, those with a disability report higher levels of flexible work but lower levels of career progression, involvement in decision making, meaningful work, job satisfaction and working suitable number of hours. While comparable earnings data are not available from ASHE for 2022, ONS research shows the pay gap for those with and without a disability in NI was 12.3%.<sup>57 58</sup>

Work quality was higher across all work quality indicators in the least deprived areas than in the most deprived 20% of areas. This ranged from a small difference of less than 1 percentage point in flexible work (57% and 57.6% of employees in the most and least deprived areas report they work flexibly) compared to a difference of 11.2 percentage points in the proportion of employees earning above the Real Living Wage.

### Skills and Qualifications

In our increasingly technological world, **digital skills** are as much about social inclusion as unlocking economic potential. Evidence from the Continuous Household Survey 2021-22<sup>59</sup> shows that 57% of adults had basic digital skills in Northern Ireland, a quarter had more than basic digital skills and almost one in five people (18%) had no digital skills.

In practice this meant that in the previous year 18% of adults in Northern Ireland had **not used the internet** for online services (e.g. internet shopping or banking), had not communicated online, had not found information online and were not aware of a range of internet safety features.

Large differences in digital skill level existed by age, labour market status and deprivation quintile. Over a third of the economically inactive population had **no digital skills** (compared to 6% of the economically active) and 21% of those in the most deprived areas had no digital skills (compared to 15% in the least deprived area) and those over 65 years were more likely to have no digital skills than any other age group (47% had no digital skills).

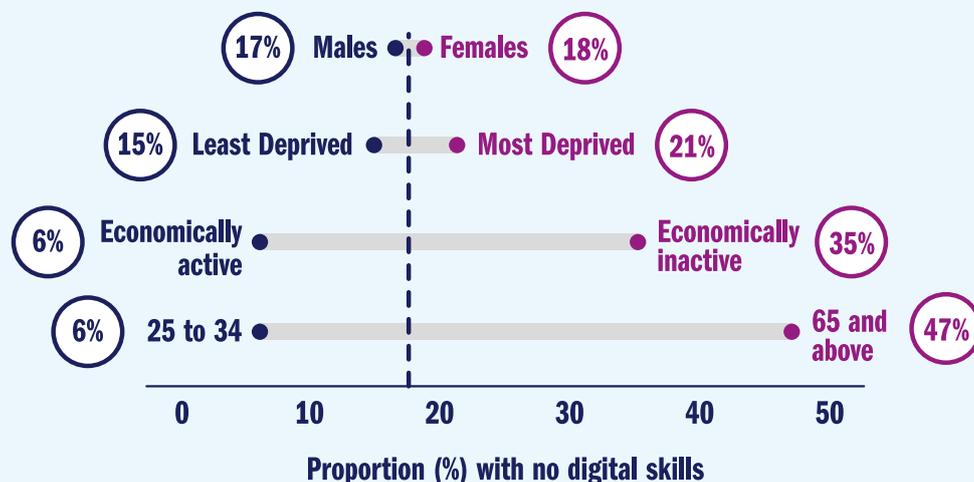
57 [Disability pay gaps in the UK - Office for National Statistics \(ons.gov.uk\)](https://ons.gov.uk)

58 Estimated wage gaps can be sensitive to compositional differences between the employed populations of both studied groups. Research will be published in late 2023 by NISRA using the novel Earnings and Employees Study 2011 and will quantify pay gaps in Northern Ireland between employees with and without disabilities across a number of personal and job-related characteristics. The research also uses statistical modelling techniques to understand factors associated with the disability pay gap. <https://www.nisra.gov.uk/support/research-support/nisra-led-research>

59 [Digital Skills in Northern Ireland 21/22 | Northern Ireland Statistics and Research Agency \(nisra.gov.uk\)](https://www.nisra.gov.uk)

## No Digital Skills - Understanding the Differences

NI = 18%



The difference in digital skills levels by age highlights the importance of developing a culture of life-long learning in NI, one of three major policy objectives in the NI Skills Strategy.<sup>60</sup>

An examination of the **uptake of education or training** in Northern Ireland<sup>61</sup> shows that approximately 17% of adults aged 25 to 64 years had participated in education or training (including job related training), informal training, tuition or other taught classes during the last three months. Notably within this broad age cohort there is a stark contrast in the uptake of training by those under 50 and those between 50 and 64 years; approximately a fifth of 25-34 year olds and 35 to 49 year olds participated in training in the past 3 months (22% and 20%) compared to 11.5% of 50 to 64 year olds. Females were more likely to be engaged in training than males at any age, people with a disability were less likely to have participated in training in the last 3 months than those without (12% compared to 19%) and people living in the most deprived 40% of areas were less likely to have engaged in training than less deprived areas.

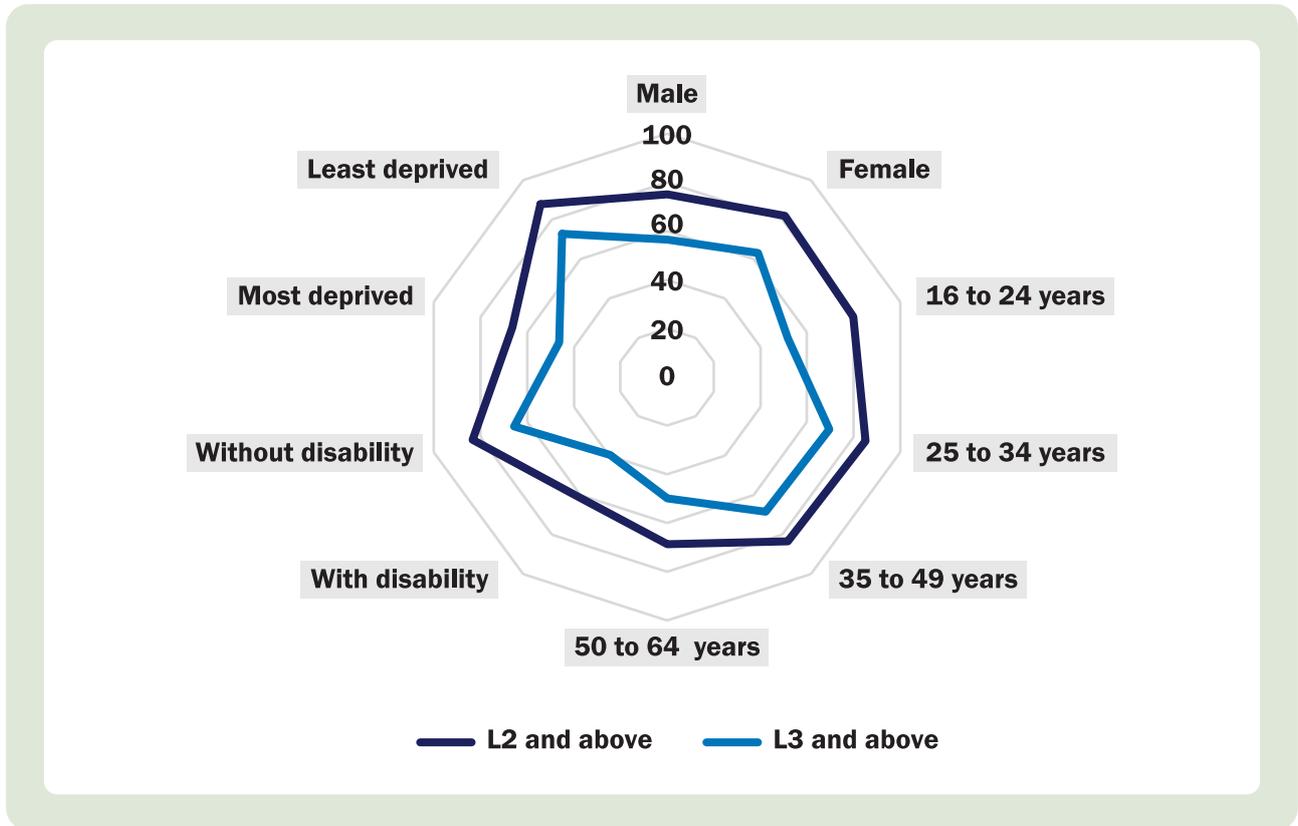
The disparity in levels of recent engagement in education or training is also reflected in the more formal qualification profile.

At a Northern Ireland level 78.5% of the working age (16-64 years) population **are qualified to Level 2 and above** (at least 5 GCSEs at grades A\* to C or equivalent) and 59.9% are **qualified to Level 3 and above** (at least 2 A level passes or equivalent). When age groups, disability status, deprivation ranking and gender were considered, those with a disability had the lowest proportions qualified at Level 2 and above (61%) and Level 3 and above (40%) while those living in the least deprived areas were most likely to be qualified to these levels (88% and 73% respectively).

60 See [Northern Ireland Skills Strategy Skills for a 10x Economy - 1st Annual Monitoring Report \(economy-ni.gov.uk\)](https://www.economy-ni.gov.uk) for a more detailed analysis of trends

61 [Highest qualification level and participation in education and training 2021 | Northern Ireland Statistics and Research Agency \(nisra.gov.uk\)](https://www.nisra.gov.uk)

Qualification Levels



L2 and above		L3 and above	
Female	<b>82%</b>	Female	<b>63%</b>
Male	<b>75%</b>	Male	<b>57%</b>
16 - 24	<b>80%</b>	16 - 24	<b>52%</b>
25-34	<b>85%</b>	25-34	<b>69.5%</b>
35-49	<b>84%</b>	35-49	<b>68.5%</b>
50-64	<b>69%</b>	50-64	<b>50%</b>
With disability	<b>61%</b>	With disability	<b>40%</b>
Without disability	<b>83.5%</b>	Without disability	<b>66%</b>
Most deprived	<b>66%</b>	Most deprived	<b>46%</b>
Least deprived	<b>88%</b>	Least deprived	<b>73%</b>

## STEM Skills Pipeline

An increase in the number of people qualified in STEM (science, technology, engineering and maths) subjects is needed to address the changing demands of the Northern Ireland economy, meet the ambitions for a 10X economy and is one of the Skills Strategy Strategic Goals. The innovation pillar shows in 2021-22, 24% of students leaving Northern Ireland Higher Education Institutions (HEIs) gained first degree and postgraduate qualifications in Narrow STEM subjects. 41% of the narrow STEM graduates and postgraduates were female.<sup>62</sup>

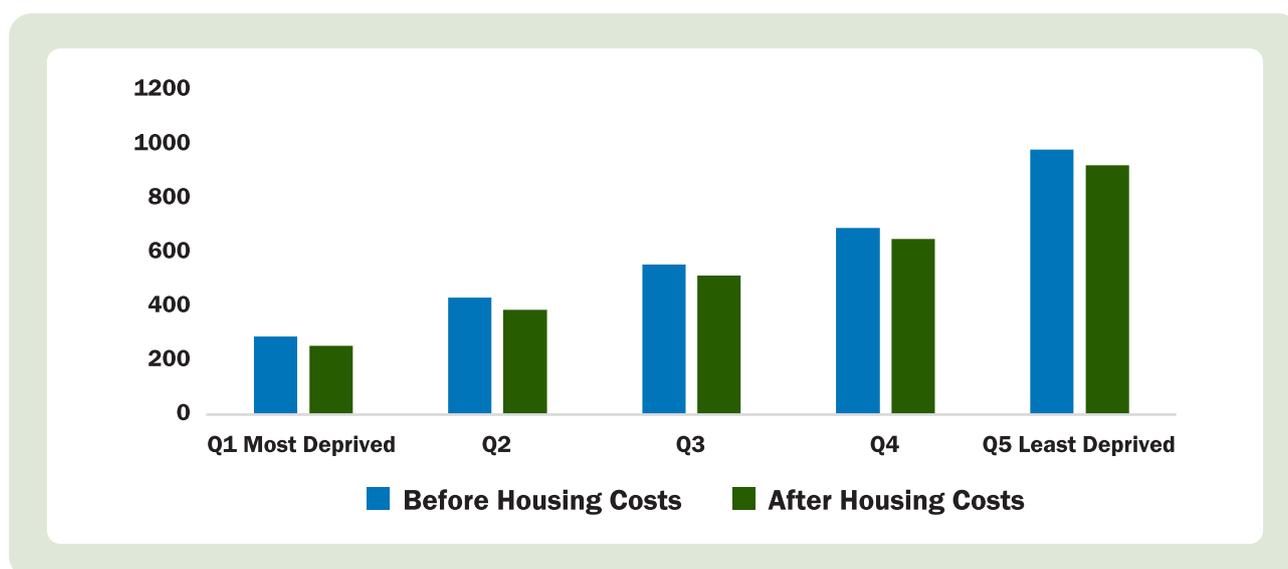
Considering the wider STEM skills pipeline shows narrow-STEM Higher Level Apprenticeship (HLA) starts in FE Colleges of 340 and narrow-STEM HLAs delivered in Higher Education Institutions of 135 in 2021-22. Within each of these Apprenticeships female participation in narrow STEM frameworks is low compared to male participation at 15% and 33% for HLAs at FE and HLAs at HEI respectively.

Considering Further Education and Higher Education as a whole shows females accounted for a 23% share of students enrolled on regulated FE sector Narrow STEM courses (out of 14,645 students) while females accounted for 38% of Narrow STEM enrolments at Northern Ireland Higher Education Institutions (out of 15,760 enrolments).

## Household Disposable Income

In 2021-22 average equivalised household income before housing costs was £555 per week and average income after housing costs was £513 per week.<sup>63</sup> Although Northern Ireland is considered to have a relatively equal income distribution, as measured by the Gini Coefficient, the difference in average weekly income (equivalised for household composition) between most and least deprived areas was over £650 per week before and after housing costs.

### Household Disposable Income 2021-22



62 [Higher education statistical fact sheets | Department for the Economy \(economy-ni.gov.uk\)](#)

63 [Northern Ireland Poverty and Income Inequality Report 2021-22 \(communities-ni.gov.uk\)](#)



5

# SUSTAINABILITY METRICS

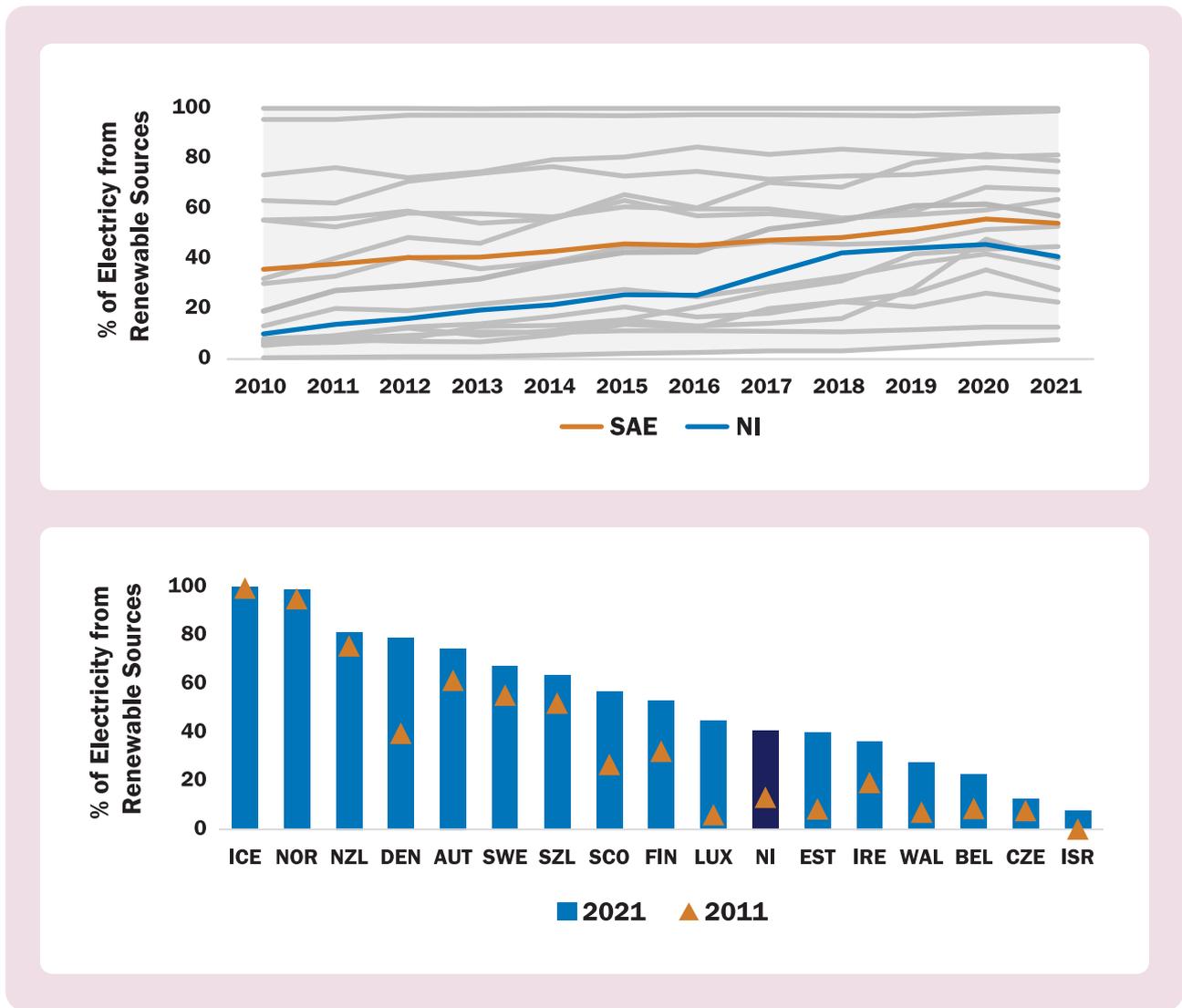
## 5. Sustainability Metrics

### Tier 1 Sustainability Metrics

#### Electricity Generated from Renewable Sources

Over the past decade Northern Ireland has made strong progress in generating electricity from renewable sources. Figures from 2021 however, show many of the small advanced economy group, including Northern Ireland, experienced a fall on this metric.<sup>64</sup> In Northern Ireland this was driven by the reduced volume of wind generation, due to lower wind speeds experienced in 2021.<sup>65</sup> 2021 data ranks Northern Ireland in 11th place. Iceland and Norway continue to be the top performers on this metric, with around 100% of electricity generated from renewable sources.

#### Electricity Generated from Renewable Sources



Sources: IRENA, OECD, DESNZ (previously BEIS)

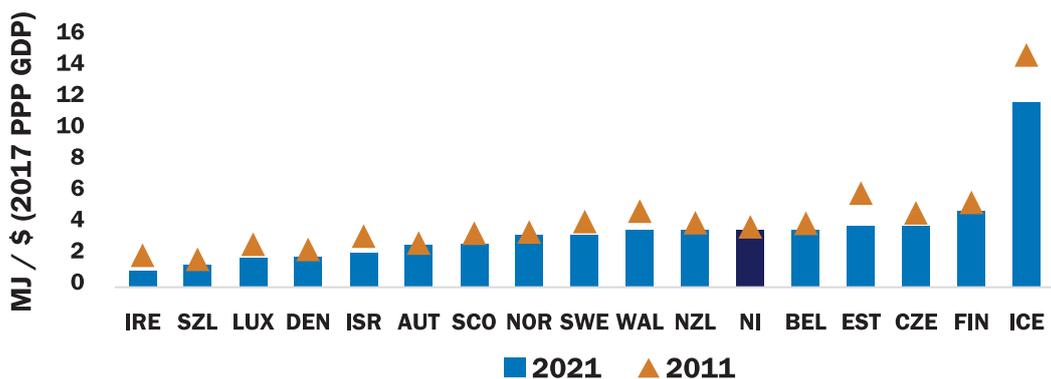
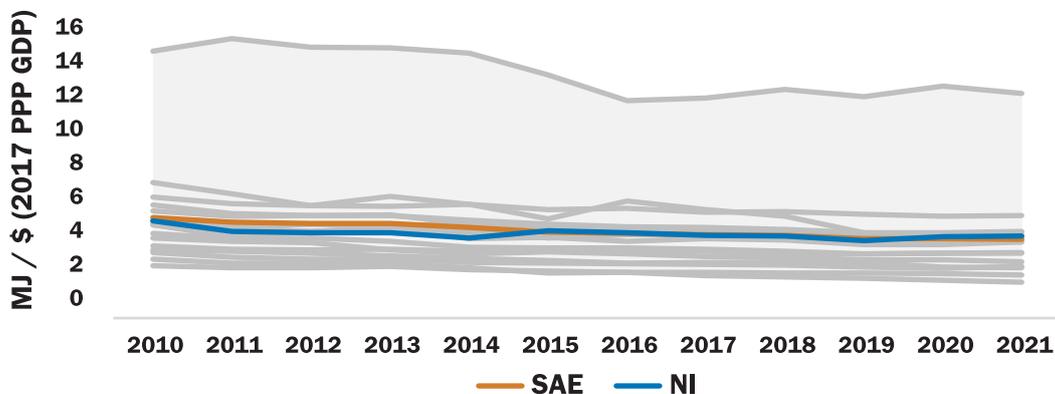
64 Latest data shows a strong rebound in 2022 for Northern Ireland. [Electricity Consumption and Renewable Generation in Northern Ireland \(nisra.gov.uk\)](https://www.nisra.gov.uk)

65 [Electricity Consumption and Renewable Generation in Northern Ireland - January 2021 to December 2021](https://www.nisra.gov.uk)

## Energy Intensity

Energy intensity is an indication of how much energy<sup>66</sup> is used to produce one unit of economic output.<sup>67</sup> Northern Ireland has energy intensity levels similar to many small advanced economies, including Belgium, Norway, Wales and Sweden. The best performers and thus the least energy intensive economies are the Republic of Ireland<sup>68</sup>, Switzerland and Luxembourg. Iceland is a significant outlier with a considerably worse energy intensity than any other economy in the comparison. Iceland has attracted metal producers that seek to lower the carbon footprint of their products by making use of local renewable energy.<sup>69</sup>

## Energy Intensity



Sources: World Bank, ONS

Note: A reduction / fall in energy intensity means improvement over time (i.e. less energy intensive).

66 Energy measured in term of MegaJoules (MJ)

67 GDP using 2017 International Dollars, at Purchasing Power Parity (PPP) rates.

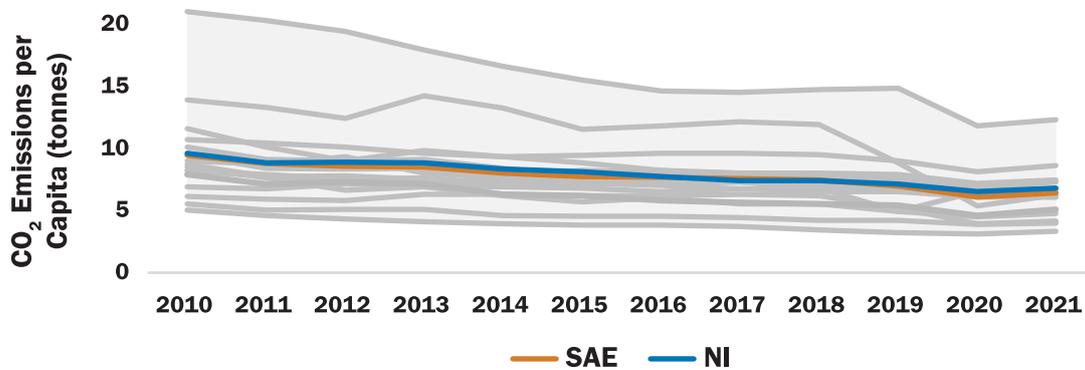
68 The Republic of Ireland is somewhat advantaged on this metric with its relatively high GDP levels (due to the presence of large multinationals and their impact on the output figures).

69 [Green by Iceland](#)

### Carbon Dioxide (CO<sub>2</sub>) Emissions

Carbon Dioxide (CO<sub>2</sub>) emissions, measured in tonnes per capita, have trended generally downwards over the past decade across the small advanced economy group. Covid-19 and the resulting restrictions introduced had a noticeable impact on CO<sub>2</sub> emissions across many economies in 2020, with 2021 seeing CO<sub>2</sub> emission levels increase to some degree. In 2021 Northern Ireland had an estimated 6.8 tonnes per capita of territorial CO<sub>2</sub> emissions, just slightly above the small advanced economy group average of 6.4 tonnes.<sup>70</sup> Sweden, Switzerland, Iceland and Denmark lead on this metric.

### Carbon Dioxide (CO<sub>2</sub>) Emissions



Sources: OECD, DESNZ (previously BEIS)

Note: A reduction / fall in CO<sub>2</sub> Emissions means improvement over time.

<sup>70</sup> The UK produces estimates of both its territorial emissions (published by DESNZ / BEIS), used here, plus its consumption emissions (published by DEFRA). Different methodologies can result in different CO<sub>2</sub>e per capita levels being reported for the various UK regions.

## Circular Economy - Material Footprint

A country or region's material footprint refers to the total amount of raw materials extracted to meet final consumption demands. It is one indication of the pressures placed on the environment to support economic growth and to satisfy the material needs of people.<sup>71</sup> This metric has been identified as a possible indicator which would fit well with the Department for the Economy's draft Circular Economy Strategy.<sup>72</sup>

According to research recently undertaken by Circle Economy for the Department for the Economy, Northern Ireland is 7.9% circular, leaving a circularity gap of more than 92%.<sup>73</sup> The research goes on to say:

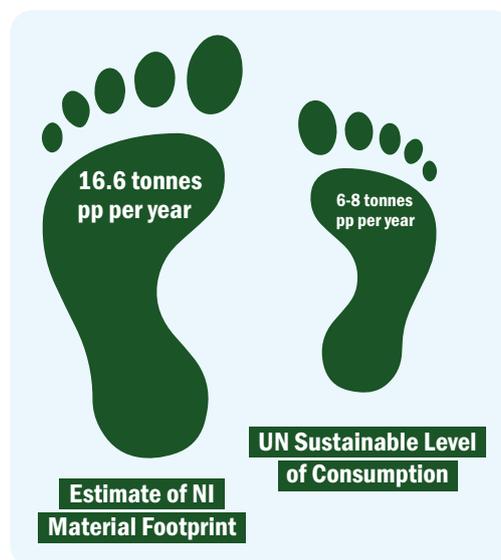
***“This means that the vast majority of resources Northern Ireland uses to satisfy its needs and wants come from virgin sources. The country consumes a total of 33.6 million tonnes of materials each year, equal to 16.6 tonnes per capita - far surpassing the global average of 11.9 tonnes. In meeting the needs of its residents - and exporting elsewhere in the world - Northern Ireland extracts a moderate 14.6 tonnes of resources per capita per year within its borders, contributing to its high material footprint: this rate of extraction far exceeds the UK average, which sits at 5.5 tonnes per capita.”***

This research therefore helpfully provided a relatively recent estimate on material usage levels and the challenge that lies ahead to reduce this.

The draft Circular Economy Strategy has a 2050 target to bring consumption of resources into what is considered sustainable levels. The UN advises that to live sustainably we should only be using an average of between 6 to 8 tonnes of resources per person (pp), per year.<sup>74</sup>

The Department for the Economy is currently exploring how best to capture these data currently, going back historically across the years, as well as capturing it in future, on an ongoing basis to at least 2030.

While this report does provide a high level commentary on this metric, it does not include a detailed analysis comparing Northern Ireland's performance against the performance of the other 16 small advanced economies. The metric falls under a 'data gathering and comparison agenda' for further explorative work to take place.



71 [—SDG Indicators \(un.org\)](https://un.org)

72 [Circular Economy Strategy for Northern Ireland | Department for the Economy \(economy-ni.gov.uk\)](https://economy-ni.gov.uk)

73 [The Circularity Gap Report Northern Ireland | Department for the Economy \(economy-ni.gov.uk\)](https://economy-ni.gov.uk)

74 [Circular Economy Strategy for Northern Ireland | Department for the Economy \(economy-ni.gov.uk\)](https://economy-ni.gov.uk)

Ideally, the resulting data for Northern Ireland will have internationally comparable estimates, especially important for benchmarking against the 16 small advanced economies. As with all of the Tier 1 Metrics however, such figures will need to be used with the appropriate caveats in mind. If the proposed indicator of material footprint is not a good fit, there may be a need to explore other possible metrics instead.

Interestingly, in August 2023 the Department for Environment, Food & Rural Affairs, DEFRA, published figures on England's material footprint, using a methodology developed by the University of Leeds on behalf of DEFRA. It builds on a similar approach for estimating the carbon footprint of the UK and England. To derive England-level estimates, UK-level household material footprint data was apportioned to final demand within England using statistics on household expenditure. The non-household categories of raw material consumption were apportioned using population shares.

The Department for the Economy will seek to continue its engagement with DEFRA and University of Leeds, particularly in respect of data for Northern Ireland, Scotland and Wales.<sup>75</sup>

75 [England's Material Footprint - GOV.UK \(www.gov.uk\)](https://www.gov.uk)

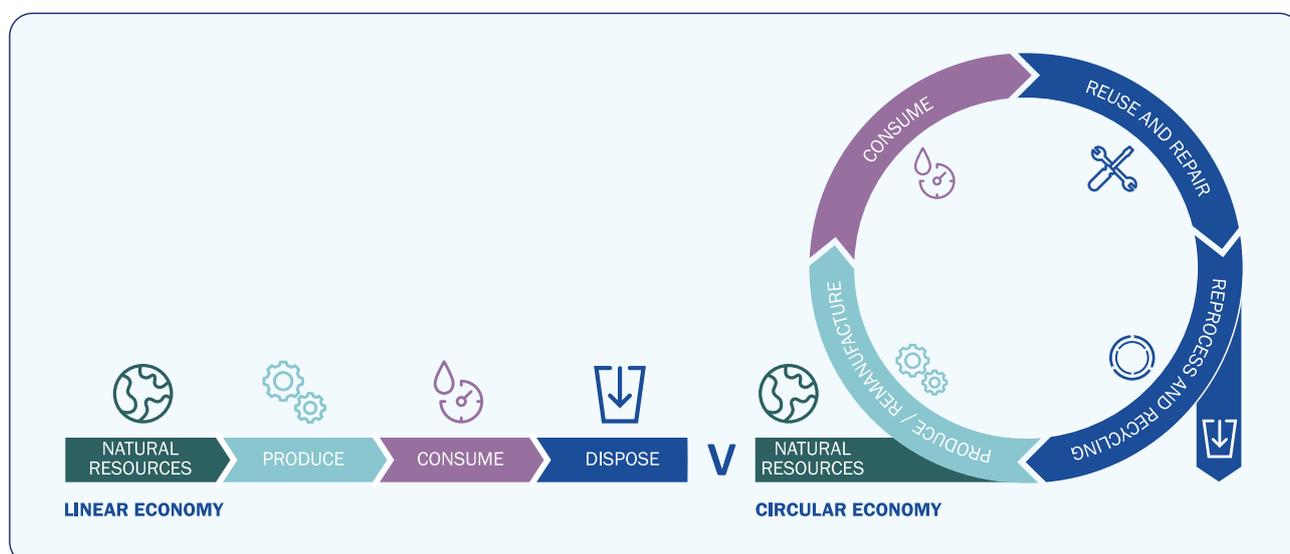
## Tier 2 Sustainability Metrics

While Tier 2 Metrics are not necessarily internationally comparable, they provide a strong link between our Programme-Level Objectives, Key Performance Indicators and the 10X improvements we want to see at that international level. These metrics are important for painting the overall picture of performance and to identify key policy lessons.

## The Circular Economy

As outlined in the draft Circular Economy Strategy for Northern Ireland<sup>76</sup>, the linear economy involves taking resources from the earth, using them once and then throwing them away. This model does not consider the environmental and societal damage it causes. A circular economy minimises the amount of waste being produced in the first place.

### Linear vs Circular Economy



The circular economy offers a model in which:

- We rethink and reduce our use of finite resources;
- We switch to regenerative resources which replenish themselves;
- We minimise waste; and
- We maintain the value of products and materials for as long as possible.

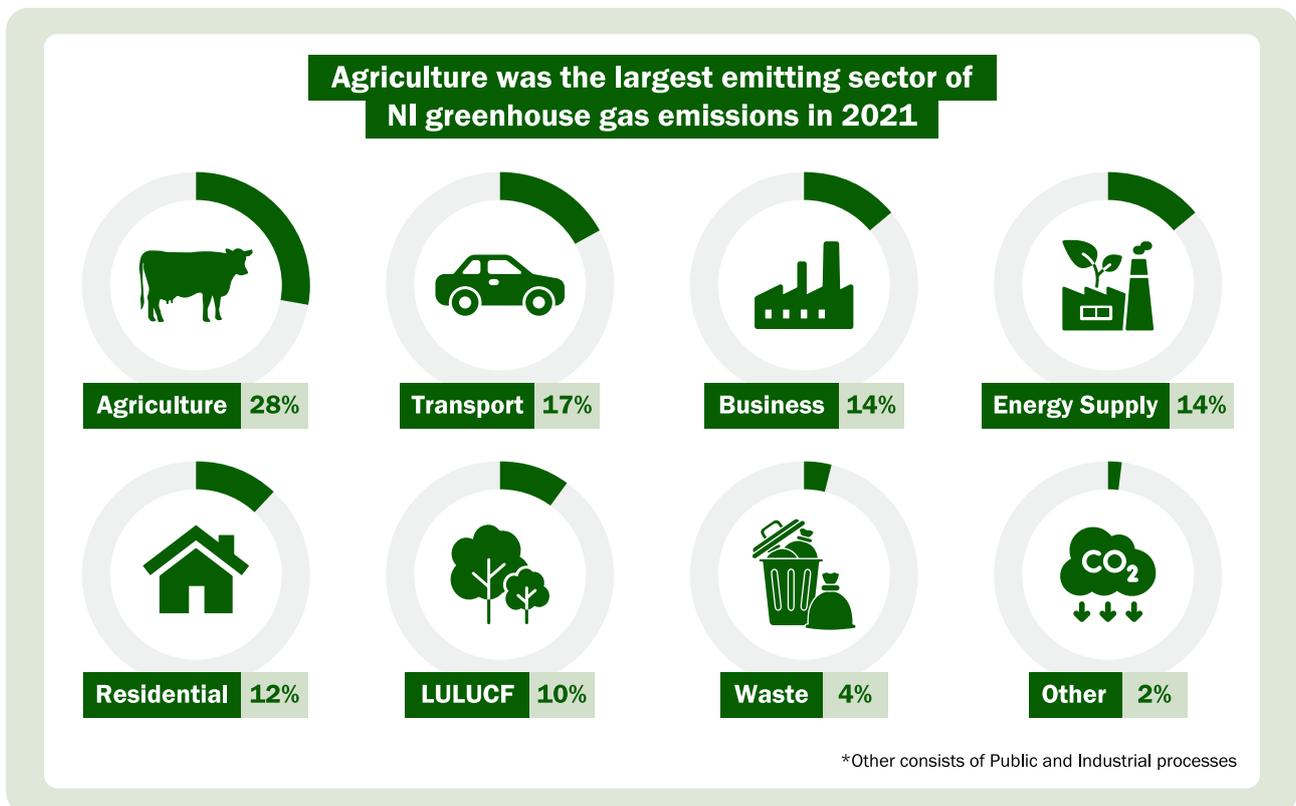
A Circular Economy is a systemic approach to economic growth that reduces overall demand for resources. It requires us to rethink what we understand as economic success and, in the process, redesign our economic model. It entails gradually decoupling economic growth from the consumption of finite resources and designing waste out of the system. Underpinned by a transition to renewable energy sources, the circular model builds economic, natural and social capital.

76 [Draft Circular Economy Strategy for Northern Ireland \(economy-ni.gov.uk\)](https://economy-ni.gov.uk)

## Emissions

Northern Ireland's Emissions are reported for seven greenhouse gases: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF<sub>6</sub>) and nitrogen trifluoride (NF<sub>3</sub>). Depending on their molecular weights, radiative properties and residence times in the atmosphere, each greenhouse gas has a different capacity to cause global warming.

In 2021, Northern Ireland's net greenhouse gas emissions were estimated to be 22.5 million tonnes of carbon dioxide equivalent (MtCO<sub>2</sub>e). This net figure is a result of an estimated 23.7 MtCO<sub>2</sub>e total emissions, offset by 1.2 MtCO<sub>2</sub>e of emissions removed through sequestration. The net figure of 22.5 MtCO<sub>2</sub>e, in 2021, represents an increase of 5.0% compared with 2020. The longer-term trend showed a decrease of 23.2% compared with emissions in 1990.



In 2021, agriculture was the largest emitting sector, responsible for 27.6% of emissions. Transport contributed 16.7% to overall emissions, whilst the business, energy supply and residential sectors contributed 14.0%, 13.7% and 12.4%, respectively. Between 2020 and 2021 all sectors, with the exception of waste management and public, showed an increase in emissions. The largest increases in terms of tonnes of carbon dioxide equivalent were in the Transport (0.4 MtCO<sub>2</sub>e), Agriculture (0.3 MtCO<sub>2</sub>e) and Energy Supply (0.2 MtCO<sub>2</sub>e) sectors.

In 2021, Northern Ireland contributed 5.3% of all UK greenhouse gas emissions, which stood at 426.5 MtCO<sub>2</sub>e. In the UK there has been a 47.7% reduction in emissions between 1990 and 2021. During the same period, the reduction in emissions in Northern Ireland was 23.2%, compared to 50.2% in England, 49.3% in Scotland and 35.0% in Wales.<sup>77</sup>

Since 1998, NI’s population and economic output have grown substantially while greenhouse gas emissions have declined. The ratio of greenhouse gas emissions (CHG) to GVA has declined by 65% in the period 1998 to 2020. In 2020, GHG emissions intensity for Northern Ireland was estimated at around 0.48 kilograms of carbon dioxide (CO<sub>2</sub>) equivalent per £ of GVA. In 1998 this figure stood at 1.38 kilograms. GHG emissions per capita decreased 36% from 17.2 tonnes CO<sub>2</sub> equivalent per person in 1990 to 11.0 tonnes in 2020. The population increased by 19% over this period, while greenhouse gas emissions decreased by 24%.

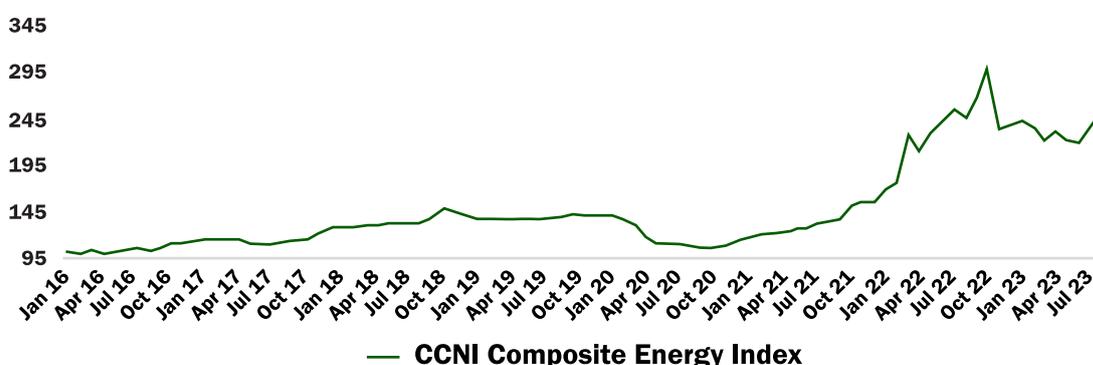
### Affordability

Northern Ireland’s reliance on fossil fuels contributes to higher energy prices and price instability. It is estimated that 68% of households in Northern Ireland rely on home heating oil.<sup>78</sup> With such a reliance on home heating oil in Northern Ireland, we are much more susceptible to price fluctuations brought about by geopolitical events. Natural disasters, war, global political instability, global economic performance, availability of alternative fuels and in some cases, a controlled supply, will all have a significant impact on the price of home heating oil. This means that the heating bills of the 68% of the NI households that depend on home heating oil are susceptible to frequent price fluctuations.

A shift towards sustainable energy sources would help to shield NI from these global and uncontrollable factors, as well as contribute to a sustainable environment. Affordability of renewable energy and price stability should, in theory, drive residential and commercial demand towards more sustainable energy use. In fact, energy prices are one of the biggest concerns currently facing NI consumers.

The Consumer Council’s annual Consumer Insight Survey (April 2023) revealed that in the last 12 months the biggest consumer issue faced by 31% of households was the costs of energy bills. The Consumer Council’s research on the Impact of the Energy Crisis on Affordability and the Impact of Energy Transition on Consumers (June 2023) estimates that 51% of households in Northern Ireland are classed as being in fuel poverty, meaning they spend over 10% of their net annual household income on energy.

### CCNI Composite Energy Price Index

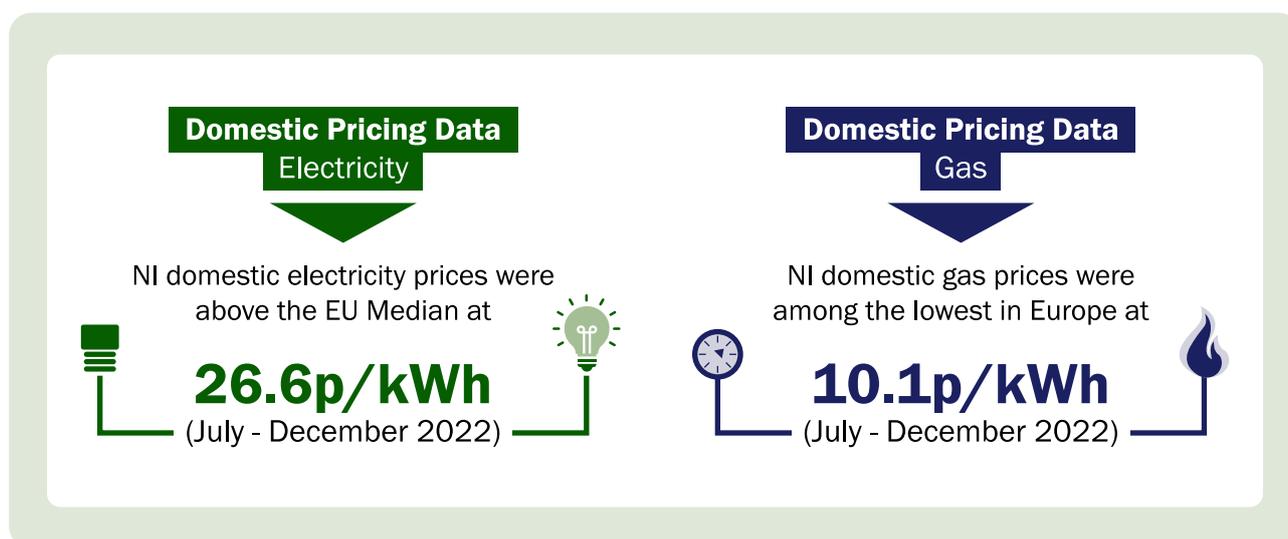


\*As this index is designed to demonstrate the price/tariff change experienced by domestic consumers in Northern Ireland over time, the Government EPG subsidy has been incorporated but also came to an end on 1 July 2023.

Household energy prices in Northern Ireland have increased significantly in the last 2 years. The Consumer Council’s Composite Energy Index tracks changes in electricity, gas and home heating oil (HHO) prices to show changes since the base period of January 2016.

Northern Ireland domestic electricity prices (26.6 p/kWh) ranked slightly above than the EU median (23.6p/kWh) but lower than Rol (36.2 p/kWh) and significantly lower than the UK (40.4 p/kWh). Domestic gas prices in Northern Ireland were among the lowest in Europe at 10.1 p/kWh. This was less than the EU median (12.2 p/kWh), UK (12.5 p/kWh) and Rol (13.3 p/kWh).<sup>79</sup> Although, it should be noted that the majority of NI households use home heating oil rather than gas.

### Domestic Energy Prices



Despite lower domestic electricity prices than the UK and lower gas prices than the EU average, Northern Ireland spends more on energy than any other UK region. Weekly household expenditure on energy in Northern Ireland was some 22% higher (at £31 per week in the period 2020-22) compared to the UK average of £24.40. This difference is likely to be driven by a combination of factors including: energy mix and the dependence on home heating oil in Northern Ireland; geographic and weather conditions with Northern Ireland being one of the windier parts of the UK; energy pricing; and lower household income levels. It is worth noting that the total weekly expenditure in Northern Ireland on all commodities and services is the lowest regionally, reflecting lower household incomes and earnings. On that basis alone, household expenditure on energy (an essential) as a proportion of all weekly expenditure in Northern Ireland, will be pushed higher.

79 [Utility Regulator Transparency Report, June 2023](#)

*Weekly Household Expenditure by UK Countries and Regions (£), 2020-2022, ONS Living costs and food survey*

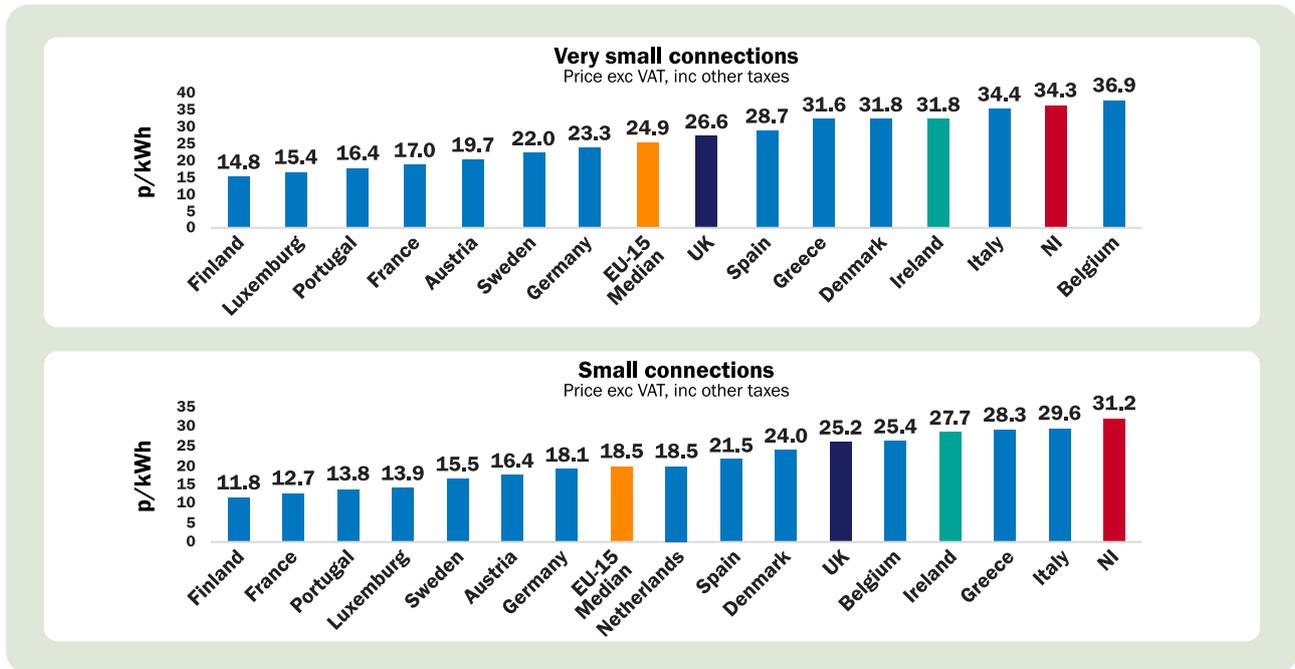
	Electricity	Gas	Other fuels	Total Weekly expenditure on energy	Total weekly expenditure (on all commodities and services)	Expenditure on energy as a % of total expenditure
UK	12.9	10.2	1.4	24.4	532.7	4.6%
England	12.8	10.4	1	24.1	544.7	4.4%
North East	11.1	10.5	0.7	22.4	420.8	5.3%
North West	12.5	11.3	0.7	24.6	508.6	4.8%
Yorkshire & the Humber	11.6	10.6	0.8	23.1	466.2	5.0%
East Midlands	12.4	10.6	0.9	23.9	524.6	4.6%
West Midlands	12.5	10.8	0.8	24.2	515.5	4.7%
East	13.3	9.4	1.7	24.4	552	4.4%
London	12.8	11	0.1	23.9	614.7	3.9%
South East	13.5	10.3	1.2	25	624.2	4.0%
South West	13.7	9.1	1.7	24.5	552.1	4.4%
Wales	12.8	9.6	2.6	25	462.6	5.4%
Scotland	13.4	10	1.5	25	475.9	5.3%
Northern Ireland	14.7	5.1	11.2	31	476.9	6.5%

Since Northern Ireland has one of the lowest electricity costs (per unit) in the UK but has the highest expenditure on electricity, it could be inferred that Northern Ireland must use significantly more electricity than the other UK regions. This is not, however, the case with Northern Ireland electricity consumption being slightly lower than GB. It is difficult to explain this contradictory information but is important to note that pricing data and spending data are taken from two different surveys which sample a proportion of the population, and they are therefore not directly comparable. It would be more valuable to focus on trends over time than the differences between them.

Electricity prices in Northern Ireland are not as favourable for non-domestic users. The NI Industrial and Commercial (I&C) electricity price for the very small connections (which represent c70% of I&C connections) was 35.3 p/kWh, which was higher than the EU median (24.9 p/kWh), higher than the UK (26.6 p/kWh) and above Rol (31.8 p/kWh). For Large and Very Large I&C customers (c0.02% of connections) NI prices (22.4 p/kWh) were higher than the EU median (17.1 p/kWh), Rol (19.6 p/kWh) and the UK (21.6 p/kWh).

In fact, NI I&C electricity prices are amongst the highest in Europe. 70% of all I&C connections are in the ‘very small’ category and 28.6% are in the ‘small’ category. The charts below shows how Northern Ireland I&C electricity prices compares to those of EU countries.<sup>80</sup>

*Commercial Electricity Prices for small and very small connections*



**The Low Carbon and Renewable Energy Sector**

A well-developed low carbon and renewable energy sector that encourages innovation in renewable energy will lead to a cleaner Northern Ireland, stable energy prices and a more secure energy supply. Rising energy prices are driven by our reliance on price volatile fossil fuels. With an estimated 51% of NI’s population living in fuel poverty, it is more important than ever to generate efficient, clean energy that is produced locally. This will keep prices stable and keep expenditure on energy within the local economy.

Around 5,000 people were employed in the low carbon and renewable energy sector in Northern Ireland in 2021. There were an estimated 465 businesses with a turnover of £834k. Despite the small size of this sector, an impressive 3% of all high growth businesses are in this sector. Most sales in this sector are made inside Northern Ireland (79%) and of the 21% that leaves Northern Ireland, the majority goes to GB. This sector is a low exporting sector with just 8% of totals sales being exported outside of the UK.<sup>81</sup>

**Waste**

Reducing waste helps to reduce pollution and protect the environment. When waste is sent to landfill, the organic material decomposes and produces greenhouses gases. While the NI recycling rate (50%) is higher than the landfill rate (25%), it is not enough to simply increase recycling because while this is preferable to landfill, it also creates greenhouse gas emissions and increases water usage.

80 [Utility Regulator Transparency Report, June 2023](#)

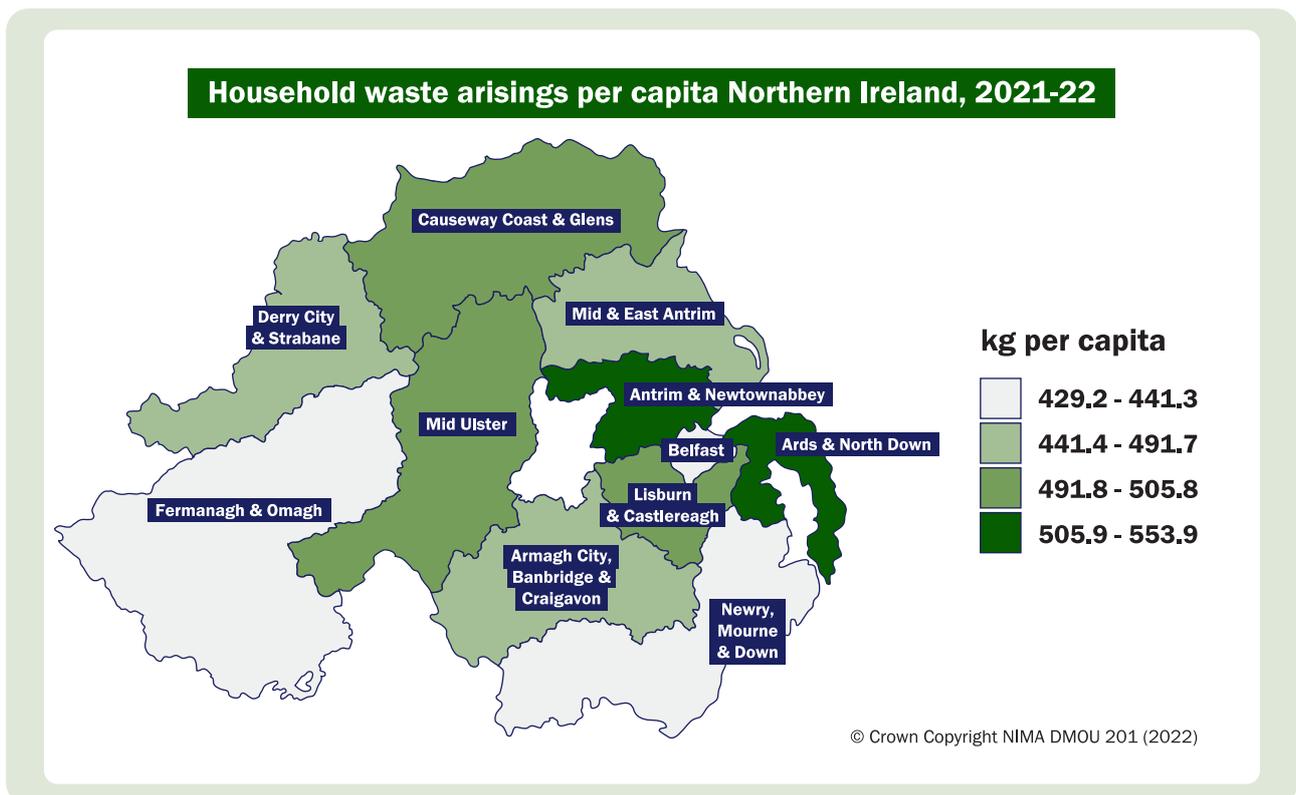
81 Derived from NISRA data using DfE’s definition of the low carbon and renewable energy sector.

The best way to deal with waste is to prevent it being created in the first place. This can be done by reducing the amount of materials used in the production of goods and by increasing the efficiency and durability of goods. Designing products to last longer and that are capable of repair will help NI towards a more circular economy where goods are reused, repaired, remanufactured, reprocessed and recycled. By-products and waste from the production of goods should, where possible, be utilised through industrial symbiosis. This would mean that even if waste continues to rise, the proportion going to landfill can be reduced because it is kept in use for longer. Over the next monitoring period we will seek to develop metrics and indicators to help us measure the scale and, hopefully, growth of these ‘R’ activities i.e., Repair and Reuse.

Northern Ireland’s councils collected 1,034,637 tonnes of waste during 2021-22 which was similar to the amount collected in 2020-21. During 2021-22, 49.7% of waste collected by councils was sent for recycling which was also similar to the recycling rate in 2020-21 (50.0%). The landfill rate for waste collected by councils was 24.9% in 2021-22, 2.1 percentage points higher than 22.8% in 2020-21 which was the lowest rate recorded.

The energy recovery rate for waste arisings was 23.2% in 2021-22 compared to a quarter of arisings (24.6%) in 2020-21, and 0.4% 12 years ago. Household waste accounted for 88.0% of all local authority collected waste during 2021-22. The remaining 12.0% was non-household waste such as rubble/soil and commercial/industrial waste. The recycling rate for household waste was 50.1% while the landfill rate for household waste was 24.7%.

In Northern Ireland there were 479kg of household waste collected per capita and 1,178kg per household during 2021-22, compared to 488kg of household waste collected per capita and 1,207 kg per household during 2020-21.



Belfast generated the smallest amount of household waste per capita at 429kg in 2021-22, followed by Fermanagh & Omagh and Newry, Mourne & Down. The largest quantity was recorded in Antrim & Newtownabbey at 554kg per capita. Household waste per capita fell in the majority of council areas compared to last year, with the greatest decrease recorded in Mid & East Antrim of 6.5%. The largest increase was recorded in Antrim & Newtownabbey, which increased by 2.0%.<sup>82</sup>

It is important to note that this data on waste is only Municipal waste collected by Councils. In the UK, construction, demolition and excavation account for 60% of waste generation. The construction sector is also responsible for a third of the waste generated in the EU. Information on these types of waste in Northern Ireland is limited, however, a UK wide waste tracking system<sup>83</sup> will come into force in April 2025 that will help improve our baseline understanding of waste generated across the economy.

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82 [Northern Ireland Local Authority Collected Municipal Waste Management Statistics, Annual Report 2012/22](#)

83 [Mandatory Digital Waste Tracking](#)



**6**

**NEXT STEPS**

## 6. Next Steps

### Tier 3 Metrics

As noted above, Tier 3 Metrics are at different stages of development across the Department and its partner organisations. The Department will continue its engagement in order to progress this workstream.

### Data Collection

This report provides an update on Northern Ireland's 10X performance, first outlined in last year's 10X Metrics Baseline Report. It further expands on the Underpinning Tier 2 Metrics. Alongside the International Tier 1 Metrics this can assist policy makers and our delivery partners in developing policies and strategies that will help make Northern Ireland a more innovative, inclusive and sustainable society.

We want to ensure that we have the best data to support the outcomes desired, therefore we will continue to monitor best available data sources. This process allows us to continue with our research and make changes should new data become available. This is important for the sustainability pillar, which in some cases is a relatively new area for data collection in Northern Ireland and the inclusivity pillar where additional breakdowns are sought.

Furthermore, it may also be advantageous to investigate if 'real time indicators' could be used as proxies for some measures, to give a more up-to-date snapshot of possible performance than is possible with the official data. There may also be merit in considering the use of short-term forecasts, which can be available for macroeconomic data relating to the labour market, for example. These approaches would only be used with the appropriate caveats in mind.

### Future Monitoring of 10X Performance

To achieve the 10X Vision we need to understand how we are performing at regional level, but also on the international stage. For this reason, we will continuously monitor progress on the range of metrics, reporting performance on an annual basis.

It is important for DfE to learn lessons of what works well elsewhere and consider if it can be applied in Northern Ireland. We will therefore continue our programme of research and the identification of relevant policy lessons from across the globe.

## Annex – List of Tier 2 Metrics

### Tier 2 Metrics for Innovation

Tier 2 Metric	Rationale for Selection
Government R&D	Forms part of GERD
Higher Education R&D	Forms part of GERD
Business R&D (BERD). BERD by Geographical Location, Sector & Company Size	Forms part of GERD
Number of R&D Companies	Provides indication of whether more companies are engaging in R&D
R&D Companies by (employee) size, ownership, location, sector	Help to inform changes in R&D activity throughout the economy
FTE of R&D workforce (Business)	Would indicate changes in business expenditure / priority of R&D
Number of Innovation Driven Enterprises (IDEs) (subject to data availability)	Although difficulties persist in capturing this data - IDEs recognised as being important for future economic performance
HE Income from Collaborative Research	Offers an insight into the health of ability of HE sector to pursue funding and probability of having better innovation outcomes
HE Income from Business Interaction	Offers insight into the health of HE engagement with private sector
HE Income from Community/ Other sources	Offers insight into the extent of continuing professional development, regeneration and development as well as Intellectual Property
STEM Graduates	Offers an insight into the provision of skills that will assist in meeting the 10X Vision
Median wage by skill level	Provides an indicator of the benefit of innovation to labour, at different skill levels
Labour Productivity by sector	Provides a breakdown of headline productivity data
Number of Innovation Active Firms	Provides an indication of whether firms are actively seeking to increase productivity
Innovation Recognition	Innovation Recognition is designed to help companies who are not innovating to become innovation active and for those who are to assess their innovation capacity and to build on that up to the development and exploitation of R&D

<b>Tier 2 Metric</b>	<b>Rationale for Selection</b>
Entrepreneurship	Business start-ups and entrepreneurship levels important for growth
High Growth Businesses	Monitoring the extent to which NI has high growth businesses will be an indicator of whether improvements in innovation and R&D are driving growth in our business base
External Sales	Growth in the value of sales, by local businesses, made outside NI
Exports	Growth in the value of sales, by local businesses, made outside the UK
FDI	Support externally-owned companies to invest in NI for the first time

## Tier 2 Metrics for Inclusivity

Tier 2 Metric	Rationale for Selection																		
Employment rate/ Gap by gender, age, disability, geography, Multiple Deprivation Measure (MDM)	<p>Department aims to help people from underrepresented groups and places to secure employment</p> <table border="1" data-bbox="614 495 1428 857"> <thead> <tr> <th>Employment rate - has disability (2019)</th> <th>Employment rate - no disability (2019)</th> <th>Difference</th> </tr> </thead> <tbody> <tr> <td>37.3%</td> <td>81.0%</td> <td>43.7%</td> </tr> <tr> <th>Employment rate - most deprived (2019)</th> <th>Employment rate - least deprived (2019)</th> <th>Difference</th> </tr> <tr> <td>58.7%</td> <td>80.2%</td> <td>21.5%</td> </tr> <tr> <th>Male employment rate (2020)</th> <th>Female employment rate (2020)</th> <th>Difference</th> </tr> <tr> <td>75.3%</td> <td>66.6%</td> <td>8.7p.p.</td> </tr> </tbody> </table>	Employment rate - has disability (2019)	Employment rate - no disability (2019)	Difference	37.3%	81.0%	43.7%	Employment rate - most deprived (2019)	Employment rate - least deprived (2019)	Difference	58.7%	80.2%	21.5%	Male employment rate (2020)	Female employment rate (2020)	Difference	75.3%	66.6%	8.7p.p.
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Economic inactivity by gender, age, disability, geography, MDM	Department aims to help people from underrepresented groups and places to secure employment																		
Work Quality Indicators, broken down by gender, age, disability, MDM	The Department's aim is to help people from underrepresented groups and places to have 'good quality' work																		
Disability and gender pay gap	Department aims to help people from underrepresented groups and places to ensure they are equitably paid when in employment																		
Full-time to part-time pay gap and gender pay gap by age	The difference in part-time and full-time hourly pay is a major contributor to the gender pay gap. Department aims to help people from underrepresented groups and places to ensure they are equitably paid when in employment																		
Household disposable income by area, MDM	Department aims to help people from underrepresented groups and places to Experience a fairer distribution of wealth																		
Proportion of the working age population with qualifications at Level 2 and above or Level 3 and above. Broken down by gender, age, disability, geography, MDM	Ensuring more people in NI achieve qualifications at Level 2/3 and above and receive lifelong learning will help increase the employment rate and reduce the inactivity rate. The Department's aim is to help people from underrepresented groups and places to Skill up																		
Proportion of population aged 25+ who have engaged in education or training in the last 13 weeks. Broken down by gender, age, disability, geography, MDM	The Department's aim is to help people from underrepresented groups and places to Skill up																		

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Proportion of the population (16+) with no digital skills, by gender, age, disability and deprivation	A lack of basic digital skills acts as a barrier to employment and social inclusion.
STEM Skills Pipeline broken down by gender, age, disability, geography, MDM	Considering all HE students at NI HEIs in 2021-22, males (34%) were more than twice as likely than female students (15%) to be enrolled on Narrow STEM subjects. Females accounted for under two-fifths (38%) of Narrow STEM enrolments.

## Tier 2 Metrics for Sustainability

Tier 2 Metrics	Rationale for Selection
Renewable electricity	Provides a breakdown of renewable electricity capacity, generation, and location.
Energy use and energy efficiency indicators	DfE has lead responsibility for the development of energy efficiency policy and legislation in Northern Ireland, working with other departments and public bodies.
Greenhouse gas emissions	An indication of our contribution to global warming and climate change. Could be developed to include residential / business / public / transport / industrial.
Household energy expenditure relative to all expenditure	Will provide a picture of how household pressures are changing. A newly created monitoring metric for the energy strategy which is not target-based, rather a measure to reflect how energy expenditure pressures on households are changing.
Households in fuel poverty	Can be affected by changes in fuel prices or changes in income but it is useful for gauging the sustainability of the economy.  A change in global fuel prices such as experienced recently or an increase in income levels will affect this.
Employment in low carbon and renewable energy economy	Target in the Energy Strategy.
Turnover in low carbon and renewable energy economy	Target in the Energy Strategy.
Domestic / Industrial and commercial prices	Gives a picture of the performance of the NI economy with regards to electricity and gas prices.
Circular Economy	We will develop metrics to align with the CE Strategy. Depending on data availability these may include: <ul style="list-style-type: none"> <li>• Domestic material consumption</li> <li>• Resource efficiency per £ economic output</li> <li>• Resource Productivity Index</li> </ul> We will also explore data availability of reuse and repair activities, green jobs, levels of extraction, more detail on landfilled waste and the number of empty homes.
Waste arisings and waste arisings per capita	Would be affected by changes in the length of time goods stay in the economy because of better durability, reuse and repair.

The following metrics have also been highlighted as potential Tier 2 Metrics for the sustainable growth pillar, but further work is needed to understand data availability:

- Total amount of waste produced by sectors - household; commerce and industry; and construction and demolition;
- Amount of waste produced by sectors per unit of GVA;
- Household spending on product repair and maintenance;
- Patents delivered in circular economy products and services; and
- Water efficiency per £GDP.