Measuring "green" jobs in the Republic of Ireland

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Introduction:

When one imagines a "Green" job, they picture a solar panel installer, environmentalist, or a worker in an electric vehicle factory. While these jobs are certainly included in some definitions of "green" jobs, there are also considerable differences between definitions – reflecting different assumptions about the green economy. Everything from train drivers to chemical scientists can be classified as being a green occupation.

These definitional differences are reflected in the estimates in employment counts, and potentially policy, which aims to promote the green transition. The purpose of this report paper is to analyse the various ways of measuring what constitutes a "Green" occupation - in an Irish context – with the goal being to provide a starting point for strategic policy debate. This will allow the State to more efficiently and effectively shape policy that ensures our emission reduction obligations are met, while also protecting the people who will be affected by this transition towards a green economy.

How one defines a "green" job influences what jobs are considered sustainable, and conversely, which jobs are not compatible with meeting/achieving our climate target goals. Green jobs are those which reduce our impact on the local and global climate and improve the quality of the environment around us. Brown jobs are the opposite.

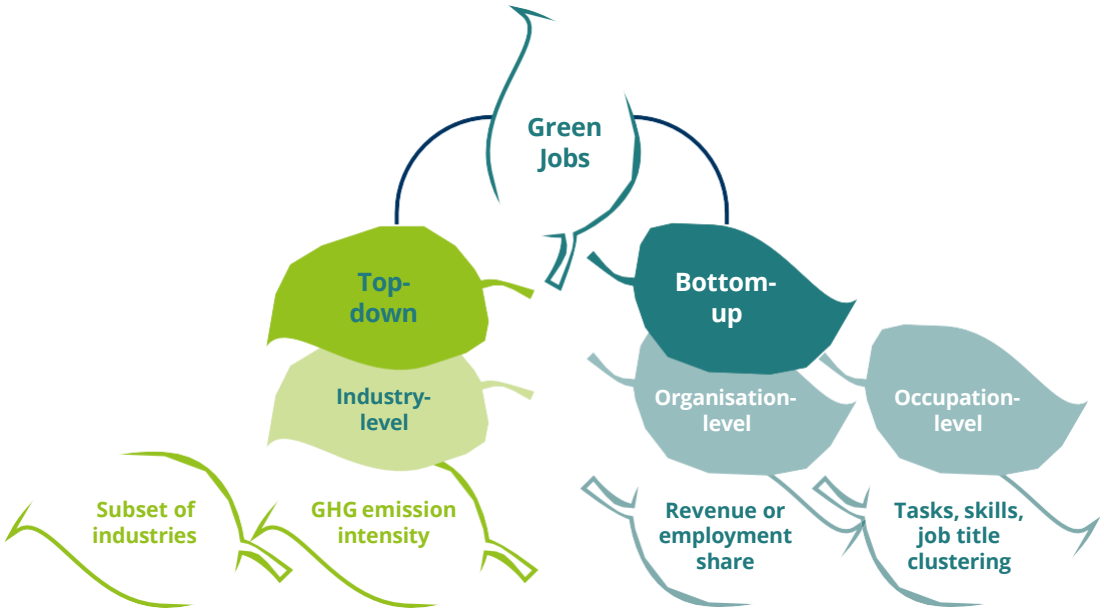
This report will focus mainly on these "'green" jobs', but we will also examine the other end of the spectrum – those occupations which would be classified as heavily polluting or are in a heavily polluting sector. This must come with a caveat that not all occupations which are classified as 'non-green' are necessarily polluting, but rather are not directly or indirectly judged to be affected by the transition to a low-carbon economy.

In between there is a sizeable proportion of "grey" jobs which do not directly improve or damage the environment. These are often jobs in the education, health, and professional sectors. They have very little direct pollution in their occupations, but they still should be incentivised to promote a sustainable work environment.

In assessing the different occupations in the labour market, we come up with varied results. This is due in part to definitional and methodological dilemmas that emerge in this field of research.

Definitional Issues:

Figure 1: Approaches to Defining "green" jobs.



Source: Valero, et. al., (2021). *'Are "green" jobs Good Jobs"*

Conceptualising and defining "green" jobs is not straightforward, as there are different approaches and methodologies in the literature which vary in how "green" jobs are defined and conceptualised, which could affect policy and decision-making in different ways. In broad terms, "green" jobs tend to be categorised according to top-down (industry-based), or bottom-up approaches (occupation-based) (Figure 1).

Top-down approaches focus on industry-level analysis, classifying industries, sectors and activities as being green and then identifying *all* occupations within those sectors as "green" jobs. This typically focuses on environmental protection activities which are identified as those activities related to reducing and preventing pollutants and harmful environmental impacts as well as resource management. This approach informs commonly used measures like the Environmental Goods and Services Sector (EGSS) used here, or the International Labour Organisation's green job measure which combines a sector approach and combines a qualitative "decent jobs" dimension. Another greenhouse gas specific top-down approach often used in the context of net zero transitions matches emission data and occupation numbers to identify emission intensive industries and observe which sectors have emission levels which hugely outweigh their employment counts. This '*emissions per person employed'* metric can identify "brown" jobs or, conversely where emissions are low, "green" jobs.

The bottom-up approaches focus on either the individual occupations and the skills, tasks, and roles involved in these jobs, or the employment share of "green" jobs within each industry. . One method uses the US Department of Labour's Occupation Information Network (O*NET) data to estimate the "greenness" of each task, and then describe the different tasks undertaken by each occupation, thus generating a percentage of time spent on 'green tasks'.

A related "Bottom-Up" method which we use in this report involves applying an occupational-level classification of "green job" developed by O*NET. This database classifies occupations into 3 distinct "Green" categories, based on the "greenness" of their related tasks (See Figure 2). This methodology identifies as green any job affected by greening directly (involving explicitly green tasks), or indirectly, and produces the following three part classification:

1. **Green New and Emerging (GNE):** The transition to a sustainable economy leads to the creation of new occupations with unique tasks and worker requirements.

   Examples: Wind energy engineers or solar photovoltaic installers, for whom all or most tasks are "Green".

2. **Green Enhanced Skills (GES):** The transition to a sustainable economy significantly alters tasks, skills, and knowledge requirements for these occupations.

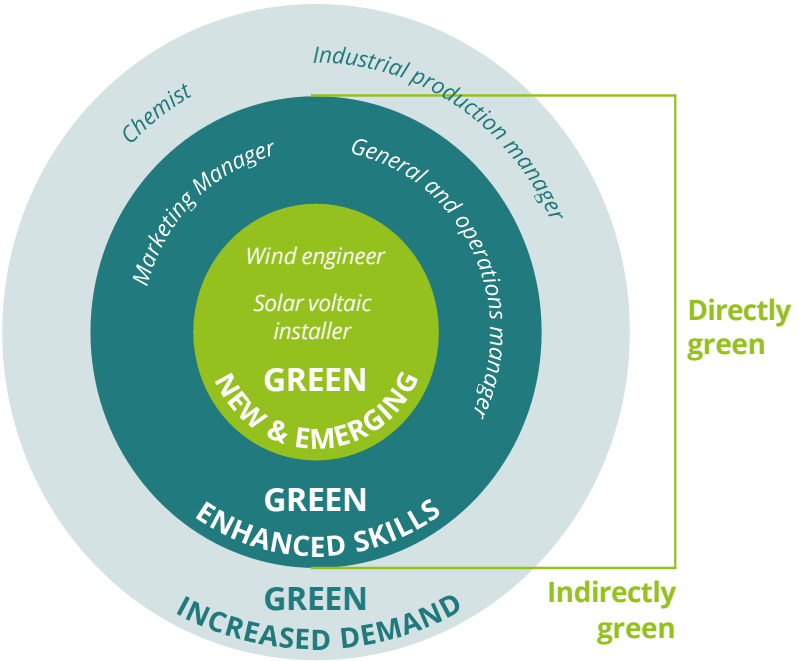
   Example 1: A general and operations manager for whom new green tasks relate to managing the sustainability of operations, or a marketing manager for whom a new green task might be developing business cases for environmental marketing strategies.

   Example 2: A construction labourer - who would need to apply weather stripping to reduce energy loss.

3. **Green Increased Demand (GID):** The transition to a sustainable economy creates a higher demand for these occupations but there are no significant changes in tasks or worker requirements due to greening. Such jobs are considered indirectly green because they support green economic activity but do not involve any green tasks.

   Examples: chemists, materials scientists, industrial production managers.

Figure 2: Varying "Greenness" of Occupations



Source: Valero, et. al., (2021). *'Are "green" jobs Good Jobs":*

This definition, in turn, does not imply that non-green jobs are necessarily "brown". Outside of jobs which are tied to environmental damage, a significant proportion of jobs might be considered "grey" as discussed later.

Data and Methodology

This report uses data from several sources. The bottom-up counts use data from Eurostat, including the Environmental Goods and Services Sector data, as well as emissions accounts data to determine "brown" jobs. These data are adjusted using national accounts employment data to determine emissions per job. These emissions refer to emissions accounts which align with national accounts measures.

We use a *Standard Occupational Classification 2010 (SOC2010)* based list of O*NET green occupations as another measure of green employment. In the absence of specific data which analyses the task content of these occupations in the Irish context, we use the job classification complied by the Greater London Authority (GLA) in their analysis of the number of "green" jobs in that area. This list is used to assemble corresponding occupational counts from the Census in 2011, 2016 and 2022 to assess the Irish labour market.

An alternative task-based measure was constructed from the UK's Office of National Statistics (ONS) Estimated time spent on green tasks by occupation code data. This describes the proportion of total job time spent on 'Green Tasks' by SOC2010 and Standard Industrial Classification (SIC) which measures industries[1]. We apply these proportions to the Irish Census data.

1 The SIC matches the Statistical Classification of Economic Activities in the European Community (NACE) Rev. 2 sector classification produced by Eurostat.

One major inconsistency in the data is the difference between official Irish Census data from the CSO and the data from Eurostat, both of which were used. Since these two collect data using different methodologies, there are discrepancies in the estimates between the same sets of data, specifically the industry employment data. The data from the CSO, which was collected for the Census, is self-completed. This means that a person receives a sheet to fill out with questions such as "What is (was) the business of your employer at the place where you work(ed) in your main job?" and is free to enter their response, which is then matched within different industries by the CSO. Occasionally, a respondent's answer is not accurate enough to be entered into the correct NACE sector and thus is either misrepresented or put under 'Industry not stated' – accounting for more than 150,000 respondents in the 2022 Census. See the Appendix for more details.

Eurostat's (nama_10_a64_e) database is compiled based upon estimated aggregates of national employment accounts. National accounts are not made up of a single data source but rather are the combinations of several administrative data, business surveys, and censuses put together. The CSO Census is only one component used to make up the national accounts which are then sent to Eurostat. Therefore, due to the influence of alternate data sources alongside the census, certain figures do not match between national accounts and census data. Appendix 1 shows the differences in employment for each broad NACE Sector between the CSO data and the Eurostat data.

Furthermore, two issues arise regarding the share of time spent on green tasks. Firstly, the ONS data ends in 2019, whereas the Irish Census was done in 2016 and then 2022 and thus the year 2019 is not included. For this project, we have projected the 2019 ONS percentage data to the 2022 Irish Census figures to find the closest approximation available. The data groups sectors S (*Other Service Activities*), T (*Activities of Households as Employers; Producing activities of households for own use*), and U (*Activities of extraterritorial organisations and bodies*) together, and thus the time spent on green tasks is an average of the three. This unfortunately means that we are not able to see industry-specific changes in those three industries, which therefore paints a limited picture.

The Top-Down Approach

Environmental Goods & Services Sector (EGSS) Method

The EU annually releases employment figures for the "Environmental Goods and Services Sector" (EGSS). This definition is the most restrictive measurement available, as it only tallies those occupations that deal directly with information, technology or materials that preserve or restore environmental quality. This requires specialised skills, knowledge, training, or experience.

Due to this narrow definition of a green role, the estimates that emerge from this measurement are noticeably smaller than others. We can Identify these as the occupations that will have the largest impact on nations reaching their emissions objectives and reducing their carbon footprint.

Table 1: Percentage of Workers in the EGSS Occupations by Sector, 2020

Total EGSS Jobs	Total Jobs	EGSS Jobs	% of Roles
Agricultural (A)	90,600	3,754	4.14%
Manufacturing & Industry (B-F)	413,475	31,288	7.57%
Services (G-U)	1,529,975	7,279	0.48%
National Total	2,037,825	41,836	2.05%

Source: Eurostat 2022 (env_av_egss1)

We can see from Table 1 that the highest proportion of these EGSS occupations are in the Manufacturing and Industry (B-F) sectors. This is because engineers and workers producing goods that will help increase efficiency and reduce emissions are located in this sector. This is consistent with results from the other methods found below.

There are very few EGSS jobs in the wider Services sectors (G-U). this is because these roles will have very little *direct* impact on the protection/regeneration of the environment.

Emission-Intensity Level Method

Looking to emissions as part of the green economy specifically, we can also use top-down industry-based methods to identify high emitting or "brown" employment. This approach utilises NACE Rev. 2 sectors which go from A (*Agriculture, forestry, and fishing*) to U (*Activities of extraterritorial organisations and bodies*), and each is a different industry.

Table 2: The Five Sectors With The Highest Employment (Thousands, 2021)

NACE Sector	Employment (thousands)
Human health and social work activities (Q)	307.09
Wholesale and retail trade (G)	306.4
Manufacturing (C)	279.83
Education (P)	210.22
Professional, scientific, and technical activities (M)	161.1

Source: *National accounts employment data by NACE sector* (Eurostat, 2021)

Table 2 shows the five sectors with the highest employment in thousands, in 2021. These are *Human health and social work activities* (Q) with 307,090 workers, *Wholesale and retail trade; repair of motor vehicles and motorcycles* (G) with 306,430, *Manufacturing* (C) with 279,830, *Education* (P) with 210,220 and *Professional, scientific, and technical activities* (M) with 161,100 employees. In total, these five sectors account for 52.48% of all jobs in Ireland. Out of the twenty total sectors, eleven have an employment number above 100,000 with an average employment of 105,531 employees.

Table 3: The Five Sectors With The Lowest Employment (Thousands, 2021)

NACE Sector	Employment (thousands)
Activities of households as employers; producing activities of households for own use (T)	4.1
Mining and quarrying (B)	5.14
Water supply; sewerage, waste management and remediation activities (E)	11.91
Real estate activities (L)	12.72
Electricity, gas, steam and air conditioning supply (D)	13.07

Source: *National accounts employment data by industry* (Eurostat, 2021)

Table 3 shows the five sectors with the lowest employment in thousands, in 2021. These are: *Activities of households as employers; undifferentiated goods and services-producing activities of households for own use* (T) with 4,100 workers, *Mining and quarrying* (B) with 5,140, *Water supply; sewerage, waste management and remediation activities* (E) with 11,910, *Real estate activities* (L) with 12,720 and *Electricity, gas, steam, and air condition supply* (D) with 13,070 employees.

These crude employment figures are used in conjunction with total emissions (GHG) per sector[2], which allows a ranking of which sectors have higher and lower emissions, and to calculate the emissions per job.

2 The emissions data from the CSO are emissions accounts, not emission inventories. In emission accounts, emissions are assigned to resident units for activities that operate both in Ireland and abroad, on the other hand emission inventories are emissions which occur only on the Island. This means that certain industries, like transport, may be skewed higher due to their international nature.

Table 4: The Five Sectors With The Highest GHG Emissions (2021)

NACE Sector	GHG Emissions (Tonnes)	Proportion of Total
Agriculture, forestry and fishing (A)	22,098,251	41.2%
Transportation and storage (H)	9,854,346	18.4%
Electricity, gas, steam and air conditioning supply (D)	9,195,937	17.2%
Manufacturing (C)	7,679,507	14.3%
Water supply; sewerage, waste management and remediation activities (E)	1,762,116	3.3&
All Other	3,029,874	5.7%

Source: *Air emissions accounts by NACE Rev. 2 activity* (Eurostat, 2021)

Table 4 shows the 2021 GHG Emissions in tonnes for the five highest emitting sectors as well as the sum of emissions for the other fifteen sectors. The most emission-intensive sectors are *Agriculture, forestry, and fishing* (A) with 22,098,251 tonnes, *Transportation, and storage* (H) with 9,854,346 tonnes, *Electricity, gas, steam and air conditioning* (D) with 9,195,937 tonnes, *Manufacturing* (C) with 7,679,507 tonnes and *Water supply; sewerage, waste management and remediation activities* (E) with 1,762,116 tonnes. Notably, the five most emission-intensive sectors account for 94.34%, and sector A (*Agriculture, forestry, and fishing*) alone accounts for 41.29% of total non-household emissions.

Table 5: The Five Sectors With The Lowest GHG Emissions (2021)

NACE Sector	GHG Emissions (Tonnes)
Real estate activities (L)	21,671
Financial and insurance activities (K)	53,921
Wholesale and retail trade; repair of motor vehicles and motorcycles (G)	120,900
Mining and quarrying (B)	121,308
Arts, entertainment and recreation (R)	122,877

Source: *Air emissions accounts by NACE Rev. 2 activity* (Eurostat, 2021)

Table 5 shows the bottom five sectors in terms of emissions, which are: *Real estate activities* (L) with 21,671 tonnes, *Financial and insurance activities* (K) with 53,921 tonnes, *Wholesale and retail trade; repair of motor vehicles and motorcycles* (G) with 120,900 tonnes, *Mining and quarrying* (B) with 121,308 tonnes and *Arts, entertainment, and recreation* (R) with 122,877 tonnes. The average total GHG emissions are 2,816,896 tonnes, though it should be noted that there was no emission data for sector 'T' and thus was not counted.

Table 6: The Five Sectors With The Highest Emissions Per Job (2021)

NACE Sector	Emissions per Job
Electricity, gas, steam, and air conditioning supply (D)	696.71
Agriculture, forestry, and fishing (A)	206.08
Water supply; sewerage, waste management and remediation activities (F)	147.95
Transportation and storage (H)	96.91
Manufacturing (C)	27.41
Mining and Quarrying (B)	23.6

Source: *National accounts employment data by industry* (Eurostat, 2021), *Air emissions accounts by NACE Rev. 2 activity* (Eurostat, 2021)

Combining both the crude employment figures and the base total emissions (GHG), we can find out the emissions per job for each industry. Table 6 shows the five highest emissions per job sectors for 2021 in which there is a stark gap between the first (D)[3] and the others, with it being more than three times higher at 696.71 tonnes per job than the following (A) at 206.08 tonnes.

Table 7 The Five Sectors With the Lowest Emissions Per Job (2021)

NACE Sector	Emissions per Job
Financial and insurance activities (K)	0.45
Information and communication (J)	0.99
Professional, scientific and technical activities (M)	1.04
Human health and social work activities (Q)	1.25
Education (P)	1.31

Source: *National accounts employment data by industry* (Eurostat, 2021), *Air emissions accounts by NACE Rev. 2 activity* (Eurostat, 2021)

Table 7 shows the sectors with the lowest emissions per job: *Financial and insurance activities* (K) at 0.45 tonnes, *Information and communication* (J) at 0.99 tonnes, *Professional, scientific, and technical activities* (M) at 1.04 tonnes, *Human health and social work activities* (Q) at 1.25 tonnes and *Education* (P) at 1.31 tonnes. Overall, the average emissions (GHG) per job is 65.6 tonnes, which means that there are only 4 sectors which have emissions higher than the average and thus heavily skew it.

3 The Eurostat data used for this data does not re-allocate emission data to the sector which consumes it, but this CSO release does. For example, emissions that are assigned to energy creation by sector D are instead assigned to the sector that uses the energy, which results in a lower emissions per job result.

Bottom-Up Approaches

O*NET Method (4-Digit Level)

As outlined in the introduction, the O*NET method allows us to present data by labelled "green occupation" for each Census from 2011 (See Table 7)

Table 8: Percentage of "green" jobs in the Irish Labour Market (2011-2022)

	2011		2016		2022	
Increased Demand	153590	8.6%	179018	9.0%	222331	9.7%
Enhanced Skills	253660	14.2%	274452	13.8%	304935	13.3%
New & Emerging	60969	3.4%	75292	3.8%	102102	4.4%
Total "green" jobs	468,219	26.1%	528,762	26.6%	629,368	27.4%
Other Job Market	1,322,497	73.9%	1,460,050	73.4%	1,669,187	72.6%
Total Labour Force	1,790,716		1,988,812		2,298,555	

Source: Labour Force Survey, Census (2022)

The green sector expanded steadily overall between 2011 and 2022, growing by over 34% over the period. This exceeds overall labour market growth of just over 28%, resulting in an increase in the share of "green" jobs in the economy from 26.1% of employment in 2011 to 27.4% in 2022. This is led by jobs in the *Green Increased Demand* subcategory, which grows by close to 45%. However, the largest proportional increase is attributable to *Green New and Emerging* occupations, which grow by more than 67% over the same period. While *Green Enhanced Skills* expands in absolute terms between the first and final Census, it does so at a slower rate than the labour market as a whole, leading to a fall in the proportion of total employment attributable to the subcategory from 14.2 to 13.3%.

Census data also allow us to take the SOC2010 list of occupations and cross reference that by Industry (NACE) sector. We measured the number of jobs in the different green categories in each NACE sector and compared the findings economy-wide (Table 9).

Table 9: Percentage of Workers in "Green" Occupations by NACE Category 2022

NACE Sector	% Green Occupations	Rank
Agriculture, forestry, and fishing (A)	83%	1
Mining and quarrying (B)	65%	2
Manufacturing (C)	50%	6
Electricity, gas, steam, and air conditioning supply (D)	56%	5
Water supply; sewerage, waste management and remediation activities (E)	60%	4
Construction (F)	62%	3
Wholesale and retail trade; repair of motor vehicles and motorcycles (G)	22%	13
Transportation and storage (H)	44%	7
Accommodation and food service activities (I)	4%	22
Information and communication (J)	40%	8
Financial and insurance activities (K)	31%	10
Real estate activities (L)	18%	15
Professional, scientific, and technical activities (M)	38%	9
Administrative and support service activities (N)	27%	11
Public administration and defence; compulsory social security (O)	18%	14
Education (P)	5%	20
Human health and social work activities (Q)	5%	21
Arts, entertainment, and recreation (R)	10%	17
Other service activities (S)	6%	19
Activities of households as employers; producing activities of households for own use (T)	2%	23
Activities of extraterritorial organisations and bodies (U)	17%	16
Industry not stated	7%	18
Total "Green" Employment across the Economy	27%	11

Source: ONS SOC2010 Definitions | Census (2022) Figures
Note: Dataset used: F7049

We observe considerable differences between the different NACE sectors; from *Agriculture, forestry, and fishing* (83%) to *Education* (5%) and *Health Services* (5%). This is understandable because as mentioned previously, these sectors are made up of the technicians, engineers and workers who will build and improve our new, climate-friendly economy:

It must be said that counts in Sector A (*Agriculture, forestry, and fishing*) are heavily weighted by the fact that Farmers (which make up about 75% of the whole sector) are classified as being a 'Green Enhanced Skill' occupation. This pushes the total percentage up considerably. Under this definition, they are counted as a "green" occupation because (with some required up/reskilling), they will have the ability to manage their land sustainably in order to reduce emissions and pollution, increase biodiversity, and

capture already-emitted pollution using their natural environment. This provides a real opportunity for both policymakers and farmers in what is currently the heaviest emitting sector, as the potential to reduce its emissions by implementing sustainable land use practices would have a massive positive impact on the State achieving its climate obligations.

The occupations in Sector B (*Mining and Quarrying)* are counted as green as these roles will be crucial in finding the minerals required to power our low-carbon, electronic-centred world. C (*Manufacturing*) is made up of all the workers building these new and more efficient systems and technologies that are more eco-friendly. D *(Electricity, gas, steam, and air conditioning supply*) and E (*Water supply; sewerage, waste management and remediation activities*) are made up of engineers of all types who are developing new ideas and technologies that can power us into the energy transition.

Time-Adjusted "Green" Jobs

In addition to typical top-down and bottom-up approaches, we can adjust the data based on the percentage of time workers spend on green tasks. The UK's Office for National Statistics (ONS) created an estimate for how long workers in each NACE sector spend on green tasks, based on the US O*NET classification. The O*NET classifications were first converted into the UK SOC codes, which can then be placed within the NACE Sectors. Lastly, they measured the relevance and the frequency of green tasks within jobs to create weighted categories and finally estimated the time spent on green tasks for each industry.

Table 10: Percentage of Time Spent by Workers in Green Tasks

NACE Sector	Proportion Green Tasks
Agriculture, forestry, and fishing (A)	1%
Mining and quarrying (B)	12%
Manufacturing (C)	10%
Electricity, gas, steam, and air conditioning supply (D)	13%
Water supply; sewerage, waste management and remediation activities (E)	18%
Construction (F)	11%
Wholesale and retail trade; repair of motor vehicles and motorcycles (G)	6%
Transportation and storage (H)	7%
Accommodation and food service activities (I)	3%
Information and communication (J)	6%
Financial and insurance activities (K)	5%
Real estate activities (L)	8%
Professional, scientific, and technical activities (M)	9%
Administrative and support service activities (N)	6%
Public administration and defence; compulsory social security (O)	3%
Education (P)	1%
Human health and social work activities (Q)	1%
Arts, entertainment, and recreation (R)	6%
Other service activities (S)	2%
Activities of households as employers; producing activities of households for own use (T)	0%
Activities of extraterritorial organisations and bodies (U)	7%
Industry not stated	1%
Total "Green" Employment across the Economy	5%

Source: Census (2022), *Time spent on green tasks,* (ONS, 2022)

Note: These – and other time share - data apply 2019 time share data for SOC2010 occupations to Census 2022 data.

The difference between Tables 9 & 10 is most noticeable in Sector A, where under this new definition, ONET have measured that currently, farmers spend 0 hours on "Green tasks". This dramatically reduces the percentage of this sector – from the highest proportion to the lowest. Due to farming having an oversized bearing on the sector (and the economy as a whole), getting the measurement of this statistic correct is crucial.

This time-adjusted measure also follows the same findings from our analysis of the EGSS data – Most of these "green" jobs are located in the Manufacturing and Industry sectors (B-F). That is due to the fact that the tasks carried out in these industries are clear and produce a result that can be quantified, and its environmental impact assessed.

The time-adjusted counts allow a further level of analysis, in being able to see how much time the average worker within a specific industry will spend on green tasks, and then compare that with the total and per-person emission data.

For this analysis, it is important to note that a green jobs can occur in sectors with high emissions. As we saw in Table 6, sector D has higher emissions per job (696.71) compared to H (96.91) but spends much longer on green tasks, 13% compared to 7%. The inverse is also true, sectors I (*Accommodation and food service activities*) and Q (*Human health and social work activities*) have the low proportions of time spent on green tasks and yet some of the lowest emissions per job due to the nature of the industry.

Utilising this methodology, we can define green industries based on whether or not jobs within them perform green tasks or by the share of green tasks on the job, regardless of their total or per-person emissions. By varying the cut-off point the results change and thus provide deeper insights into Irish industries and "green" jobs, as well as the change between years.

Table 11: Percentage of workers in sectors with over 33, 50 and 66% of workers engaged in "green" tasks, 2011-2022

Year	Percentage of Workers in Industries over 33%	Percentage of Workers in Industries over 50%	Percentage of Workers in Industries over 66%
2011	54.8%	29.5%	0.3%
2016	62.8%	22.9%	17.2%
2022	67.8%	30.9%	18.2%

Source: *Time spent on green tasks* (ONS, 2022), Census 2022 (CSO, 2023).

Table 11 shows the percentage of workers that are in sectors more than ≥33%, ≥50% and ≥66% of workers engaged in some green tasks between the years 2011-2022. The starkest difference is the percentage of workers in sectors with a green job time share higher than 66%, going from 0.3% of the total workforce to 18.2% in just 9 years.

Similarly, workers in sectors with over 33% of workers performing some green tasks saw a smaller increase, going from 54.8% in 2011 to 67.8% in 2019. These both contrast with the percentage of workers in sectors over 50%, which barely saw an increase, going from 29.5% in 2011 to 30.9% in 2019.

Despite this group growing less overall, the trend points to the suggestion that jobs which are a "shade of green" are increasing within the Irish labour market.

Furthermore, another possible framing of green sectors would be adjusting the employment data by the time spent on green tasks following the count shown in table 10. This presents us with an adjusted count of how many people are involved in a 'green sector' by virtue of their tasks.

Table 12: The five sectors with the highest aggregate employment after adjusting for time spent on green tasks (2022)

NACE Sector	Green employment (thousands)	Total employment (thousands)
Manufacturing (C)	23.7	242.9
Wholesale and retail trade (G)	17.6	276.9
Construction (F)	14.4	134.5
Professional, scientific and technical activities (M)	13.8	158.1
Information and communication (J)	7.1	125.5

Source: *Time spent on green tasks,* (ONS, 2022), Census 2022 (CSO, 2023).

Note: Approximately 6.5% of respondents did not state an industry.

This adjustment leads to a significant downward revision in green jobs numbers in aggregate and in their distribution between sectors. Total green jobs numbers fall from over a quarter of aggregate employment using the broad occupation identification method to just over 5% or around 119,000 in 2022 based on 2019 ONS time share data weighting. This reflects a distinction between jobs identified as having some green content or likely to experience change due to a transition, and current time spent on green tasks.

Table 12 shows the five sectors with the highest aggregate green employment after the data has been adjusted for time spent on green tasks. The most notable effect in proportional terms relative to the data in the previous section is the fall of Agriculture from one of the major sources of green employment at nearly 11% of the green jobs total under the unadjusted occupational count, to a relatively negligible 0.5% of green employment in time share terms. *Information and Communication* enters the top 5 green sectors with 6% of green jobs, though this is a fall from the 8% share using the wider methodology.

Geographical Spread of "Green" Jobs

There are multiple ways to approach the geographical spread of "green" jobs, either by looking at the unadjusted count of sectoral employment, the most emission-intensive sectors, or looking at the geographical occupational data

Using the un-adjusted sector count, we can map where emission-intensive sectors are located. By gathering the employment data of the five emission-intensive sectors (per job): *agriculture, forestry and fishing* (A), *manufacturing* (C), *electricity, gas, steam and air conditioning supply* (D), *water supply; sewerage, waste management and remediation activities* (E) and *transportation and storage* (H), we can see the spread of these jobs, which can in the future aid policy and decision-makers when looking at the just transition.

Figure 3: The five most emission-intensive sectors mapped (2021)

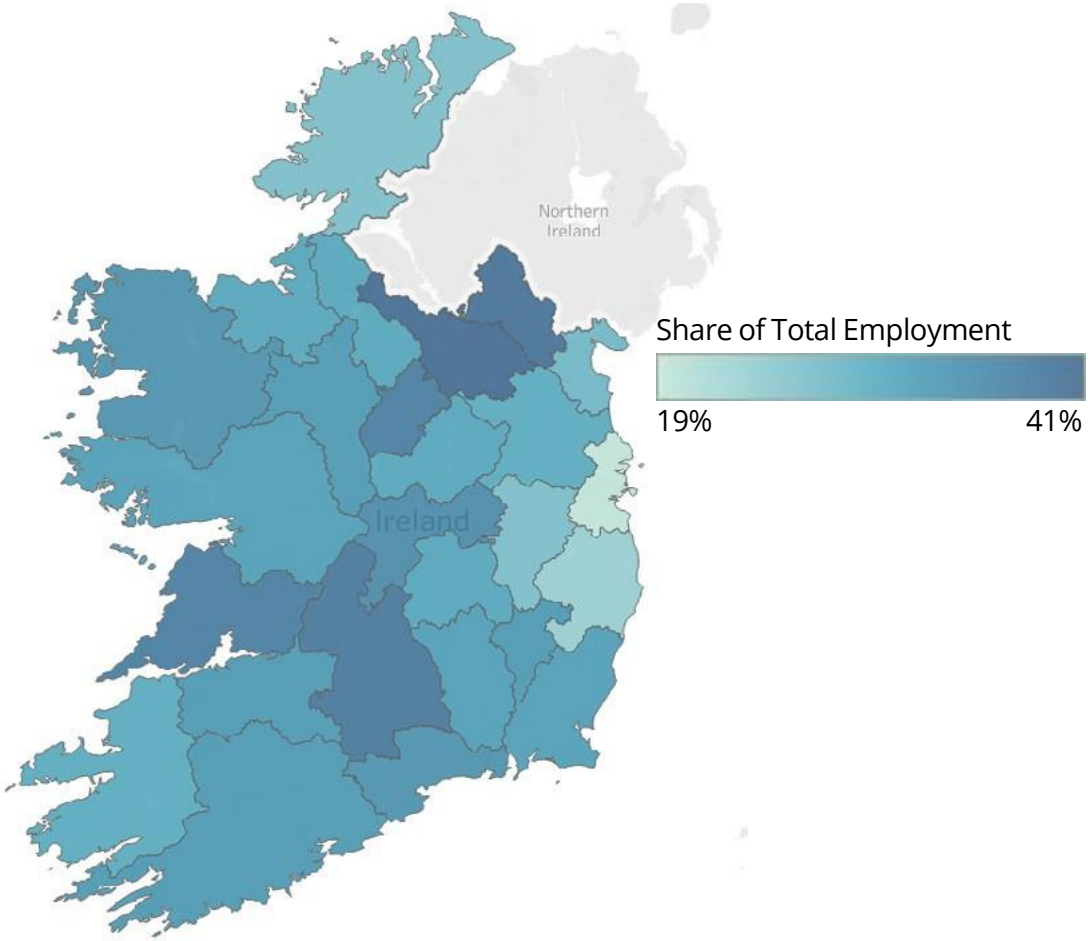


Figure 3 is a map of Ireland which shows the geographical spread of the five highest emitting sectors as a share of total employment in the county. Dublin County is the lowest in Ireland with only 13% of total employment being in the five sectors mentioned. This value is contrasted by the data from counties Cavan, Monaghan, Tipperary, Longford, and Clare with the respective values being 33%, 32%, 31%, 30% and 30%. This is because these counties contain a high share of sector A – *Agriculture, forestry and fishing* compared to their total respective job market. If we are to eliminate the *agriculture, forestry and fishing* (A) sector and rather replace it with the next highest emission sector, *mining and quarrying* (B), the results look considerably different.

Table 14: Share Of The Five Most Emission-Intensive Industries Sectors Per County, With And Without Agriculture, Forestry, And Fishing (2021)

County	Top 5 Emitting Industries	Top 5 Emitting Industries without Agriculture	% Change
Monaghan	32%	23%	-9%
Cavan	33%	24%	-9%
Tipperary	31%	22%	-8%
Leitrim	24%	17%	-7%
Kerry	23%	16%	-7%
Kilkenny	25%	18%	-7%
Roscommon	26%	19%	-7%
Mayo	27%	20%	-7%
Wexford	25%	19%	-6%
Sligo	24%	18%	-6%
Donegal	20%	14%	-6%
Laois	24%	18%	-6%
Carlow	26%	20%	-6%
Clare	30%	24%	-5%
Longford	30%	24%	-5%
Waterford	27%	22%	-5%
Limerick	26%	22%	-4%
Westmeath	24%	19%	-4%
Offaly	28%	24%	-4%
Cork	26%	22%	-4%
Galway	25%	21%	-4%
Wicklow	17%	14%	-3%
Meath	23%	20%	-3%
Kildare	20%	18%	-3%
Louth	21%	19%	-2%
Dublin	13%	13%	0%

Source: *National accounts employment data by industry* (Eurostat, 2021)

Table 14 shows the percentage change between including the *agriculture, forestry and fishing* (A) sector and excluding it, with the biggest changes happening in counties Monaghan, Cavan, Tipperary, and Leitrim. These four counties lost 9%, 9%, 8% and 7% respectively, meaning that the percentage of intensive sectors as a share of the whole workforce declined. For Cavan, the change was considerable, as it went from a third of all jobs being emission intensive to slightly less than a quarter – showing the impact that the Agricultural sector has on the Irish workforce. On the other hand, Dublin was the

only one which did not see any change, and counties Louth, Kildare, Meath, and Wicklow all saw a change of less than 4%.

It is equally possible to approach the geographical spread based on the occupational, rather than sectoral, data.

Table 15: Green employment in counties with largest populations of persons at work (2016)

County	Green Job Employment	Percentage of Total Employment	Percentage of Green Employment
Dublin	145,365	31%	25%
Cork	73,802	11%	13%
Galway	33,751	5%	6%
Kildare	28,101	5%	5%
Meath	26,112	4%	5%
Total Five	307,131	57%	53%
All Others	273,118	44%	47%

Source: *Population Aged 15 Years and Over in the Labour Force* (2011 to 2016) (CSO, 2020)

Table 15 shows the five counties with the largest numbers of individuals at work according to the 2016 Census. It also shows the county's employment as a percentage of total employment, with Dublin making up 31% and the top five making up 57% of the entire country's employment. This allows us to compare the percentage of total employment in a county compared to the percentage of green employment in that same county, showing whether green employment is under or over-represented.

Conclusion

Different methodologies for green job measurement come to very different conclusions about the extent of the green economy in Ireland. According to the narrower, but commonly used EGSS definition, "green" jobs made up just over 2% of overall employment according to the latest data.

It must be stated that the overall objective of the Green transition is not to make every job actively "Green". In reality, not every job will be tasked with actively improving our planet, but the core change must be made by reducing the number of "brown" jobs so that their negative impact can be grossly outweighed by the impact of this new green sector.

Oftentimes these "green" jobs are necessary and needed in these sectors precisely because the sectors they are located in are currently the areas of the economy with the highest emissions per job. This is the crucial transition required to reverse the negative impact we have had on the planet.

The vast majority of jobs, however, will have a negligible direct impact on the warming of the planet, these "grey" jobs need to become as efficient as possible in their processes in order to ensure that every person, organisation, and nation is doing their bit to reduce our impact on the environment.

There are numerous downfalls in the current research of the current Irish labour market regarding the measurement of the Green economy, which does not give people an accurate assessment of the current state of play in terms of the number of "green" jobs in the economy. The question of Agriculture and in particular, how to measure the state of play environmentally and justly for farmers is crucial if we are to move the conversation in this country. Without proper studies and data, we cannot effectively implement policies to improve the quality of our renowned natural environment, whilst also not seriously impacting the people who have managed it.

Appendix 1

Difference in Employment Counts

NACE Sector	CSO	Eurostat	Difference	% Difference
Agriculture, forestry, and fishing (A)	82228	101520	19292	23%
Mining and quarrying (B)	4756	6270	1514	32%
Manufacturing (C)	242857	285900	43043	18%
Electricity, gas, steam, and air conditioning supply (D)	13312	15450	2138	16%
Water supply; sewerage, waste management and remediation activities (E)	12177	15980	3803	31%
Construction (F)	134482	165790	31308	23%
Wholesale and retail trade; repair of motor vehicles and motorcycles (G)	276896	315810	38914	14%
Transportation and storage (H)	86912	111830	24918	29%
Accommodation and food service activities (I)	122613	168390	45777	37%
Information and communication (J)	125471	163720	38249	30%
Financial and insurance activities (K)	105238	119490	14252	14%
Real estate activities (L)	12362	12550	188	2%
Professional, scientific, and technical activities (M)	158146	166940	8794	6%
Administrative and support service activities (N)	87031	107660	20629	24%
Public administration and defence; compulsory social security (O)	129978	133120	3142	2%
Education (P)	211457	210160	-1297	-1%
Human health and social work activities (Q)	269617	333540	63923	24%
Arts, entertainment, and recreation (R)	38169	50810	12641	33%
Other service activities (S)	52663	57130	4467	8%
Activities of households as employers; producing activities of households for own use (T)	1684	4940	3256	193%
Activities of extraterritorial organisations and bodies (U)	1661	/	/	/
Industry not stated	150587	/	/	/

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