

# Navigating the Landscape of Green Jobs

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# Executive Summary

In response to the pressing challenges posed by climate change, businesses worldwide are embracing sustainability as a core principle to drive innovation and resilience. This shift towards eco-conscious practices should be correlated with the rise of Green Jobs - roles explicitly designed to reduce environmental impact while driving economic growth. However, the discrepancy between theoretical promises and tangible realities in the job market requires closer examination.

Our analysis reveals that the prevalence of job advertisements explicitly mentioning Green Skills falls short of expectations in all countries studied, indicating a gap between aspirations and realities. The Energy and Utilities sectors have the highest concentration of green jobs, followed by Transport and Logistics, while Retail & FMCG and Financial Services currently lag behind. Renewable energy engineering, sustainability management, energy management, and environmental compliance are emerging as critical skillsets. Furthermore, our research explores how companies differentiate themselves through Green Job advertising. While some demonstrate an intentional commitment to sustainability, others neglect to highlight green aspects in their recruitment efforts, possibly due to legacy practices. To capitalize on the growing interest in Green Jobs, companies must develop effective branding strategies and craft compelling job advertisements. Authenticity is key, with an emphasis on expressing sustainability commitments and achievements at the company level and clearly defining essential Green Skills at the position level. By aligning strategies with global sustainability goals and effectively communicating their commitment, businesses can navigate the challenges and opportunities of the Green Hypertransformation, paving the way for a sustainable future.

This whitepaper examines Green Job prevalence in key sectors such as Energy & Utilities, Financial Services, Retail & FMCG, and Transport & Logistics across Belgium, Canada, France, the Netherlands, and the United States, delving into the prevalence of Green Jobs ads compared to other job ads, the importance of Green Skills, and the operationalization of green job advertising for employers.

# The promise of Green Hypertransformation and Green Jobs

In today's dynamic business landscape, businesses are undergoing a transformative journey, responding to the urgent challenges of our time, particularly the widespread impact of climate change. The evolution of stringent environmental regulations, paired with an unparalleled increase in market demand for eco-friendly solutions and intense competition, underscores the critical necessity for a strategic transition towards sustainability.

Beyond mere compliance, organizations are recognizing the essential value of embracing sustainability as a guiding principle, driving innovation and resilience in the face of current challenges. This transformative shift affects various facets of business operations, resulting in the increase of green products, the optimization of operational processes, the development of a universal culture centered on environmental responsibility, and a strategic repositioning of core activities.

**Central to navigating this green Hypertransformation are skilled individuals capable of guiding the fundamental transition towards sustainable practices.** This pivotal moment in economic evolution gives rise to what the International Labor Organisation (2023) defines as "Green Jobs" – roles that extend beyond traditional employment, representing economically viable positions explicitly designed to reduce environmental impact. These roles encompass a spectrum of exper-

tise, from sustainable resource management to eco-friendly product development, shaping a workforce oriented towards addressing the complexities of a rapidly changing world.

Gaining popularity in the late 2000s<sup>1</sup>, the concept of Green Jobs includes forms of employment that actively contribute to the shift towards more sustainable societies and economies.



As organizations become increasingly committed to sustainability, the question arises around the impact on employment. The rise of Green Jobs becomes inseparable from this broader shift. However, the correlation between corporate ambitions and the transformation of jobs and skills has yet to be established. Considering the job market as a mirror of the transformation of companies and ways of working, this whitepaper aims to highlight how recruitment reflects the Green Hypertransformation.

This whitepaper aims to bridge the gap between macroeconomic projections and on-the-ground realities by examining the prevalence of Green Jobs in the job market across the United States, Netherlands, Canada, Belgium, and France. Focusing on pivotal sec-

tors such as Energy & Utilities, Financial Services, Retail & FMCG, and Transport & Logistics, our research delves into three questions that uncover the dynamics of the evolving job landscape:

- ▶ How does the actual job market reflect national and sectorial macro-economic trends in terms of Green Job openings?
- ▶ Which Green Skills are considered the most important in the current labor market?
- ▶ Are Green Jobs always explicitly labelled in advertisements?



With pragmatic and insightful conclusions to navigate the challenges and opportunities presented by the Green Hypertransformation, this whitepaper supports the reflection of companies, HR executives and individuals in greening jobs. By leveraging sector-specific insights, this research goes beyond a generic analysis, offering a nuanced understanding of growth patterns, industry-specific trends, and the complex dynamics within each sector. Through actionable insights, we aim to guide strategic decision-making and support organizations in their journey towards a sustainable and successful future.

# What are Green Jobs?

**Green Jobs can be considered as the human component of shifting business models, activities and products towards environmental sustainability. Since we first heard of Green Jobs in 2008, the concept has developed, progressively enriched by the evolutions of legislative framework, the evolutions of market demand and other innovation opportunities.**

There are two approaches which coexist to identify Green Jobs: one is output-oriented, the other is process-oriented<sup>2</sup>. The output-oriented approach is meant to identify jobs producing goods or services beneficial to the environment or resource conservation<sup>3</sup>. This approach often involves categorizing jobs within the Environmental Goods and Services Sector (EGSS), focusing on specific sectors such as agriculture, manufacturing, construction, and scientific activities<sup>4</sup>. However, this approach may overlook potentially green jobs in sectors not traditionally associated with environmental outputs<sup>5</sup>.

This is why this whitepaper uses a process-based approach to identifying Green Jobs. They are then considered based on activities that render production processes more environmentally sustainable or resource-efficient<sup>6</sup>. This perspective acknowledges that green practices can exist in traditional sectors, provided they adopt cleaner production technologies or organizational practices<sup>7</sup>. Additionally, a task- and skills-based approach examines the specific activities associated with green jobs, facilitating a nuanced understanding of job transitions and workforce requirements<sup>8</sup>.

Within the European Union (EU), while there's no legal definition of green jobs, a taxonomy has been developed by the European Classification of Occupations, Skills and Competences to provide a multilingual framework on skills, competencies and occupations, including ones related to Green Jobs<sup>9</sup>. This research relies on the aforementioned ESCO framework v1.1 from the category "Green".

Green jobs considered in this whitepaper are inspired by the definition provided by the International Labor Organisation: "Economically viable employment that reduces environmental impacts to sustainable levels. This includes employment that helps to promote and restore ecosystems and biodiversity, reduce consumption of energy, materials and resources and de-carbonise the economy and minimise or avoid the generation of waste and pollution."



(2) Urban, P., Rizos, V., Ounnas, A., Kassab, A., & Kalantaryan, H. (2023). Jobs for the Green Transition: Definitions, classifications, and emerging trends. (3) Vona, F., Marin, G., Consoli, D., & Popp, D. (2018). Environmental regulation and green skills: An empirical exploration. *Journal of the Association of Environmental and Resource Economists*, 5(4), 713-753. (4) ILO (2013, October). Proposals for the statistical definition and measurement of green jobs. 19th International Conference of Labour Statisticians, Geneva, Switzerland. (5) Bohnenberger, K. (2022). Greening work: Labor market policies for the environment. *Empirica*, 49(3), 347-368. (6) Sommers, D. (2013). BLS green jobs overview. *Monthly Labor Review*, 136(1), 3+. (7) ILO (2013, October). Proposals for the statistical definition and measurement of green jobs. 19th International Conference of Labour Statisticians, Geneva, Switzerland. (8) Bowen, A., Kuralbayeva, K., & Tipoe, E. L. (2018). Characterising green employment: The impacts of 'greening' on workforce composition. *Energy Economics*, 72, 263-275. (9) Green Skills and Knowledge Concepts: Labelling the ESCO classification, ESCO, 2022.

# Global outlook on the emergence of Green Jobs

## **Expectations and realities of the emergence of Green Jobs in national labor markets**

Recognizing the pivotal role of Green Jobs in steering the transition towards a more sustainable future, it's normal to wonder how this translates to the current job market. Are the projected surges in green employment materializing, or are we witnessing a gap between aspirations and reality?

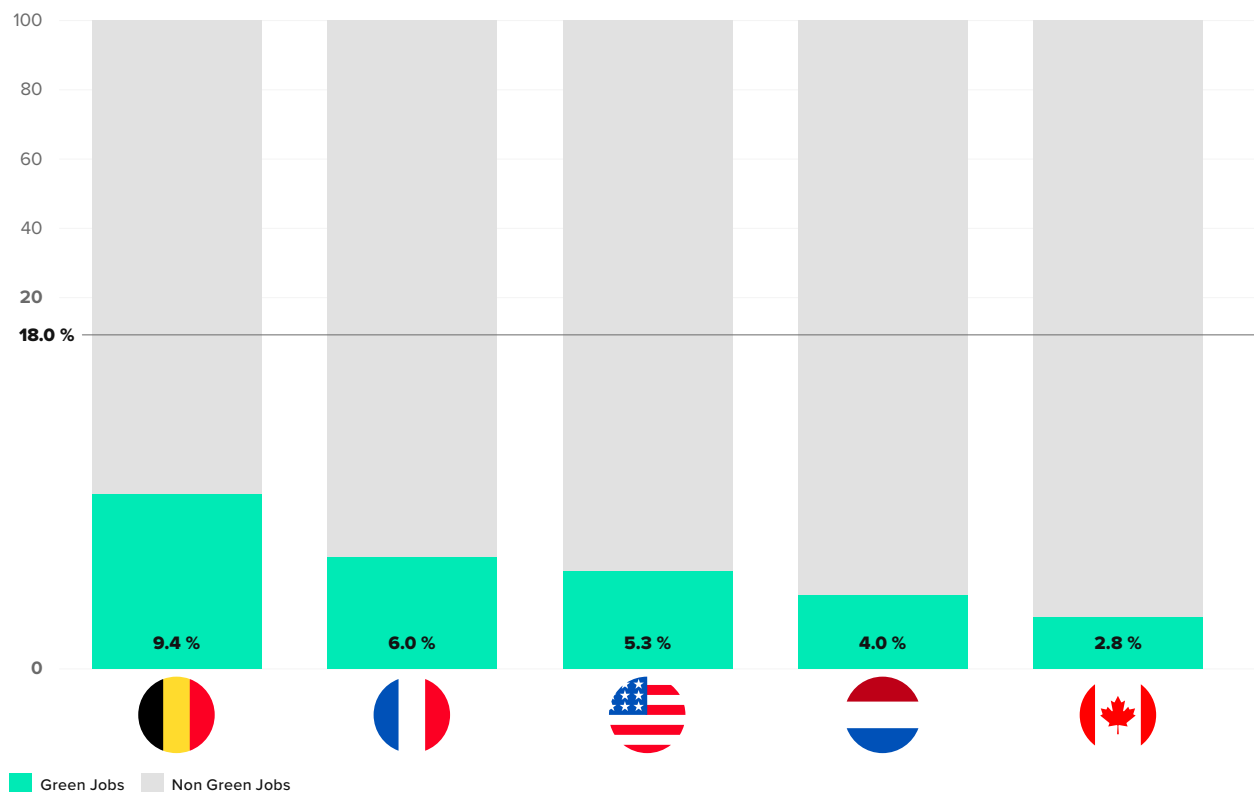
This chart visually represents the prevalence of Green Jobs in five prominent countries (Belgium, France, the United States, the Netherlands and Canada) across the

employment landscape in four key sectors (Energy & Utilities, Transport & Logistics, Retail & FMCG, and Financial Services).

While the OECD estimates that 18% of jobs have at least 10% of their tasks dedicated to green tasks<sup>10</sup>, the prevalence of job offers with mentions of Green Skills falls short of 10% in each of the countries studied.



FIGURE 1: PREVALENCE OF GREEN JOBS



## Green Jobs: national explanations and sectorial observations

In the Energy and Utilities sector, Green Jobs represent between 14.4% and 27.6% of all job ads in Belgium, France, Canada, the Netherlands and the United States – making it the sector with most Green Jobs, globally.



**In most countries, Energy and Utilities have the greatest proportion of Green Jobs, except France, in which Green Jobs in the Transport sector exceeds those of other sectors.**

Green Jobs in the Transport & Logistics sectors are highly spread out across geographies, with France and Belgium showing high levels at 16.0% and 18.0% respectively, while the Netherlands, Canada and the United States are between 4.7% and 6.7%. The structure of transport networks may explain the discrepancy between Europe and America, although the Dutch exception is not yet explained.

**The Retail and FMCG sectors exhibit lower proportions of Green Jobs, between 1.5% and 6.3%.**

This may still indicate challenges associated with implementing sustainable practices in industries characterized by complex supply chains and significant environmental footprints. However, emerging initiatives aimed at promoting eco-friendly transportation alternatives, such as the promotion of electric vehicles for example, and sustainable consumption

patterns, like reducing packaging waste, signify opportunities for growth and innovation in these sectors.

**Conversely, the Financial Services sector shows relatively low proportions of Green Jobs across all countries analyzed.**

While modest percentages represent the integration of sustainability principles within financial institutions, there remains untapped potential for further engagement in green finance and ethical investment practices to drive environmental impact at a systemic level.

### Zoom on Green Financial services.

As of 2023, North American and European banks have contributed over \$1.2T in funding for green initiatives. Projection indicates that based on the current momentum, global green financing is expected to grow to \$33T by 2050, underscoring the commitment to sustainability in the coming decades.

**It is important to note the key difference in the distinct approach by the EU and North America in terms of allocating funding for green initiatives. The EU relies heavily on regulatory forces, establishing an ESG framework as a guide for its market participants. In contrast, North America leans toward a market-driven approach which leverages its powerful private sectors and technological innovations to spearhead the change.**



## Zoom on Green Jobs by country

**Belgium** stands out for its proactive approach towards environmental sustainability, with substantial representation of Green Jobs across the energy and transport sectors. This reflects the country's commitment to renewable energy development and emissions reduction targets, positioning it as a leader in sustainable practices within the European context.

In the draft **National Energy and Climate Plan 2021-2030**, Belgium proposes an **18.3% share of energy from renewable sources in gross final consumption of energy in 2030 as contribution to the EU renewable energy target for 2030.**

Source: *Summary of the Commission assessment of the draft National Energy and Climate Plan 2021-2030*, European Commission, 2019

**France** is prioritizing Green Jobs in the transport sector through investments in sustainable mobility infrastructure and initiatives to reduce carbon emissions. While the energy sector also features prominently, opportunities for further integration of sustainability principles across industries underscore the importance of concerted efforts to advance environmental sustainability on a national level.

**France heavily utilizes Vehicle Emission Standards to cut air and greenhouse gas pollution, promoting cleaner technologies and ultimately driving Green Jobs in the transport sector.**

Source: *National Energy Climate-Plan of France*, 2023

The **Netherlands** demonstrates leadership in renewable energy innovation and technology, as evidenced by its high prevalence of Green Jobs in the energy sector. However, opportunities for further growth in green employment within the retail and transport sectors suggest the need for targeted interventions to enhance sustainability across diverse industries and foster holistic economic development.

**The Netherlands is considered among the Innovation Leaders according to the European Innovation Scoreboard**

FIGURE 2A TO 2E: SECTORIAL PROFILES OF GREEN JOBS PREVALENCE PER INDUSTRY

Figure A: Belgium

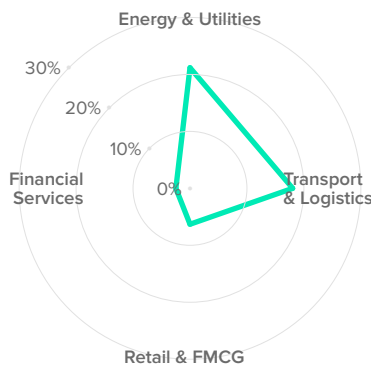


Figure D: Canada

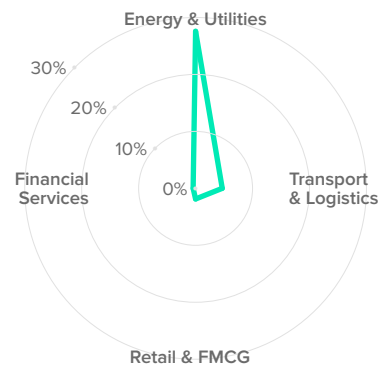


Figure B: France

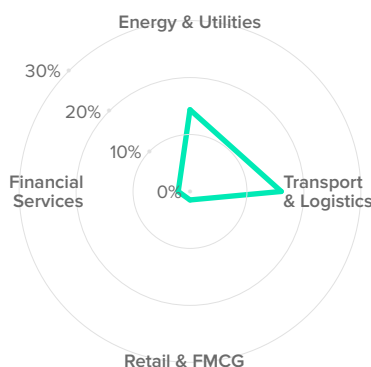


Figure E: United States

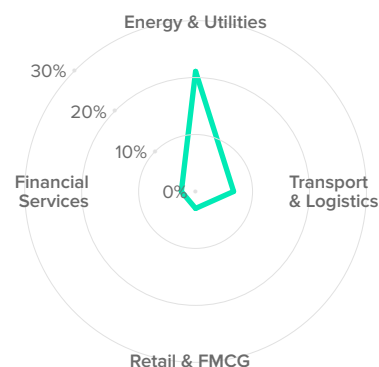
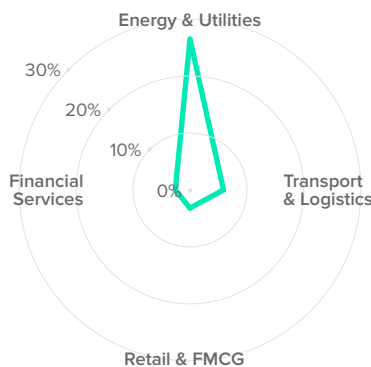


Figure C: Netherlands



**(85) in the EU. Entrepreneurial training and government procurement are above the EU average as drivers of research and innovation.**

Source: *2023 Country Report - the Netherlands*, European Commission, 2023

**Canada** showcases comprehensive efforts to expand Green Jobs, particularly in the energy sector, driven by its vast renewable energy resources and commitment to a low-carbon economy. Despite lower percentages in other sectors, ongoing initiatives seek to leverage Canada's natural advantages to promote sustainable growth and environmental

stewardship on a national scale.

**The Federal Government of Canada manages several funding programs, such as the "Oil Spill Response Challenge" and the "Greener Homes" initiative.**

Source: *Funding, Grants and Incentives*, Government of Canada, 2023

The **United States** has made significant strides in expanding green employment opportunities, with a strong focus on the energy and transport sectors. Policy support for clean energy initiatives and advancements in sustainable transportation solutions contribute to the proliferation of Green Jobs nationwide, positioning the U.S. as a key player in the global transition towards a sustainable future.

**The Clean Air Act (CAA) is the comprehensive federal law that regulates air emissions from stationary and mobile sources. Among other things, this law aims to protect public health and public welfare and to regulate emissions of hazardous air pollutants.**

Source: *Summary of the Clean Air Act*, United States Environmental Protection Agency, 2023



# Green upskilling: which Green Skills are the most desirable?

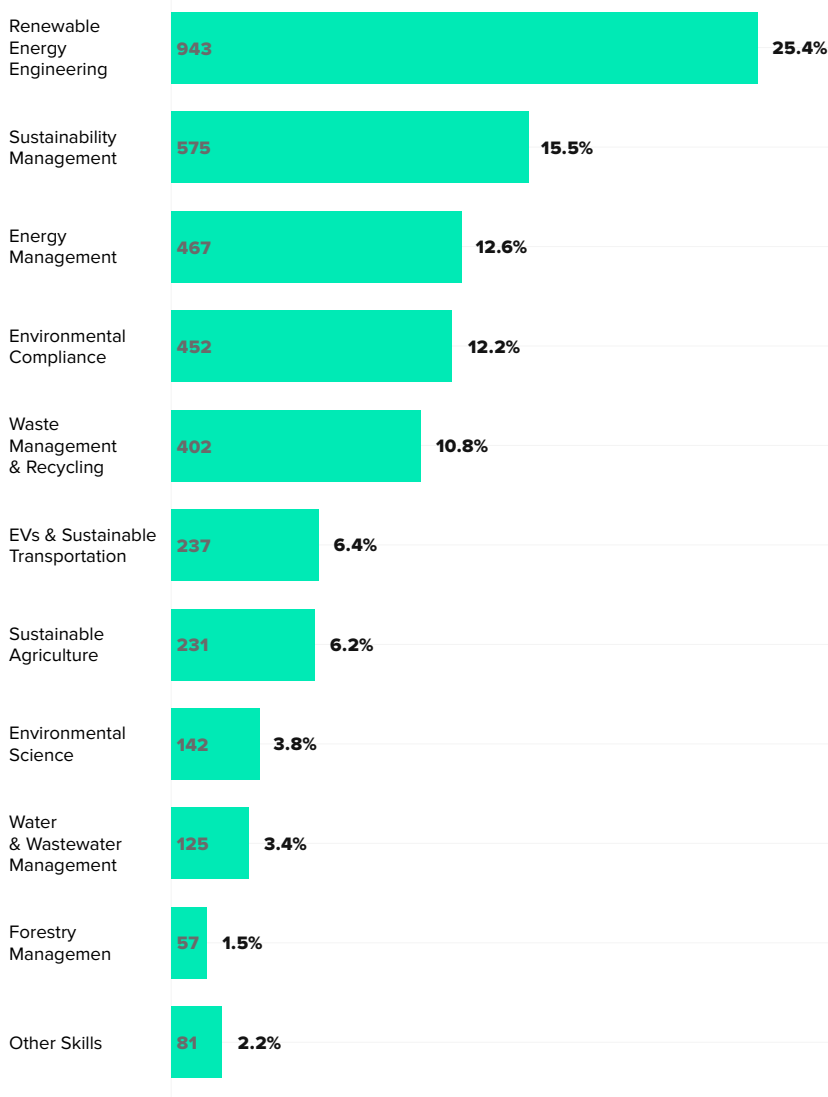
In a comprehensive analysis of 3,712 Green Jobs, it was revealed that the top 10 Green Skills categories listed above account for 97.8% of the total. Within this subset, over 50% of the jobs were concentrated in the energy sector and 32% of the jobs were in the transportation sector, signifying these sectors transition to the green economy. The remaining 18% of jobs were distributed across financial services and retail sectors, which lag behind the aforementioned sectors.

Top four key skills groups - Renewable energy engineering, Sustainability management, Energy management, and Environmental compliance - collectively represent 75% of skills required in the labor market.



Notably, the highest demand within this sample can be linked to energy production and management (respectively 25.4% and 12.6%). Renewable energy engineering emergence reflects the escalating support for clean energy infrastructure projects such as solar and wind farms, biogas plants, and the re-fitting of existing “dirty” infrastructure.

FIGURE 3: PREVALENCE OF GREEN SKILLS GROUP IN GREEN JOB ADS



Energy management includes the efficient usage of all forms of energy (electric, gas, thermal), hence a reduction of energy consumption and energy loss.

Skills that relate to shifting operations to meet environmental standards and the ability to justify these, can be found within the categories 'Sustainability Management' and 'Environmental Compliance'. Sustainability Management emerged as the second most sought-after green skill, encompassing responsibilities related to corporate sustainability strategy, environmental education, and enhancing a company's Environmental, Social, and Governance (ESG) performance. Envi-

ronmental Compliance encompasses understanding environmental regulations, conducting audits and reporting to regulatory authorities. As regulators around the world tighten expectations on environmental performance, the demand for environmental compliance professionals will likely increase as well. This data underscores the importance of upskilling and adapting to the changing needs and demands of the Green Job market, aligning with the global emphasis on sustainable practices and clean energy initiatives.

In the coming decades, we are expecting a focus on introducing new skills into the job market and transforming

existing jobs by incorporating new professional practices and adequate competences to support these.

Governments all over the world are also committing to retraining their workforce. For example, Canada has already dedicated

**\$111.4 M**

to upskilling its workforce in anticipation of the increased demand for Green Skills<sup>11</sup>.



(11) More Canadian workers to benefit from the green economy, Employment and Social Development Canada, 2023

# Differentiation through Green Job advertisements: for employers

Differences can be observed not only across countries, but also within industries which leads us to consider the importance of companies differentiation as employers. Are Green Jobs the symptom of shifting operations or do they manifest a HR lever, embodying ESG messages in a professional setting?

## Top-performers and last-in-class: a signal for organizational and HR maturity?

Among 430 companies included in the research, only 236 companies with more than 50 postings were considered for this part of the study.

**1 in 3** companies studied have **0** Green Jobs postings.

An initial observation reveals that 75 of them, representing a bit less than a third of this sample, do not advertise Green Jobs. Assumption is made here on the weight of the legacy of former practices: **the current HR effort does not focus on fundamentally shifting their ways of recruiting, leading to the reuse of outdated job descriptions.** Indeed, the variety of skills and activities covered in the ESCO framework is such that most companies should have presented at least one job compatible with at least one green skill.

Analyzing the dispersion per sector, between companies, puts into perspective the top “Green employers”. A high proportion of Green Jobs among the top employers’ job openings coexist with employers for which Green Jobs do not show in job openings. The width of dispersion within industries shows that, either:

- *the sector is composed of subsectors, some of which are rapidly shifting to greener practices, and some of which remain averse to climate transition or*
- *some companies have undertaken clear actions to advertise their efforts to integrate greener practices into their job ads.*

FIGURE 4: DISPERSION OF EMPLOYERS BASED ON %AGE OF GREEN JOB ADS



**Dispersion within the Energy and Utilities sector can be understood by the coexistence of fast-growing companies that operate in the Renewables energy field** (solar, wind generation and storage projects), with traditional players in oil and gas, exploiting natural resources. The 9<sup>th</sup> decile of Energy & Utilities companies ranges between 46% and 83% of Green Jobs among all job ads, among which we have equal parts of utilities companies supplying electricity to the public and environmental services companies. The 1<sup>st</sup> decile, ranging below 2%, is composed

of companies in the oil & gas sector, with several European subsidiaries of a major French company. Similarly, dispersion in the transport sector can be explained by sub-sectors linked to public transportation and traditional transporters. Yet, in these cases, the greening of operations can still be observed with manufacturers of public transport vehicles and international freight companies.

**Retail & FMCG and Financial Services do not fall under such classification. Coexistence of very high-performers**

**above 16% of Green Jobs and the majority of employers with 0% Green Job ads proves that the former have green recruiting needs, aimed at fueling the green transition.** This can be explained either by an organizational transformation, where positions have been set up to support the growth of green activities or by an effort made to explicitly label the green component of existing positions. In any case, such efforts allow differentiation in employer branding, building a positive employer image.



## The importance of branding and how to write effective Green Job advertisements: a case study

Employer branding efforts lead to stronger recognition of the greenness of jobs, as seen in top-performing employers within a sector with a low proportion of Green Jobs. Companies that actively promote these positions can differentiate themselves, attracting a talent pool that values environmental responsibility, at a lower cost<sup>12</sup>.

Through an examination of our Green Jobs database and a case study conducted on a selection of vacancies, this chapter offers practical guidance for developing compelling Green Job ads that resonate with candidates passionate about sustainability.

**These guidelines provide concrete direction, emphasizing the importance**

**of authenticity in branding jobs as green.** It is important that companies accurately label positions as green solely when they directly or indirectly contribute to sustainability goals, avoiding greenwashing tactics that mislead candidates and undermine genuine environmental efforts.

### Project Manager

#### • Introduction to the company

At our company, we are committed to achieving carbon neutrality by 2023. Our impactful initiatives have already positively influenced the environment, generating 50 million megawatt-hours, and recovering 90 metric tons of waste by 2021.

#### • The role

As a project manager, you will become a pioneer in unraveling climate-related and environmental risks. You will lead multimedia investigations and remediation projects, contributing directly to our carbon-neutral goal. Lead green initiatives: Spearhead projects to reduce environmental impact and promote sustainable practices organization-wide, such as implementing renewable energy, enhancing waste reduction, and developing eco-friendly transportation. Collaborate across departments: Work closely with cross-functional teams to integrate sustainability into project planning and execution and co-develop comprehensive sustainability strategies.

#### • Your skillset

**We are seeking individuals who are...**

Passionate about sustainability, adept in environmental regulations, and experienced in green technologies. Excellent in implementing agile solutions to address climate challenges and contribute to global sustainability frameworks.

Able to articulate the importance of sustainability initiatives, inspiring and motivating teams to embrace sustainable practices.

#### • What's in it for you ?

Experience a hybrid work model with set days in the office and remote work flexibility to minimize commuting. Of course, you are welcome to opt for a car from our green car fleet. Our commitment support eco-friendly practices extends amongst others, to recycling programs and energy-efficient infrastructure.

#### • Why work for us ?

Join a sustainability leader, ranked 5<sup>th</sup> globally and 1<sup>st</sup> in North America by Corporate Knights in 2020 and recognized by Forbes for diversity in 2021. Explore our detailed sustainability vision and action in our annual CSRD report here. Be part of a team driving real change!



#### Express your sustainability commitment and strategy

.Express your organization's sustainability goals and ambitions, such as achieving carbon neutrality within a specified timeframe.

.Highlight the global reach and impact of your organization's projects by providing specific examples of how your company's initiatives have positively influenced the environment.

#### Showcase the vision of the role

.Recognize the challenges faced by the industry and explain how the role plays a part in overcoming these challenges.

.Outline the specific responsibilities that candidates will assume regarding sustainability.

#### Clearly define essential skills and requirements

.Emphasize competencies related to sustainable practices, environmental regulations, and green technologies. Be transparent about the qualifications needed for the role, such as relevant degrees, certifications, or experience in sustainability-focused fields. This clarity helps attract candidates who possess the necessary skills and enthusiasm for combating climate change.

#### Highlight eco-friendly practices in the workplace

.Display any eco-friendly policies and initiatives your company has in place, such as recycling programs, energy-efficient infrastructure, or opportunities for remote work to minimize daily commuting.

#### Exhibit company achievements and eco-friendly framework

.Showcase your company's achievements in the realm of sustainability and workplace diversity. Share any rankings or recognition received for such efforts, such as being named one of the most sustainable companies. Besides that, update your vacancies with concrete examples of eco-friendly frameworks, such as a CSRD report.



# A collective shift to Greener Jobs

The global consensus on steering economic development towards greater sustainability is supported by regulatory developments and a shift in consumption demand. However, the effect on employment growth remains limited.

As this white paper highlights, the prevalence of Green Jobs in job postings varies across countries and sectors. The landscape presents both challenges and opportunities: from a two-speed energy sector, through the Transport sector driven by public transport, and Financial Services which struggle to promote the green dimension of their jobs. Thus, the job market does not yet show evidence of a clear transformation towards Green Jobs, although a few companies stand out.

These companies either operate within inherently eco-conscious industries, have strategically integrated sustainability positions into their organizational framework, or excel in promoting their commitment to sustainability through branding initiatives.

For companies that aim to develop sustainable activities, addressing the topic of employment will be crucial. Anticipated workforce shortages underscore this significance, as the latest reports show that job postings for 'green' jobs are growing nearly twice as fast as the number of workers with such skillsets<sup>13</sup>.

On the journey to match corporate ambitions and Human Resources, the following areas must be addressed by companies:

- ▶ **Defining a clear Sustainability strategy, incorporating organizational and employee perspectives.**
- ▶ **Acknowledging Human Resources challenges with a thorough examination of the current and future state of the workforce through a Strategic Workforce Planning approach.**
- ▶ **Review Employer positioning and Recruitment practices to showcase the green dimensions of jobs roles at a company.**



Promotion of these evolutions will eventually strengthen the emergence of Green Skills and Green Employment for all actors considered. Facing employers' current demand, employees are drawn to cultivate their Green Skills individually<sup>14</sup>, while public authorities' best interests lie in the development of Green Education at a wider scale.








## Data & Model Methodology

This research delves into the question of whether the promise of Green Jobs has been delivered in reality. Through meticulous analysis of the proportion of Green Jobs among posted job vacancies, our methodology provides a comprehensive outlook on the current state of Green Jobs in the labor market. By unraveling these insights, we aim to provide recommendations and potential areas for improvement in promoting environmentally conscious job opportunities.

### Data Sources

The main data source that lies at the core of our methodology is a dataset with job ads from the online job board Indeed. The job ads were scraped throughout 2023 across numerous countries, sectors, and companies. To ensure a fair comparison in terms of the number of job ads per country and sector, each sector per country should have at least 1000 job ads. As a result, a subset of the total dataset was used for this analysis, as the number of job ads did not always reach the minimal criterion. Each entry in the dataset contains at least the job ad title, job ad text, the language, company, and sector. If listed in the online job ad, information on the salary, and city are also stored. The dataset contains 46 420 job ads across 433 companies.

## Appendices

		Financial Services	Energy & Utilities	Retail & FMCG	Transport & Logistics	Totals
	Companies	46	18	40	21	125
	Job Ads	2,819	1,001	1,825	1,830	7,475
	Companies	8	10	6	10	32
	Job Ads	4,402	2,886	3,763	3,639	14,690
	Companies	31	19	17	21	88
	Job Ads	2,747	1,189	3,484	2,057	9,477
	Companies	29	20	22	13	84
	Job Ads	3,692	2,663	1,010	1,743	9,346
	Companies	54	36	15	16	121
	Job Ads	2,085	1,186	1,071	1,090	5,432

In parallel with the job ads, we use the ESCO Skills Framework v1.1.1 (European Skills, Competences, Qualifications and Occupations), a comprehensive classification system developed by the European Union. This framework serves as a unified language for describing skills and qualifications, enhancing labor market transparency, mobility, and empowering stakeholders, including individuals, employers, education providers, and policymakers. The ESCO Skills Framework is meticulously constructed through the collection and analysis of information from various sources<sup>4</sup>. It covers a diverse range of skills, encompassing technical, transferable, language, social, digital skills, and most notably in our research, Green Skills.

Green Skills, within the ESCO Framework, refer to the knowledge, abilities, values, and attitudes essential to support a society actively reducing the impact of human activity on the environment. The framework is translated into 28 languages (all official EU languages plus Icelandic, Norwegian, Ukrainian, and Arabic), but for this analysis only the Green Skills framework in English, Dutch and French was used. There are 570 green skill entries for each language, which contain a full sentence description, and at least one few-keyword label. The full description is better suited for our approach, outlined in the following section.

### Classification and Explanation: AI-powered approach






The first step is to define our methodology as a computational problem. This is defined as follows; if a job ad text contains at least one ESCO green skill in its job description it is considered as a Green Job. To evaluate the performance of our models, we manually labelled 200 job ads per language (EN/NL/FR).

Due to the variability in language usage across countries, companies, and sectors, literal text matching or word counting approaches do not perform well enough. Semantic search, however, allows for approximate matching of green skill descriptions with the job ad texts. We used OpenAI's GPT-3.5 encoder (ada-text-embeddings-002) to embed both the Green Skills and job ads, which was subsequently compared with the cosine similarity of both vectors. This essentially computes the semantic overlap between the job ad and a green skill. An optimal threshold was computed with the manually labelled test set per language.

If exceeded, our model identifies that green skill in the job ad text and thus considers the job ad as a Green Job ad. Besides the classification of the job ad, the highest ranked green skill (if it exceeds the threshold) is added as an explanation of the model's decision. Additionally, all individual green skill embeddings were first clustered, and then categorized into 25 (medium categories). Subsequently, an overarching category name was automatically generated. These 25 medium categories were then manually adjusted and validated. This allows for the comparison between, for example, sectors on a different granularity than the individual and very specific Green Skills themselves. With our model, we can efficiently classify thousands of job ads across languages and sectors, with detailed information on what makes a job green for further comparative analyses.

### Prevalence of Green Jobs - Methodology

The graph presents the ratio of Green Jobs ads in industries studied. It presents the prevalence of job ads labelled as Green Jobs by the model, compared to all job ads of the data set. The calculation was made per sector, per country. As a second step, these ratios were weighted by the relative size of the sectors compared to one another, based on governmental sources:

	 National Bank of Belgium, 2022	 Statistics Canada	 INSEE excepted : * and **	 Statline, December 2023	 US Bureau of Labor Statistics
Energy & Utilities	18,500	128,986	214,000	38,000	8,100,000
Financial services	110,500	807,630	502,000*	292,000	4,900,000
Retail & FMCG	602,100	2,825,079	3,444,000	1,464,000	52,000,000
Transport & Logistics	276,500	806,581	1,551,000**	406,000	2,200,000
<b>Sub-total of studied sectors</b>	<b>1,007,600</b>	<b>4,568,276</b>	<b>5,711,000</b>	<b>2,200,000</b>	<b>71,700,000</b>

\* Fédération Bancaire Française et Observatoire de l'Evolution des métiers de l'assurance

\*\* Ministère de la transition écologique et de la cohésion des territoires





### Prevalence of Green skills group among Green Job ads – Methodology

The model used enables us to identify when a Green Job ad contains at least one green skill from the ESCO framework. When such a match is found, the model pairs the Green Job ad with the skill from ESCO framework with the highest semantic overlap, allowing us to classify the prevalence of skills in all Green Job ads.

TO FACILITATE INTERPRETATION OF THE RESULTS, THE 570 SKILLS OF THE ESCO FRAMEWORK WERE CLASSIFIED IN 18 SKILLS GROUPS, WITH THE HELP OF GENERATIVE AI AND MANUAL VALIDATION.

Green Skills group	Description
<b>Ecological Conservation</b>	The protection, preservation, management, or restoration of natural environments and the ecological communities that inhabit them.
<b>Energy Management</b>	The management of energy pertaining to its use, distribution, and energy reduction initiatives.
<b>Environmental Compliance</b>	Conforming to environmental laws, regulations, standards and other requirements for the purpose of business operations.
<b>Environmental Remediation</b>	The cleanup of hazardous substances dealing with the removal, treatment and containment of pollution or contaminants from the environment.
<b>Environmental Science</b>	Academic roles that study and research solutions to environmental problems.
<b>EVs &amp; Sustainable Transportation</b>	Jobs in the transportation sector that deals with research, development, manufacturing, and operating EVs and EV infrastructure.
<b>Forestry Management</b>	Management of natural resources pertaining to forestry.
<b>Renewable Energy Engineering</b>	Designing and implementing renewable energy systems that can provide clean, efficient, and reliable power.
<b>Sustainability Management</b>	Corporate Social Responsibility (CSR) related roles that is embedded in an organization to improve its ESG performance.
<b>Sustainable Agriculture</b>	Jobs related to the sustainable cultivation and management of agricultural practices.
<b>Sustainable Materials</b>	Research, design, and manufacturing of materials that have less environmental impact.
<b>Waste Management &amp; Recycling</b>	Sustainable practices in the waste management sector focused on reducing, reusing, and recycling.
<b>Water &amp; Wastewater Management</b>	Jobs related to the treatment process of wastewater that eliminates pollutants and contaminants.

### Dispersion of employers based on percentage of green job ads – Methodology

Using the dataset described in the 'Classification and Explainability' section, the results present dispersion of employers per their proportion of Green Jobs opening: median, quartiles and last deciles.

### Purpose and methodology of our qualitative case study

The case study mentioned in our last section, focused on the exploration of green and non-Green Jobs within the financial services sector, we analyzed key elements in job descriptions to uncover the factors that distinguish between the two categories. Specifically, we compared highly similar roles, namely operational risk officers/managers, of which some were labelled as green and some were as non-green, to identify what makes a job perceived as green.

Our qualitative analysis delved into language, responsibilities, and organizational context to determine the elements contributing to the perceived 'greenness' of the roles. Expert consultations further validated our findings and provided insights on sustainability practices in financial services positions.

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# About Sia Partners

Sia Partners is a next-generation management consulting firm. We offer a unique blend of AI and design capabilities, augmenting traditional consulting to deliver superior value to our clients. With 3,000 consultants in 20 countries and expertise in more than 30 sectors and services, we optimize client projects worldwide. Through our Consulting for Good approach, we strive for next-level impact by developing innovative CSR solutions for our clients, making sustainability a lever for profitable transformation.

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