

GREEN JOBS

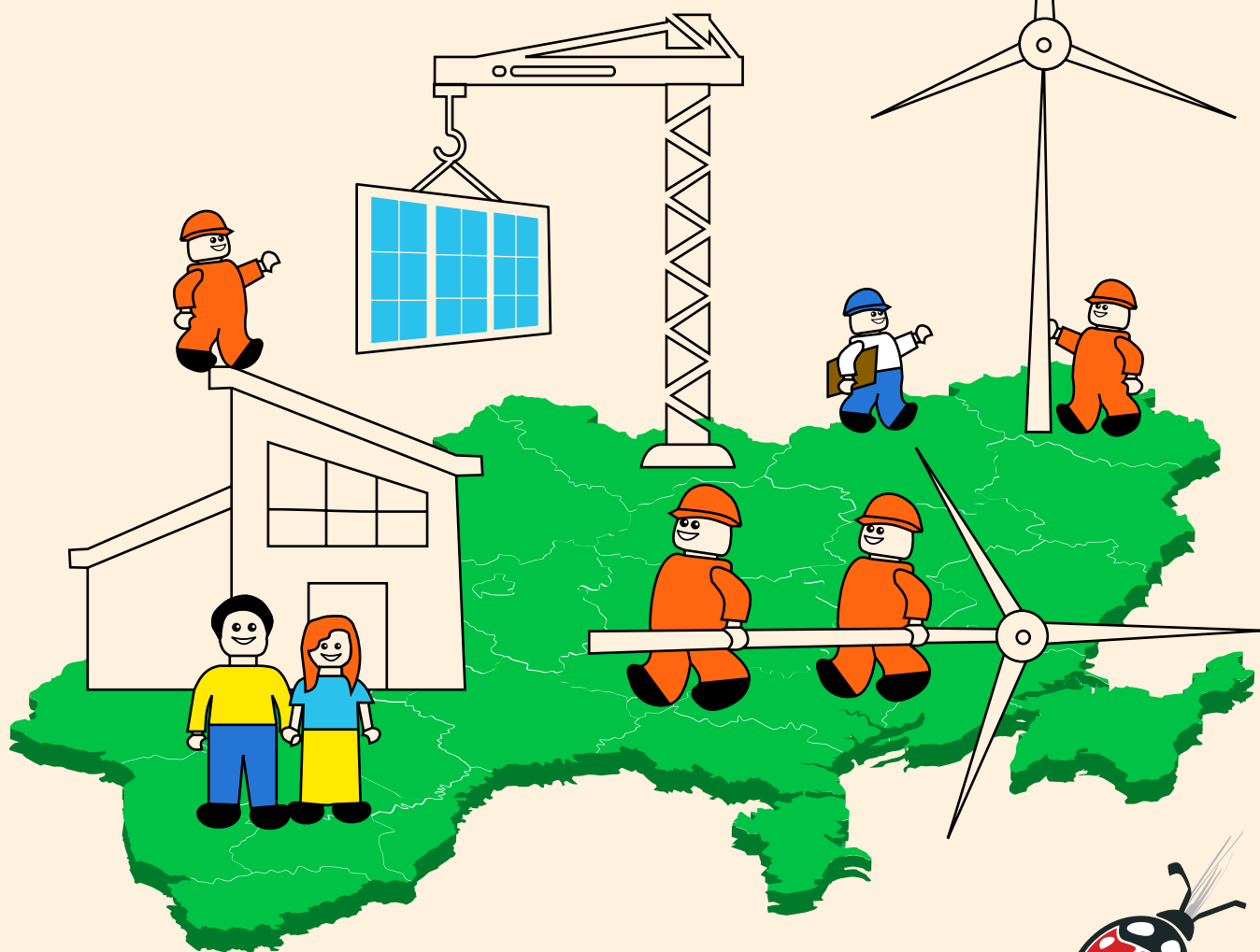
Policy Brief

AND THE POST-WAR

RECONSTRUCTION

OF UKRAINE

September 2023



RAZOM WE **STAND**



Resource and Analysis Center
"SOCIETY AND ENVIRONMENT"

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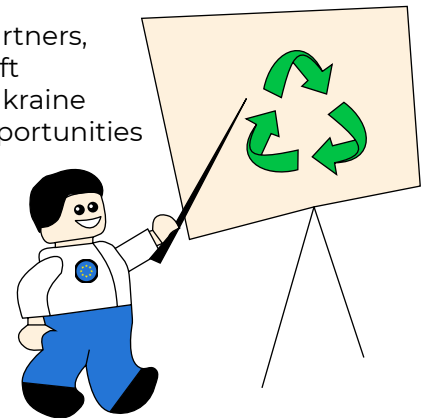
INTRODUCTION

Ukraine has lost 3.5¹ to 4.8 million jobs, with over 4.5 million individuals leaving the country due to the war instigated by Russia. Among the paramount challenges in Ukraine's post-war reconstruction and recovery is the repatriation of its population. Human capital is the linchpin in the advancement of cities and the nation. A compelling incentive for the return of individuals will be the promise of employment, encompassing fair remuneration.

Rebuilding Ukraine on the principles of "better than it was" and "greener than it was" offers the prospect of reinstating devastated infrastructure, housing, and industry and an opportunity for systemic reevaluation and transformation of the country. The support of Ukraine's green post-war recovery and development can be intricately linked to the generation of new jobs characterized by their green essence and content.

In this context, the endorsement of green recovery by international partners, including the European Union, assumes significant relevance. The draft Regulation outlining the establishment of a financial instrument for Ukraine (Ukraine Facility) emphasizes its role in job creation and providing "opportunities for investment in skills, including vocational education and training to prepare the workforce for the digital and green transition."²

This policy brief aims to analyze the state of green jobs in Ukraine, explore the existing concepts in other nations and their potential application in Ukraine, and elucidate how the green post-war recovery and reconstruction of Ukraine will contribute to the generation of green jobs.



This policy brief also estimates the volume of green jobs that can materialize through green post-war reconstruction, specifically within the transportation, energy, water and wastewater, healthcare, and education sectors. These estimations draw upon needs assessments conducted by the World Bank, the Government of Ukraine, the European Union, and the United Nations.

The analytical note has been meticulously crafted by experts from the Resource and Analysis Center "Society and Environment," an independent Ukrainian think tank with a distinguished track record in environmental and climate policy and legal research since 2006.

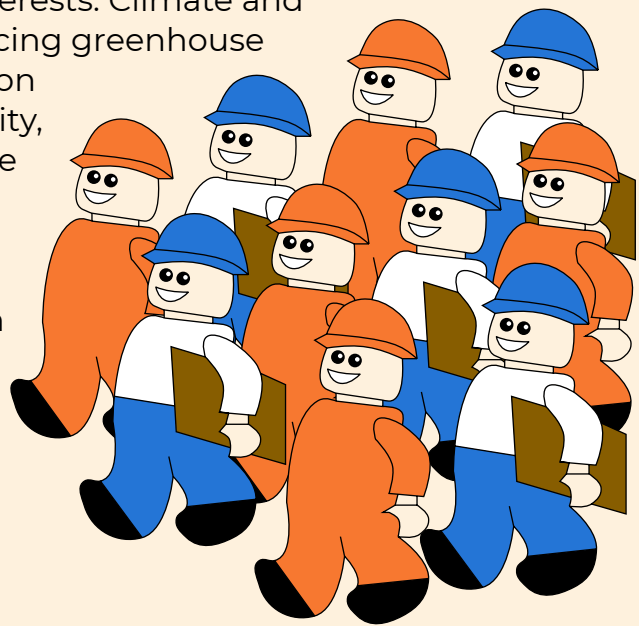
¹ UKRINFORM.UA. (22 June 2023). Ukraine has lost 3.5 million jobs due to the war. Retrieved from <https://www.ukrinform.ua/rubric-economy/3726307-ukraina-cerez-vijnu-vratila-35-miljona-robocih-misc.html>

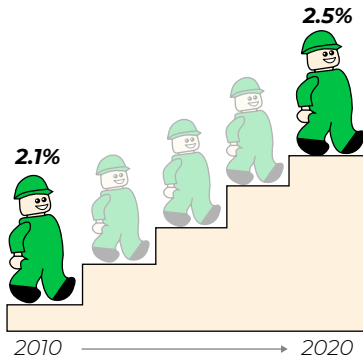
² European Commission. Proposal for a Regulation of the European Parliament and the Council on Establishing the Ukraine Facility. Brussels, 20.6.2023. COM(2023) 338 final. 2023/0200 (COD). Available at: https://neighbourhood-enlargement.ec.europa.eu/system/files/2023-06/COM_2023_338_1_EN_ACT_part1_v6.pdf

Section I

GREEN TRANSFORMATION AND ITS IMPACT ON THE DEVELOPMENT OF THE GREEN JOBS MARKET

Sustainable development and the transformation of economies towards greener practices have emerged as effective mechanisms for harmonizing environmental, social, and economic interests. Climate and ecological policies geared towards reducing greenhouse gas emissions, transitioning to low-carbon development, achieving climate neutrality, and conserving biodiversity have notable implications for the labor market. The intricate relationship between a green climate transition and the labor market takes center stage in the strategic vision for the further advancement of both the economy and society.

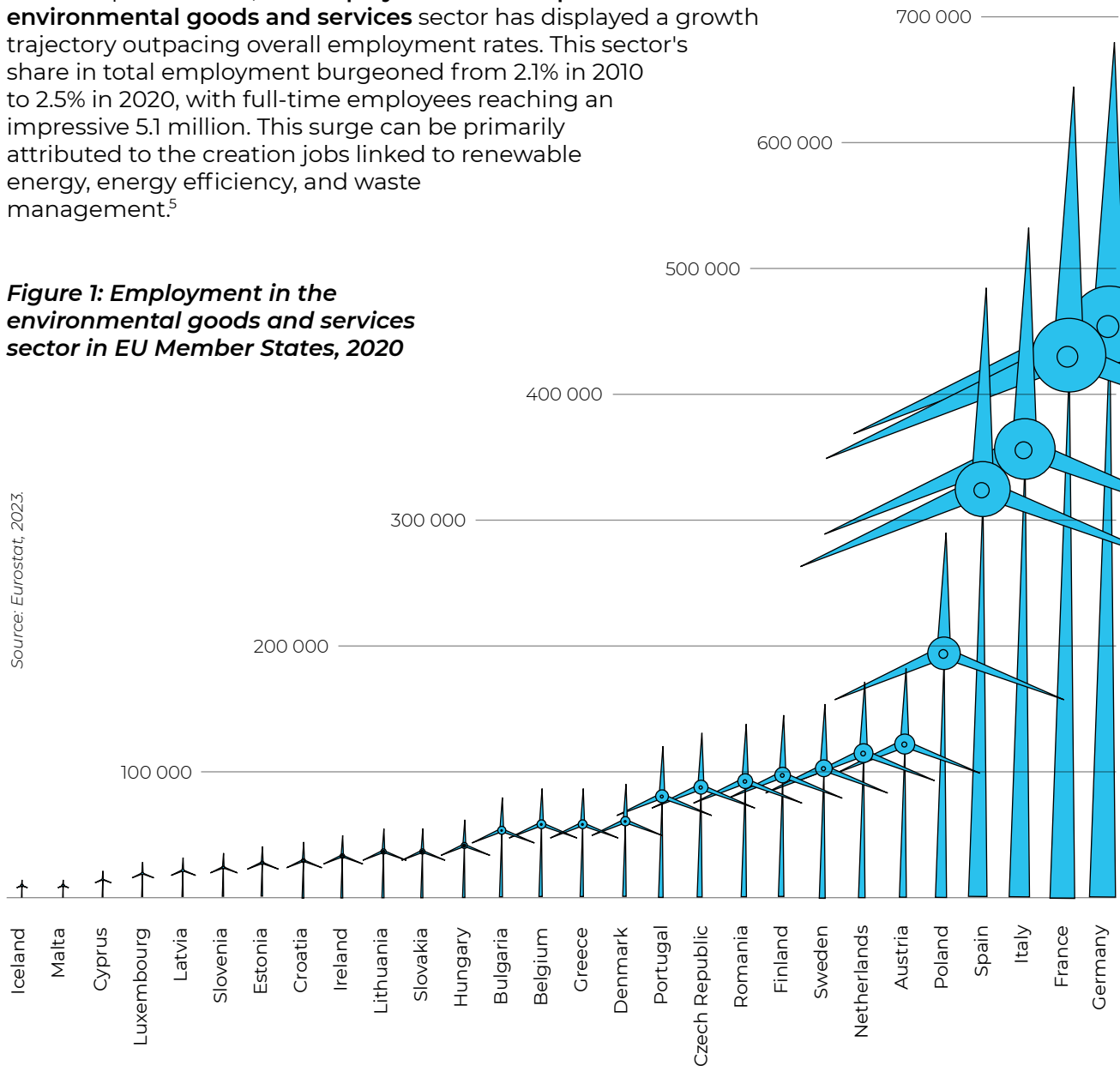




In 2019, the European Commission embraced the **European Green Deal**, whose primary objective is to guide Europe towards a sustainable green transition, ultimately transforming the continent into a climate-neutral entity by 2050. Such a transition is poised to generate new employment opportunities, a prime example being the EU's construction sector, which anticipates creating an additional 160,000 green jobs by 2030.³ This transition will, in parallel, influence the labor market by necessitating the acquisition of new professional skills and the retraining of workers across both emerging and traditional sectors of the economy.⁴

Over the past decade, the **employment landscape within the EU's environmental goods and services sector** has displayed a growth trajectory outpacing overall employment rates. This sector's share in total employment burgeoned from 2.1% in 2010 to 2.5% in 2020, with full-time employees reaching an impressive 5.1 million. This surge can be primarily attributed to the creation jobs linked to renewable energy, energy efficiency, and waste management.⁵

Figure 1: Employment in the environmental goods and services sector in EU Member States, 2020



Source: Eurostat, 2023.

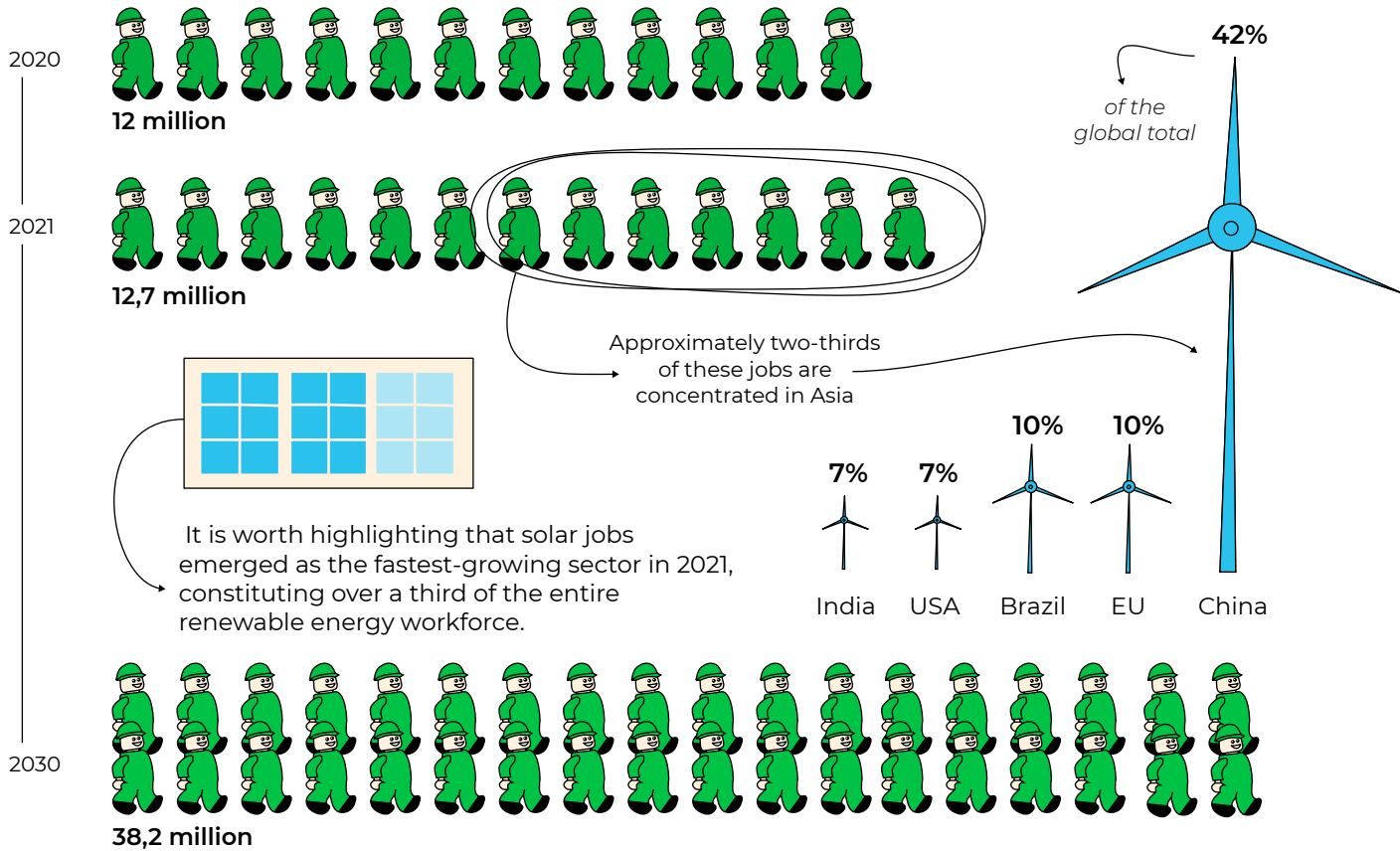
³ Commission of the European Communities. (14 October 2020). A Renovation Wave for Europe: Greening our buildings, creating jobs, improving lives (COM(2020) 662 final). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, and the Committee of the Regions. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1603122220757&uri=CELEX:52020DC0662#footnoteref7>

⁴ European Commission. (10 March 2020). A New Industrial Strategy for Europe. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, and the Committee of the Regions. COM(2020) 102 final. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52020DC0102>

⁵ European Environment Agency. (28 April 2023). Employment in the Environmental Goods and Services sector (8th EAP). Policy Paper. Retrieved from <https://www.eea.europa.eu/ims/employment-in-the-environmental-goods>

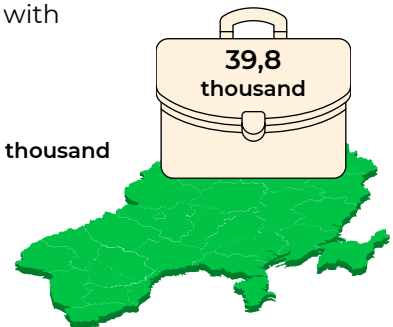
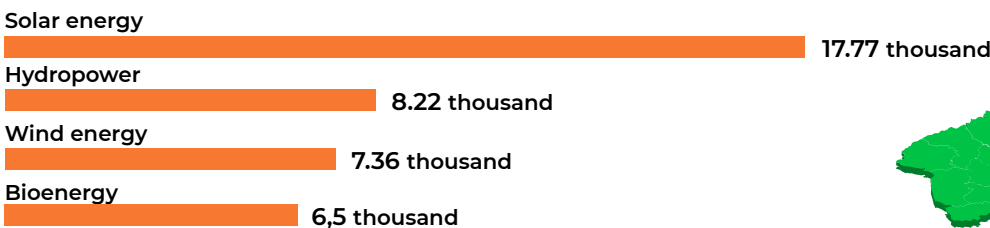
Renewable Energy and Green Jobs

In 2021, the renewable energy sector witnessed a substantial workforce of 12.7 million individuals, either directly or indirectly employed. This marked an increase from the 12 million jobs reported in 2020. Approximately two-thirds of these jobs are concentrated in Asia, where China is the dominant contributor, accounting for 42% of the global total. The European Union and Brazil are closely contributing 10%, while the United States and India follow with 7% each.



In 2030, global employment in the renewable energy sector is projected to soar to 38.2 million jobs. This signifies a substantial growth trajectory from the current 12.7 million jobs. Furthermore, expanding energy efficiency, electric vehicles, power systems/flexibility, and hydrogen can generate employment for an additional 74.2 million individuals by 2030.⁶

Within Ukraine, the renewable energy sector employed 39.8 thousand people in 2021. This workforce was predominantly distributed among various renewable energy sources, with solar energy leading the way at 17.77 thousand jobs. Hydropower, wind energy, and bioenergy sectors maintained a relatively balanced distribution of employment, with 8.22 thousand, 7.36 thousand, and 6.5 thousand jobs, respectively, in the industry utilizing solid biomass.⁷



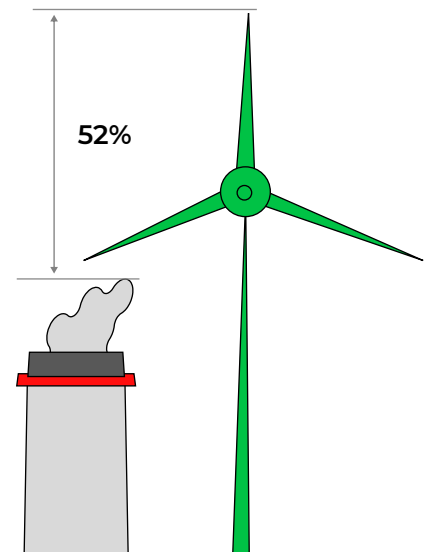
⁶ IRENA and ILO (2022), Renewable energy and jobs: Annual review 2022, International Renewable Energy Agency, Abu Dhabi and International Labour Organization, Geneva. <https://www.irena.org/publications/2022/Sep/Renewable-Energy-and-Jobs-Annual-Review-2022>

⁷ Ukraine: Renewable Energy Employment by Technology in 2021/ IRENA and ILO (2022). Retrieved from <https://www.irena.org/Data/View-data-by-topic/Benefits/Renewable-Energy-Employment-by-Country>

Investments in green transition initiatives, the broader application of ESG (Environmental, Social, and Governance) standards, and climate change adaptation have significantly influenced job creation.

The most recent report from the World Economic Forum underscores the positive impact of the green transition on job generation.⁸ This assertion is corroborated by corporate expectations, particularly within sectors like energy, materials, and infrastructure, where the global demand for green jobs is upward (green job listings have surged by 40% since 2015).

The impact of green investments on job numbers is expected to be highly favorable, with a job creation-to-replacement ratio of 52.2%. In other words, investments in transitioning towards green business practices are projected to yield 52% more job openings than displaced positions. Furthermore, the broader adoption of ESG standards is expected to create jobs at a rate of 51.4%, while investments in the climate sphere are forecasted to achieve a rate of 43.9%. Consequently, the net effect of the green transition on employment is projected to be overwhelmingly positive, mainly driven by investments in green initiatives, climate-related technologies, and the expanded implementation of ESG standards.



On 16 August 2022, US President Joe Biden enacted the **Inflation Reduction Act**,⁹ designed to bolster tax revenues, combat inflation, and intensify investments in clean energy technologies, manufacturing, and innovation. The allocated \$370 billion earmarked for energy and climate change is aimed at realizing the US objective of reducing greenhouse gas emissions by 40% in 2030 compared to 2005. This initiative seeks to accelerate private investments in clean energy solutions across all sectors of the economy, concurrently generating well-compensated employment opportunities and fresh economic prospects for the workforce.

The Inflation Reduction Act builds upon the climate and clean energy provisions outlined in the Infrastructure Law (the Infrastructure Investment and Jobs Act), which was signed into law in November 2021. The latter delineated extensive funding for projects to modernize the power grid, establish a nationwide network of electric vehicle chargers, fortify battery supply chains, and expand public transportation and passenger rail systems, among other measures, all while engendering new high-quality jobs.¹⁰

Investments in energy and conventional infrastructure projects are expected to lead to an augmentation of high-quality job opportunities. The Inflation Reduction Act is anticipated to generate at least 1.3 million new jobs by 2030.¹¹

Since the enactment of the Inflation Reduction Act, 142,016 new positions have been created in 41 states between 16 August 2022 and 31 March 2023. As of 31 March 2023, there are 191 ongoing clean energy projects with a cumulative investment value of \$242.81 billion.¹²

⁸ "The Future of Jobs Report 2023." World Economic Forum. URL: <https://www.weforum.org/reports/the-future-of-jobs-report-2023/>

⁹ <https://www.congress.gov/117/bills/hr/5376/BILLS-117hr5376enr.pdf>

¹⁰ White House. (2023, January). Building a Clean Energy Economy: A Guidebook to the Inflation Reduction Act's Investments in Clean Energy and Climate Action (Version 2). Retrieved from <https://www.whitehouse.gov/wp-content/uploads/2022/12/inflation-reduction-act-guidebook.pdf>

¹¹ Mahajan, Megan, et al. "Updated Inflation Reduction Act Modeling Using the Energy Policy Simulator." Washington: Energy Innovation, 2022.

[Link] <https://energyinnovation.org/wp-content/uploads/2022/08/Updated-Inflation-Reduction-Act-Modeling-Using-the-Energy-Policy-Simulator.pdf>

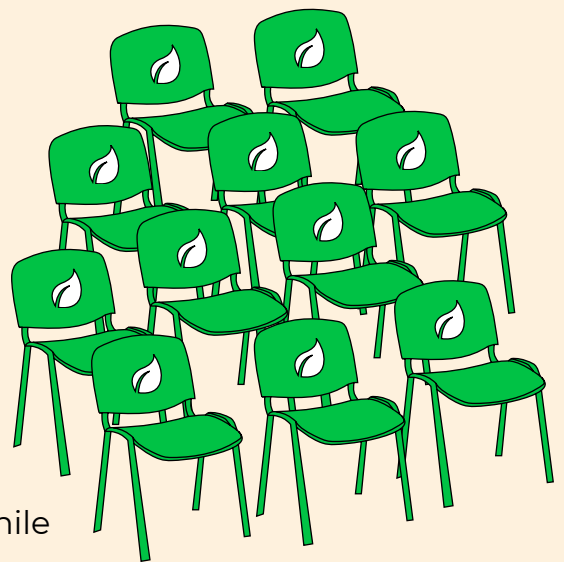
¹² Clean Energy Boom Report. 31 March 2023.

[Link] <https://climatepower.us/wp-content/uploads/sites/23/2023/05/April-2023-Clean-Energy-Boom-Report.pdf>

Section II

GREEN JOBS - BASIC CONCEPTS

Currently, there is no universally accepted global definition of green jobs. Various countries and international organizations have formulated their interpretations of green jobs and established their identification and quantification mechanisms. Two predominant approaches exist for defining the essence of green jobs: outcome-based and process-based approaches. The former categorizes green jobs based on the sector or industry in which they are generated, while the latter defines them based on the employee's profession, tasks, and skills. In practical application, these approaches can coexist harmoniously. The International Labor Organization underscores that "decent work" is an integral facet of the green jobs concept.

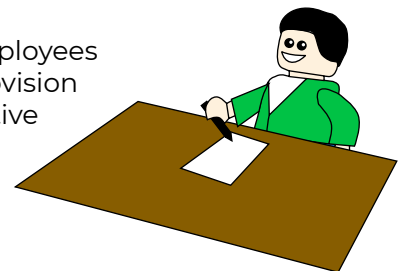


The shift towards sustainable development and green climate transformation has created green jobs. The International Labor Organization (ILO) states that green jobs constitute a novel employment category crucial for fostering eco-friendly businesses and economies. Defining and measuring these jobs holds significance in comprehending the nexus between environmental sustainability and labor markets.¹³ This connection yields various outcomes, including creating fresh job profiles, the obsolescence of specific existing "traditional" roles, and the requirement for skill evolution and acquisition across many occupations. Interpreting green jobs also influences the quantification of their prevalence and quality.

The definition of "green jobs" extends beyond mere academic interest; it carries practical implications. Several countries have incorporated the concept of "green jobs" into their national frameworks (e.g., Austria, Korea, Germany, Finland, France, Japan, and the United States).¹⁴ It is essential to note that stakeholders propose diverse definitions of green jobs today, and a universally accepted or consolidated concept still needs to be present. Two primary approaches exist for understanding and calculating green jobs:¹⁵

1 The Output Approach: This method identifies specific production activities deemed "green" (e.g., the renewable energy sector) and sectors or industries engaged in manufacturing environmental goods or providing ecological services. All roles within such sectors or industries qualify as green jobs. The delineation of green sectors and industries relies on the UN System of Environmental-Economic Accounting (SEEA) Central Framework,¹⁶ which countries tailor to their particular circumstances, accounting for their statistical data availability. The European Commission has developed Environmental Goods and Services Sector Accounts (EGSS)¹⁷ based on SEEA. EGSS encompasses two activity categories - environmental protection activities, aimed at curtailing greenhouse gas emissions and other detrimental environmental impacts, and resource management activities.

However, this approach has its limitations, including the inclusion of employees not directly involved in environmental product production or service provision (e.g., accountants, security personnel, and other technical or administrative roles) and those engaged in non-core, auxiliary activities not perceived as environmentally relevant by the enterprise or economic entity.



2 The Process Approach: This methodology hinges on data concerning specific professions, task execution, and the requisite skills and competencies of employees. It encompasses jobs involving environmentally friendly production processes and practices, regardless of the sector or industry's "green" classification. Such positions may exist within environmentally unfriendly enterprises that exert pressure on the environment and natural resources. However, the job descriptions of these employees incorporate tasks aimed at mitigating or mitigating the company's adverse environmental impact and implementing resource-efficient technologies or practices, such as environmental protection specialists. Green jobs are identified based on the environmentally friendly nature of the tasks or skills associated with different occupations. Each occupation is segmented into a distinct set of responsibilities, and its categorization as a "green job" hinges on the nature of those tasks. An example of this approach is the O*NET Green Economy Program, the primary information source for US

¹³ International Labour Organization (ILO). (2013). "Sustainable Development, Decent Work, and Green Jobs: Report V." In International Labour Conference, 102nd Session. Retrieved from https://www.ilo.org/ilc/ILCSessions/previous-sessions/102/reports/reports-submitted/WCMS_207370/lang--en/index.htm.

¹⁴ OECD. (2012). The Jobs Potential of a Shift Towards a Low-carbon Economy: Final report for the European Commission, DG Employment. Retrieved from <https://www.oecd.org/els/emp/50503551.pdf>.

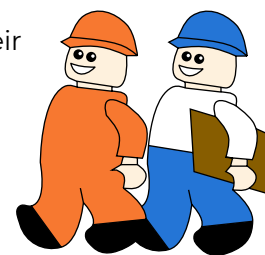
¹⁵ OECD. (2023). Job Creation and Local Economic Development 2023: Bridging the Great Green Divide. Retrieved from <https://www.oecd.org/publications/job-creation-and-local-economic-development-26174979.htm>.

¹⁶ United Nations. "Central Framework of the UN System of Environmental and Economic Accounting (SEEA)." Accessed via <https://seea.un.org/content/seea-central-framework>.

¹⁷ Environmental Goods and Services Sector. Eurostat. Retrieved from https://ec.europa.eu/eurostat/cache/metadata/en/env_egs_esms.htm [https://ec.europa.eu/eurostat/cache/metadata/en/env_egs_esms.htm]

occupations. The program's centerpiece is the O*NET database, containing standardized descriptors for nearly 1,000 careers spanning the US economy.¹⁸ Some approaches propose the introduction of environmental intensity assessments alongside task gradation, revealing the proportion of ecological functions within a given occupation's overall responsibilities.

This approach's advantage lies in classifying jobs as "green," regardless of their sector or industry affiliation. However, it also presents challenges, including the necessity for national authorities to establish an appropriate occupation classification with task breakdowns, determine these occupations' environmental intensity, and compile pertinent statistics. Additionally, cross-state comparisons have become more complex due to the need for standardized mechanisms.



These **approaches are not mutually exclusive**; they can **complement each other** effectively.

Utilizing the US Bureau of Statistics' Process and Outcome-Based Approaches¹⁹

The US Bureau of Labor Statistics (US BLS) employs two distinct approaches for gauging green jobs: (1) an output-based approach that identifies economic entities involved in producing environmental goods and services, tallying the associated jobs and (2) a process-based approach that identifies economic entities employing environmentally friendly production processes and practices, counting the corresponding jobs.

In the output-based approach, the BLS focuses on jobs linked to producing specific sets of goods and services without delving into the environmental impact of the production process. In contrast, the process-based approach assesses whether a business employs methods or technologies that positively impact the environment, regardless of the product or service they generate. This approach applies across industries and sectors. Each process necessitates distinct measurement strategies and typically results in counting different jobs.

At the international organizational level, the definition of "green jobs" has been a collaborative effort involving the International Labor Organization (**ILO**) and the United Nations Environment Program (**UNEP**), as well as independent efforts by the ILO through the Green Jobs Program.²⁰ These organizations provide two **definitions of green jobs**: one for policy and another **for statistical purposes**.²¹ The policy-oriented definition aims to assist countries in crafting national policy frameworks, strategies, and action plans. At the same time, the statistical report serves the purpose of measuring, assessing, and monitoring relevant policies and programs at the national level.

The definition of "green jobs" for policy purposes is formulated in the report titled "Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World"²² and the operational definition presented by the Green Jobs Program.²³ While these definitions may not be identical, they share common approaches to interpreting this concept:

- Green jobs contribute to the preservation or restoration of the environment.
- They encompass roles within industries and sectors heavily reliant on natural resources and environmental quality. The specifics regarding how these sectors are represented and their scope may differ between the two definitions. The Green Jobs Program's working report does not delve into granular details but broadly categorizes them as "traditional sectors" and "new, emerging, green sectors."

¹⁸ "O*NET Online." Retrieved from <https://www.onetonline.org/>

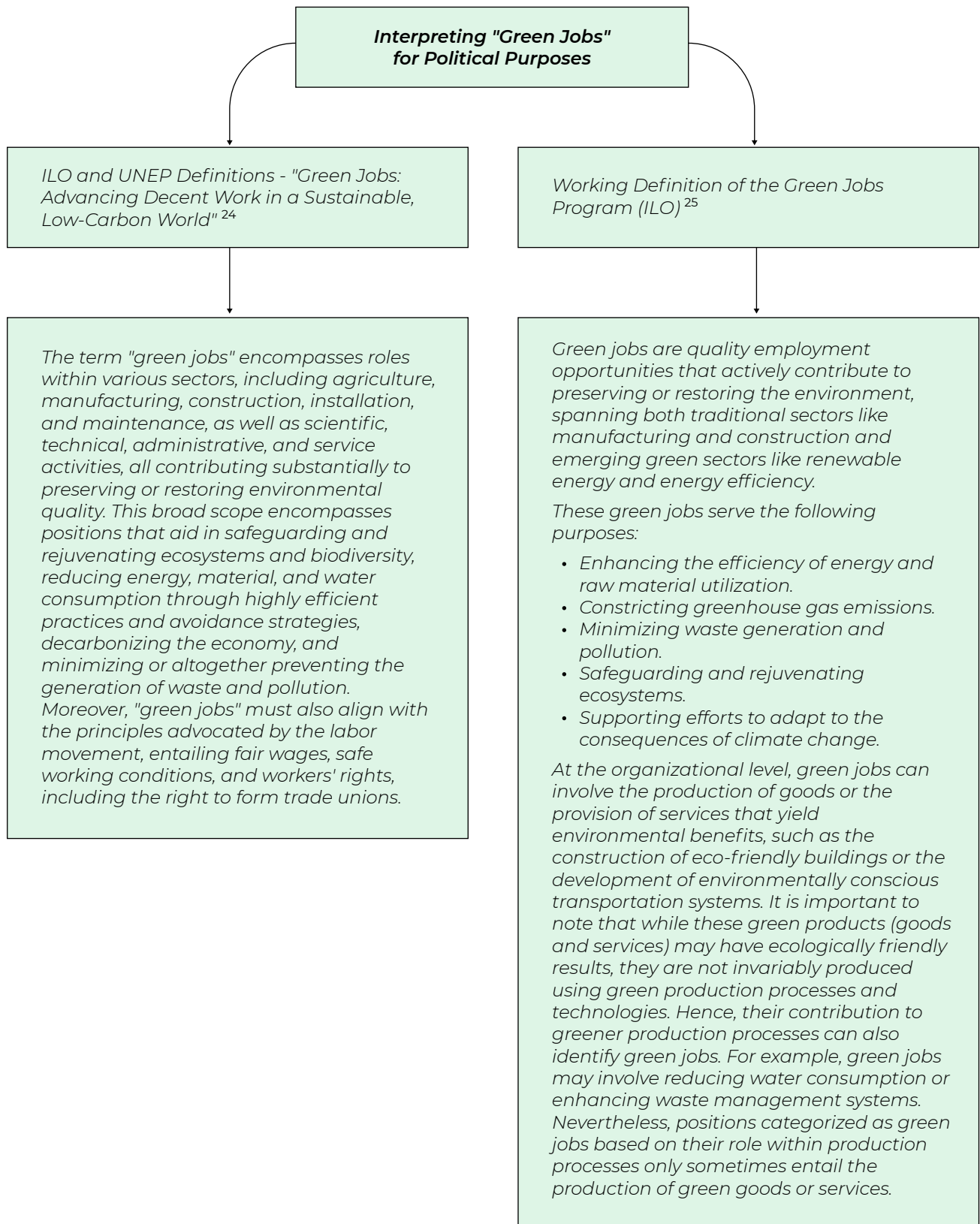
¹⁹ US Bureau of Labor Statistics. (Accessed September 2023). "Green Jobs Information." Retrieved from: <https://www.bls.gov/green/>

²⁰ In 2023, due to an ILO restructuring, the Green Jobs Program was incorporated into the ILO Priority Action Agenda aimed at achieving an equitable transition toward environmentally sustainable economies and societies.

²¹ Castillo, Monica. (2023). "Green Jobs, Green Economy, Just Transition and Related Concepts: A Review of Definitions Developed Through Intergovernmental Processes and International Organizations." Geneva: International Labour Office. Retrieved from https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/documents/publication/wcms_883704.pdf

²² UNEP/ILO/IOE/ITUC. (September 2008). Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World. Retrieved from https://www.ilo.org/global/topics/green-jobs/publications/WCMS_158727/lang-en/index.htm

²³ ILO. (2016). "What Is a Green Job?" Retrieved from https://www.ilo.org/global/topics/green-jobs/news/WCMS_220248/lang-en/index.htm



²⁴ International Labour Organization (ILO). "Skills for Green Jobs: A Global View." Policy Paper. Accessed via https://www.ilo.org/global/topics/green-jobs/publications/WCMS_158727/lang-en/index.htm.

²⁵ International Labour Organization (ILO). (n.d.). "Green jobs for a sustainable and equitable future." Policy Paper. Retrieved from https://www.ilo.org/global/topics/green-jobs/news/WCMS_220248/lang-en/index.htm

Simultaneously, a distinguishing feature of these definitions for policy purposes is the inclusion of the crucial element of **decent work** within green jobs - productive outcomes for both women and men characterized by freedom, equality, security, and human dignity. Work attains decency when it results in equitable income, assures stable employment, and provides safe working conditions. In essence, jobs cannot be considered "green" unless they meet the criteria of decency.

Decent work

The notion of "decent work" was first introduced by Director-General Juan Somavia in 1999, emphasizing, "The primary objective of the ILO today is to promote opportunities for women and men to obtain decent and productive work in conditions of freedom, equality, security, and human dignity... Decent work is the focal point of all four of the [ILO's] strategic objectives: promoting rights at work, employment, social protection, and social dialogue."²⁷

The definition of "green jobs" for statistical purposes was established by the 19th International Conference of Labor Statisticians, which in 2013 endorsed the Guidelines for the Statistical Definition of Employment in the Environmental Sector.²⁶ According to these guidelines, "green jobs" encompass "employment in the environmental sector that adheres to the principles of decent work (including adequate wages, safe working conditions, labor rights, social dialogue, and social protection)." In turn, employment in the environmental sector encompasses all individuals engaged in producing ecological goods and services and employees whose responsibilities involve enhancing the environmental performance of their economic unit's production processes or optimizing the use of natural resources. In essence, the statistical concept of green jobs amalgamates two approaches: employment in producing environmental products (output-based strategy) and career in ecological processes (process-based practice).

Assessing decent work within green jobs relies on proper work indicators.²⁸ The International Labour Organization (ILO) conducted pilot studies in Albania and Mongolia to evaluate its statistical methods, selecting two key indicators: social security coverage and adequate wages. These studies raised concerns regarding the necessity for the chosen decent work indicators to remain relevant across diverse countries, ensuring their comparability and proportionality.

²⁶ International Labour Organization (ICLS). (2013). "Guidelines Concerning a Statistical Definition of Employment in the Environmental Sector." [Online] Available at: https://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/normativeinstrument/wcms_230736.pdf

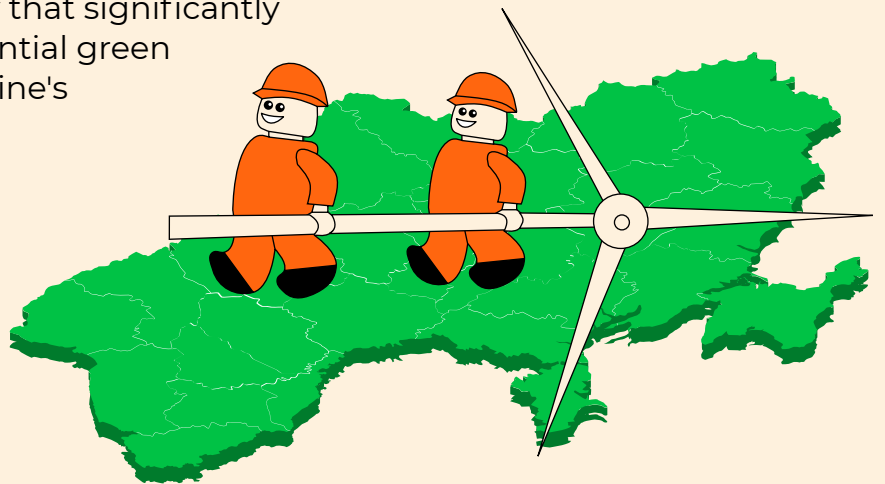
²⁷ Somavia, Juan. "Address by Mr. Juan Somavia, Secretary-General of the International Labour Conference, 1 June 1999." International Labour Conference, 87th Session. Geneva. [Link]([https://www.ilo.org/public/libdoc/LO_Chronology/09616\(1999-87\)Somavia.pdf](https://www.ilo.org/public/libdoc/LO_Chronology/09616(1999-87)Somavia.pdf)) International Labour Organization. "Decent Work. Report of the Director-General, International Labour Conference, 87th Session." Geneva, 1999. [Link]([https://www.ilo.org/public/libdoc/ilo/P/09605/09605\(1999-87\).pdf](https://www.ilo.org/public/libdoc/ilo/P/09605/09605(1999-87).pdf))

²⁸ ILO. (2013). Decent Work Indicators: Guidelines for Producers and Users of Statistical and Legal Framework Indicators. [Online] Available at: https://www.ilo.org/wcmsp5/groups/public/---dgreports/---integration/documents/publication/wcms_229374.pdf

Section III

THE IMPACT OF GREEN RECOVERY AND RECONSTRUCTION IN UKRAINE ON JOB CREATION

Currently, there are no studies or estimates regarding the number of green jobs that could emerge during the post-war recovery process in Ukraine. Furthermore, there needs to be an international or comprehensive methodology that significantly complicates quantifying potential green job opportunities within Ukraine's post-war reconstruction.



For this study, we have employed existing methodological approaches to assess the potential job creation resulting from substantial public investments in the economy. These investments encompass conventional and modern green technologies, including climate-related technologies.

To estimate the prospective green job opportunities arising from post-war recovery efforts, we have relied on data from the most recent comprehensive evaluation of Ukraine's financial recovery needs (RDNA-2²⁹). Additionally, we have drawn from methodologies for estimating job creation stemming from direct public investment.³⁰ We have also incorporated data from the State Statistics Service regarding labor mobility in Ukraine, categorized by economic activity types during the pre-war period.³¹

The methodology utilized for estimating job creation, as outlined in the International Monetary Fund's working paper, enables us to ascertain the number of jobs expected to result from a USD 1 million investment in specific economic sectors. This methodology, as proposed by the IMF, provides insights into the potential job creation per USD 1 million investment across various sectors of the economy, including energy, transportation, water supply, sewerage, schools, and hospitals (Table 1). This proposed methodology generally aligns with available empirical studies concerning the impact of climate and environmental programs and projects, such as energy and building renovation initiatives.³² For our calculations, we have considered estimates of total restoration needs, encompassing short-term, medium-term, and long-term requirements. Unfortunately, this methodology did not accommodate the inclusion of the construction sector in our calculations, despite housing reconstruction needs representing a significant portion of Ukraine's overall recovery requirements (out of a total of USD 411 billion).

According to the IMF's methodology, the number of jobs generated varies based on three primary factors: the state of economic development (classified as advanced, transitional, or low-income), labor intensity, and labor mobility. In the case of Ukraine, which falls under the category of an emerging market economy, these factors collectively influence job creation rates.

Table 1: Number of Jobs Created per USD 1 Million of Direct Public Investment in Transition Countries

| | Mobility of the labor force | | |
|------------------------------|-----------------------------|--------|------|
| | high | medium | low |
| Energy | | | |
| high intensity* | 23.2 | 22.3 | 21.2 |
| medium intensity | 16.2 | 15.6 | 14.8 |
| Roads | | | |
| high intensity* | 23.4 | 14.9 | 6.5 |
| medium intensity | 16.4 | 10.4 | 4.6 |
| Schools and hospitals | | | |
| high intensity* | 22.2 | 17.7 | 13.1 |
| medium intensity | 15.5 | 12.4 | 9.2 |
| Water and sanitation | | | |
| high intensity* | 35.1 | 24.6 | 14.2 |
| medium intensity | 24.6 | 17.2 | 9.9 |

*Labor intensity in the sector.

Source: IMF, 2021.

²⁹ World Bank, Government of Ukraine, European Union, United Nations. "Ukraine: Rapid Assessment of Damage and Recovery Needs (February 2022 – February 2023)." March 2023. [Link to Document] (<https://documents1.worldbank.org/curated/en/099062823034041908/pdf/P18017401fe8430010af21016afb4ebc8c4.pdf>)

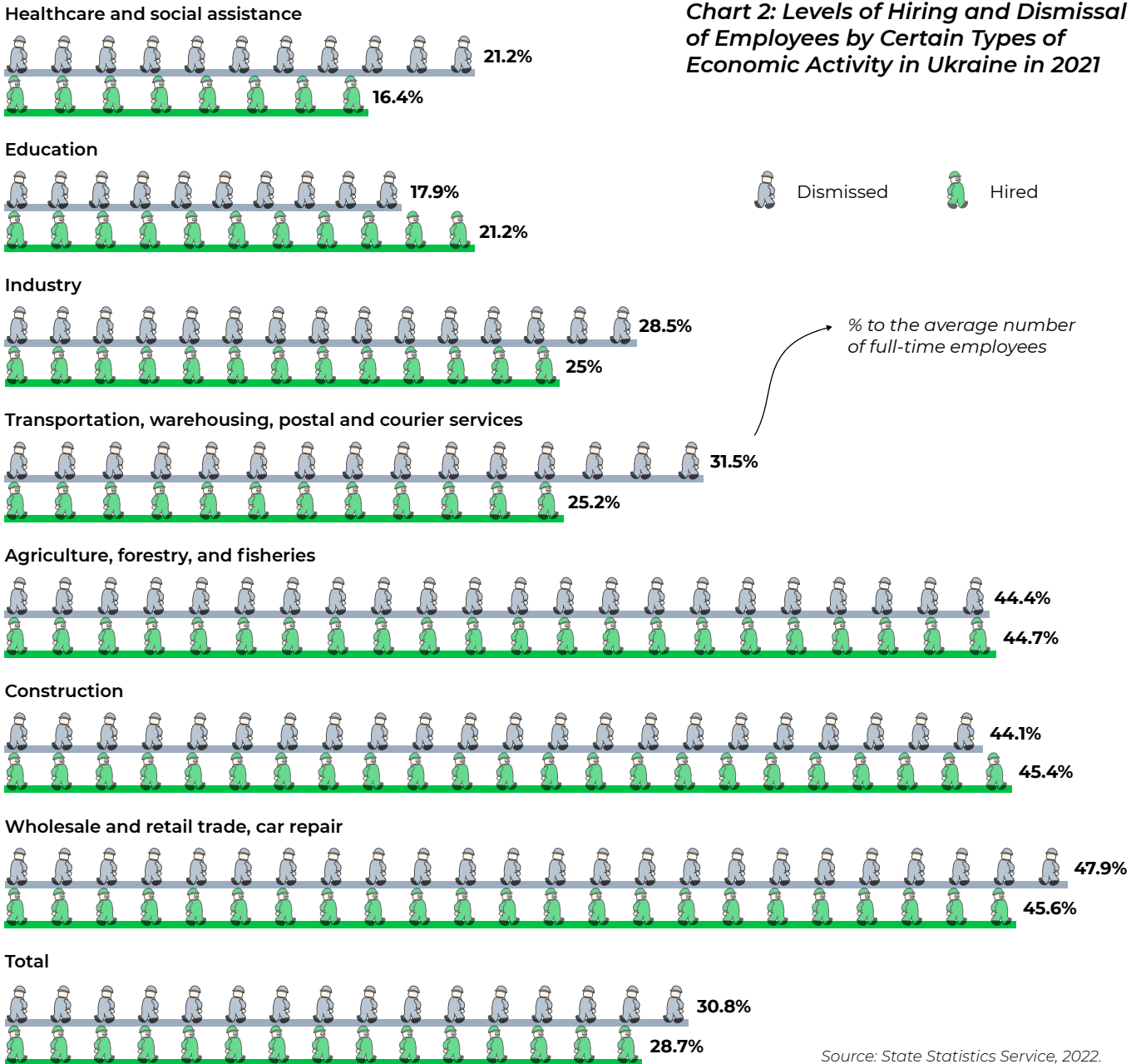
³⁰ Moszoro, Marian. "The Direct Employment Impact of Public Investment." IMF Working Paper WP/21/131, May 2021. International Monetary Fund. [Link] (<https://www.imf.org/-/media/Files/Publications/WP/2021/English/wp21131-print-pdf.aspx>)

³¹ State Statistics Service of Ukraine. (2022). "Labour in Ukraine - 2021: A Statistical Handbook."

³² García Vaquero, M.; Sánchez-Bayón, A.; Lominchar, J. (2021). "European Green Deal and Recovery Plan: Green Jobs, Skills and Wellbeing Economics in Spain." *Energies*, 14, 4145. [DOI: 10.3390/en14144145]

The number of jobs created due to investment is directly related to the intensity and mobility of the labor force. The higher the mobility or passion, the more jobs are created. Unfortunately, there are no relevant studies on sectoral labor intensity and labor mobility in Ukraine. In particular, most studies on labor mobility in Ukraine focus on its geographic (spatial) mobility. While there are statistics on labor mobility available in Ukraine, they suggest a high sectoral mobility of labor in Ukraine with significant differences between individual sectors of the economy (Figure 2).

Chart 2: Levels of Hiring and Dismissal of Employees by Certain Types of Economic Activity in Ukraine in 2021



At the same time, given that the IMF methodology defines labor mobility as the ease of moving to another job within a sector rather than the number or share of such moves, and given the peculiarities of employment in Ukraine, statistics on dismissals and hiring cannot serve as an adequate proxy for calculating the number of jobs created using the proposed methodology. Therefore, we calculated maximum, average, and minimum labor mobility. This also allowed us to obtain three different quantitative estimates for each sector (from pessimistic to optimistic).

The calculations were based on the average labor intensity (for a baseline estimate under a pragmatic scenario of sectoral recovery). Using these approaches, it is possible to calculate the number of jobs created under normal conditions.

As noted in the IMF's methodology, recent research and policies on post-COVID-19 recovery clearly show that investments in green, including climate-friendly technologies and activities, create more jobs. Therefore, the labor intensity, on average, corresponds to a high labor intensity in the sector when investing in green technologies.³³ Thus, for the green post-war recovery scenario, the indicators for high power were used, which allowed us to calculate the total number of jobs created in the process of Ukraine's post-war recovery on a green basis (energy efficiency, renewable energy, fossil fuel phase-out, climate change adaptation, to list a few).³⁴

The resulting difference in the number of jobs can be considered additional green jobs created in the process of green postwar recovery. Such green jobs are only supplemental, as they do not include green jobs that will be made in the process of post-war reconstruction under any circumstances (in particular, on a professional basis, since even "dirty" activities, such as metallurgy, will include green jobs: environmental specialists, and sustainability managers).

We have obtained three quantitative estimates of the number of jobs that will be created in the post-war reconstruction process for selected sectors (energy, transportation, education, and healthcare):

- the number of jobs that will be made in the process of post-war reconstruction under normal conditions (Table 2);
- number of jobs to be completed in the process of post-war reconstruction on a green basis (Table 3);
- the number of additional green jobs created in the green post-war reconstruction (as a difference between the previous ones, Table 4).

Table 2: Estimated Job Generation in Post-War Reconstruction Under Standard Conditions

Source: World Bank, Government of Ukraine, UN, EU (2023); Our Calculations.

| | Requirements, in millions of dollars | Number of Jobs Generated in the Reconstruction and Recovery Process | | |
|---|---|--|------------------|------------------|
| | | max | avg | min |
| Transportation | 92 078 | 1 510 079 | 957 611 | 423 559 |
| Energy* | 45 753.4 | 741 205 | 713 753 | 677 150 |
| Water supply and sewerage (including irrigation) | 16 036.2 | 394 491 | 275 823 | 158 758 |
| Healthcare* | 10 789.9 | 167 243 | 133 795 | 99 267 |
| Education* | 7 848.5 | 121 652 | 97 321 | 72 206 |
| Total | | 2 934 670 | 2 178 303 | 1 430 941 |

* Excluding the Requirements for Restoring Service Delivery.

³³ IMF, op.cit.

³⁴ Resource and Analysis Center "Society and Environment." "Green Post-War Recovery of Ukraine: Vision and Models." Policy Brief, August 2022. <https://www.rac.org.ua/uploads/content/658/files/zelene-vidnovlennyaifinal.pdf>

Table 3: Estimated Job Creation in the Green Post-War Reconstruction Process

Source: World Bank, Government of Ukraine, UN, EU (2023); Our Calculations.

| | Requirements, in millions of dollars | Number of Jobs Generated in the Green Recovery and Restoration Process | | |
|---|---|---|------------------|------------------|
| | | max | avg | min |
| Transportation | 92 078 | 2 154 625 | 1 371 962 | 598 507 |
| Energy* | 45 753.4 | 1 061 479 | 1 020 301 | 969 972 |
| Water supply and sewerage (including irrigation) | 16 036.2 | 562 871 | 394 491 | 227 714 |
| Healthcare* | 10 789.9 | 239 536 | 190 981 | 141 348 |
| Education* | 7 848.5 | 174 237 | 138 918 | 102 815 |
| Total | | 4 192 747 | 3 116 653 | 2 040 356 |

* Excluding the Requirements for Restoring Service Delivery.

Table 4: Quantity of Supplementary Green Employment Generated During the Green Post-War Recovery Process.

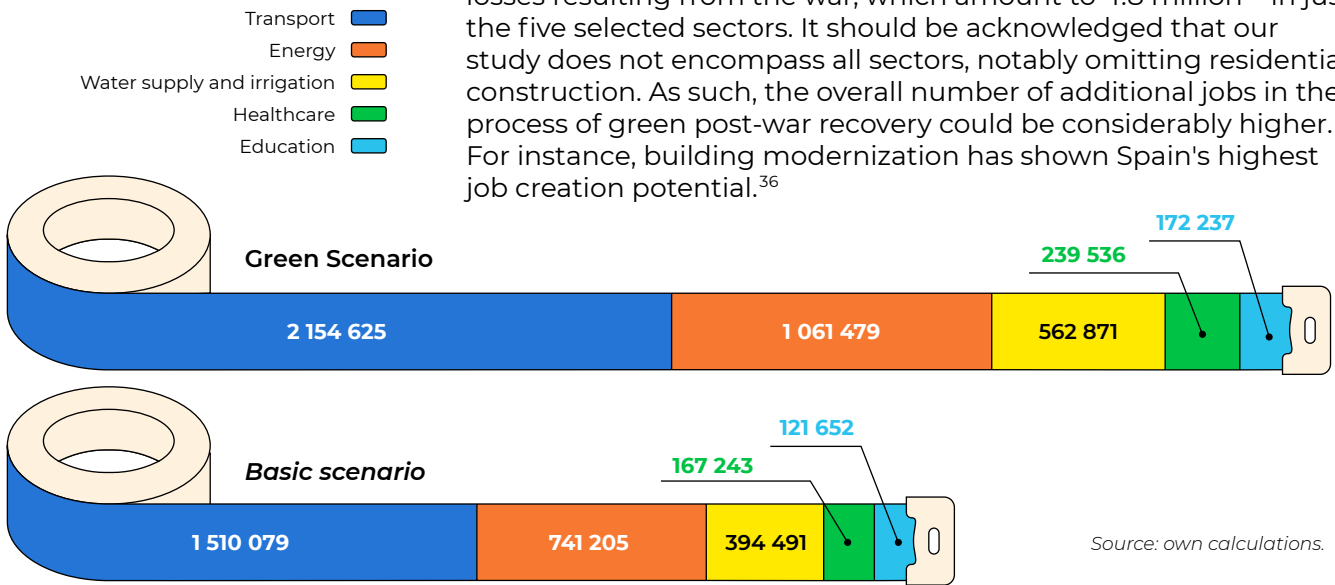
Source: World Bank, Government of Ukraine, UN, EU (2023); Our Calculations.

| | Requirements, in millions of dollars | Supplementary Green Jobs Generated During the Green Post-War Reconstruction (Recovery) Process | | |
|---|---|---|----------------|----------------|
| | | max | avg | min |
| Transportation | 92 078 | 644 546 | 414 351 | 174 948 |
| Energy* | 45 753.4 | 320 274 | 306 548 | 292 822 |
| Water supply and sewerage (including irrigation) | 16 036.2 | 168 380 | 118 668 | 68 956 |
| Healthcare* | 10 789.9 | 72 292 | 57 186 | 42 081 |
| Education* | 7 848.5 | 52 585 | 41 597 | 30 609 |
| Total | | 1 258 077 | 938 350 | 609 415 |

* Excluding the Requirements for Restoring Service Delivery.

The results enable us to draw several conclusions regarding the impact of implementing green principles in the post-war reconstruction process on prospective job creation.

Figure 3: Job Creation During the Post-War Reconstruction and Recovery of Ukraine

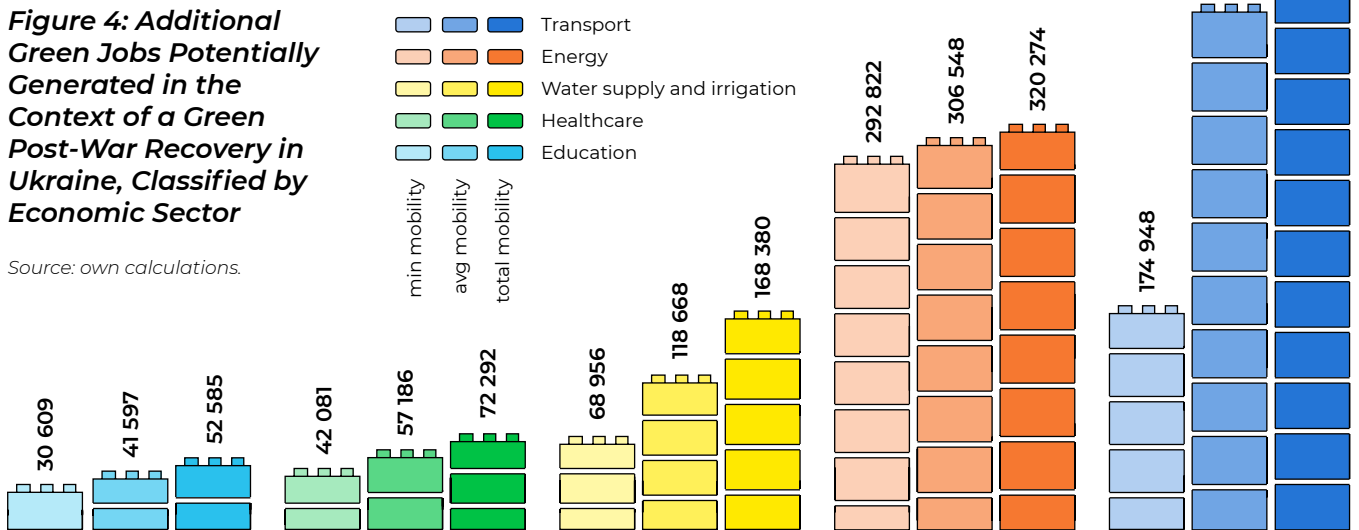


Source: own calculations.

The supplementary jobs that may emerge in the context of post-war reconstruction, focusing on environmental and climate considerations, are inherently sustainable and will contribute to a green-oriented post-war recovery in the foreseeable future. **The estimated number of additional green jobs ranges from 1.3 million to 609 thousand**, contingent upon the extent of labor mobility across economic sectors. Labor mobility will be contingent on numerous factors, including the organizational and legal frameworks governing the execution of post-war reconstruction initiatives (projects).

Energy, transportation, and water supply are among the sectors exhibiting the highest potential for generating additional employment opportunities (as depicted in Figure 4). These three sectors alone can yield as many as 1.2 million different jobs.

Figure 4: Additional Green Jobs Potentially Generated in the Context of a Green Post-War Recovery in Ukraine, Classified by Economic Sector



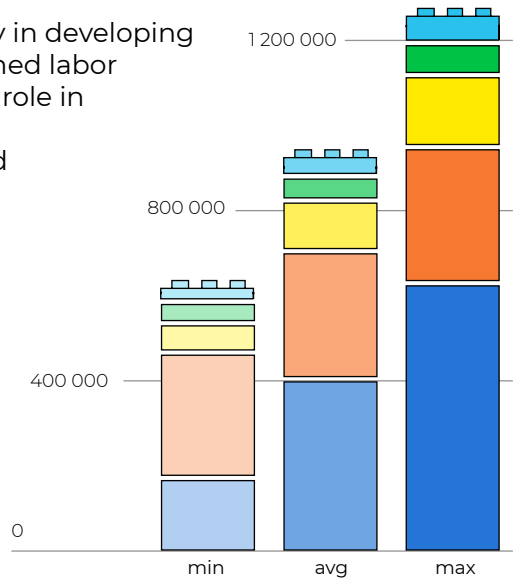
Source: own calculations.

³⁵ KPMG. (2022, December). Post-War Reconstruction: An Analysis of Historical Endeavors and Present Conditions. Retrieved from <https://kpmg.com/ua/uk/home/insights/2022/12/post-war-reconstruction-of-economy-case-studies.html>

³⁶ GarcíaVaquero, M.; Sánchez-Bayón, A.; Lominchar, J. Op.cit.

In planning post-war reconstruction and recovery, particularly in developing implementation strategies, it is essential to promote heightened labor mobility within various sectors. This, in turn, will play a pivotal role in fostering job growth. It is worth noting that the energy sector exhibits a lower reliance on labor mobility. Thus, efforts should be concentrated on the transport and water sectors, as they hold the most significant potential for augmenting the pool of green jobs through enhanced labor mobility (refer to Figure 5).

Figure 5: Influence of Labor Mobility on Increasing Additional Green Jobs

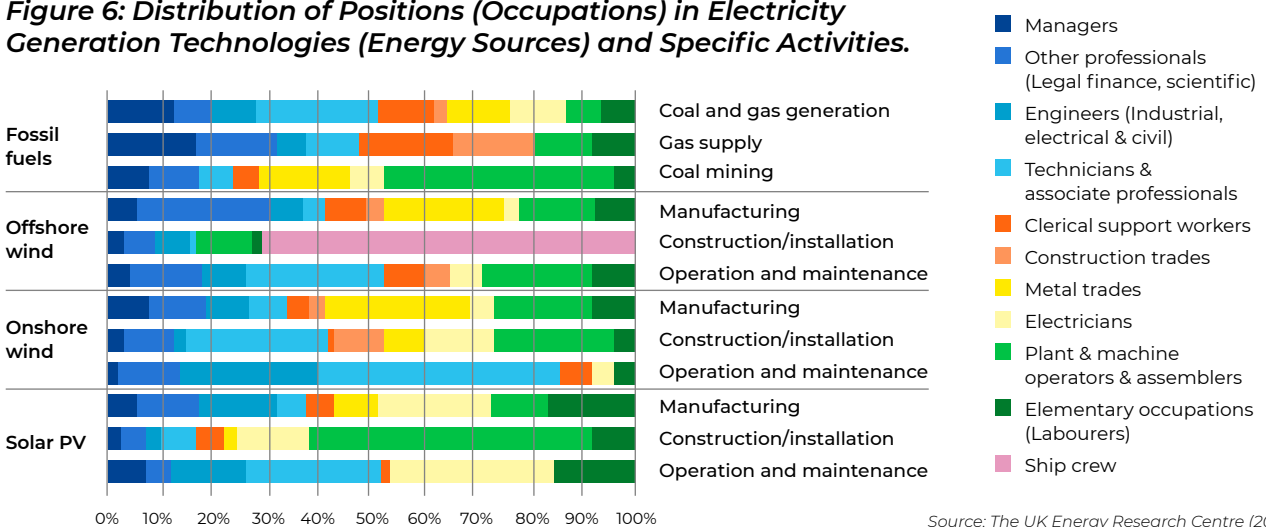


Source: own calculations.

In the initial phases of post-war reconstruction, the prevalence of low-skilled green jobs will be significant, facilitating the prompt employment of available workers and aiding in the reintegration of individuals into the workforce. Nevertheless, as we look ahead, it becomes evident that green jobs will increasingly demand higher skills. Therefore, creating such employment opportunities should be complemented by measures to ensure that the workforce attains the necessary competencies, particularly in the medium and long term.

In the broader context, the transition to green industries is conducive to the emergence of more skill-oriented occupations.³⁷ However, it is essential to note that this general observation does not imply that all green jobs surpass the skill requirements of "conventional" jobs. In practice, this variance hinges on the specific sector, technological aspects, and stages of the project lifecycle (refer to Figure 6). For instance, building modernization and renewable energy projects encompass a substantial portion of the local labor force that does not necessitate specialized educational or professional qualifications. For example, in the United States, over 20% of workers in these sectors lack a college degree.³⁸ During the construction phase, low-skilled job roles dominate. However, in subsequent stages such as operation, production, and particularly research and development (R&D), there is a higher prevalence of medium- and high-skilled positions.

Figure 6: Distribution of Positions (Occupations) in Electricity Generation Technologies (Energy Sources) and Specific Activities.



Source: The UK Energy Research Centre (2022).

³⁷ Hanna, R., Heptonstall, P., & Gross, R. (2022). Green Job Creation, Quality, and Skills: A Review of the Evidence on Low Carbon Energy. UKERC Technology and Policy Assessment. <https://doi.org/10.5286/ukerc.edc.000953>

Valero, A., Li, J., Müller, S., Riom, C., Nguyen-Tien, V., & Draca, M. (2021). Are 'Green' Jobs Good Jobs? How Lessons from the Experience to Date Can Inform Labour Market Transitions of the Future. Grantham Research Institute on Climate Change and the Environment and Centre for Economic Performance, London School of Economics and Political Science.

³⁸ The Direct Employment Impact of Public Investment, by Marian Moszoro, IMF Working Paper WP/21/131, May 2021, International Monetary Fund, <https://www.imf.org/-/media/Files/Publications/WP/2021/English/wpia2021131-print-pdf.aspx>

Hence, a green post-war recovery is poised to generate employment opportunities that may not initially necessitate a substantial proportion of highly skilled labor. This dual effect serves a twofold purpose: it enables the immediate engagement of existing workers, facilitating their return to the workforce while also affording time for upskilling, retraining, and specialized education. This foresight is instrumental in averting potential shortages of medium- and high-skilled labor in the labor market within 2-3 years following the initial stages of post-war recovery. Therefore, establishing green jobs mandates the implementation of targeted initiatives designed to enhance skills, facilitate retraining, and provide specialized education, including higher education, to ensure a suitable supply of relevant employment opportunities in the future.

CONCLUSIONS

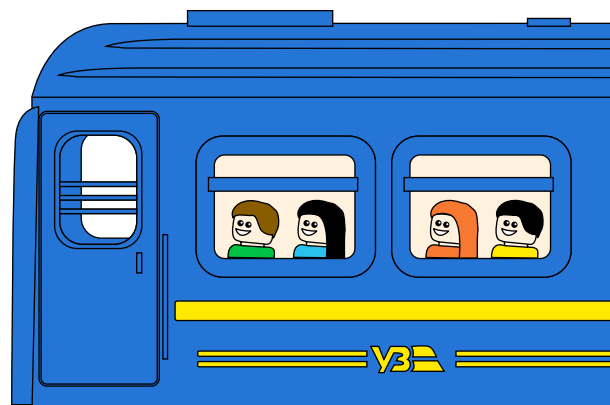
The shift towards green transformation and the pursuit of a climate-neutral economy ushers in a new category of employment: green jobs. This transformative shift carries profound implications for labor markets, education systems, social equity, and the economic development of nations at large. This vision and approach are already widely adopted by entities such as the European Union, its member states, the United States of America, and various developed and developing countries. The European Green Deal is a clear exemplar, illustrating the interconnection between green transformation, investment in green initiatives, and job creation. An illustrative example within the EU is the construction sector, which anticipates an additional 160,000 green jobs by 2030.

The impact of the green transition on job numbers is anticipated to be overwhelmingly positive, mainly due to investments in green transition endeavors, climate-centric technologies, and the broader implementation of ESG (Environmental, Social, and Governance) standards. Public investments wield a more substantial job-creating potential when they align with green objectives, encompassing climate, energy, resource efficiency, circular economy, and environmental technologies.

In Ukraine's post-war recovery, adopting green recovery principles within just five key sectors – transportation, energy, healthcare, education, and water supply – could generate over 4.2 million jobs. Notably, the sectors with the highest capacity to produce additional employment opportunities are energy, transportation, and water supply, accounting for a potential 1.2 million jobs. In summary, Ukraine's green post-war recovery has the potential to fully compensate for the approximately 4.8 million jobs lost within the country.

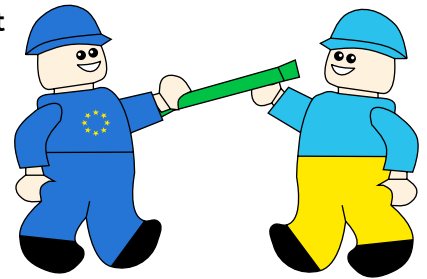
The creation of green jobs during Ukraine's post-war recovery and reconstruction will play a pivotal role in facilitating the reintegration of its populace. In the initial years of post-war reconstruction, low-skilled green jobs are expected to dominate, allowing for the immediate employment of available workers and aiding in people's return. As time progresses, the green post-war recovery will evolve to generate more skilled job opportunities, although the demand for these professional roles will materialize later.

Ukraine's green post-war recovery will drive the equitable transformation of coal and other regions needing economic redirection and aid in the post-war adaptation of individuals who have lost their livelihoods. This recovery effort will establish essential conditions, including time, for implementing retraining and educational measures to ensure a prepared future workforce.



Anticipations of green job expansion within the post-war reconstruction process should be paralleled by public policies aimed at cultivating a workforce equipped with the requisite skills, particularly in the medium and long term. The unique characteristics of green jobs mandate a systematic approach to their definition and tracking in Ukraine, facilitating effective public policy across various domains, including the economic, social, energy, environmental, and climate sectors. Moreover, a systematic and comprehensive evaluation of the green job market's development will guide sector-specific development priorities, industry support, and vocational and higher education initiatives.

Ukraine may consider applying the European green jobs concept at its initial stages. Its practical implementation, however, hinges upon the adoption of statistical research practices in Ukraine, specifically within the environmental goods and services Sector (EGSS), aligning with EU standards. Subsequently, the European model should be enriched with components that comprehensively understand Ukraine's green job market, encompassing job roles, skills, and more. Furthermore, public policy should be sensitive to ensuring decent work in this domain and promoting gender equality.



APPENDICES

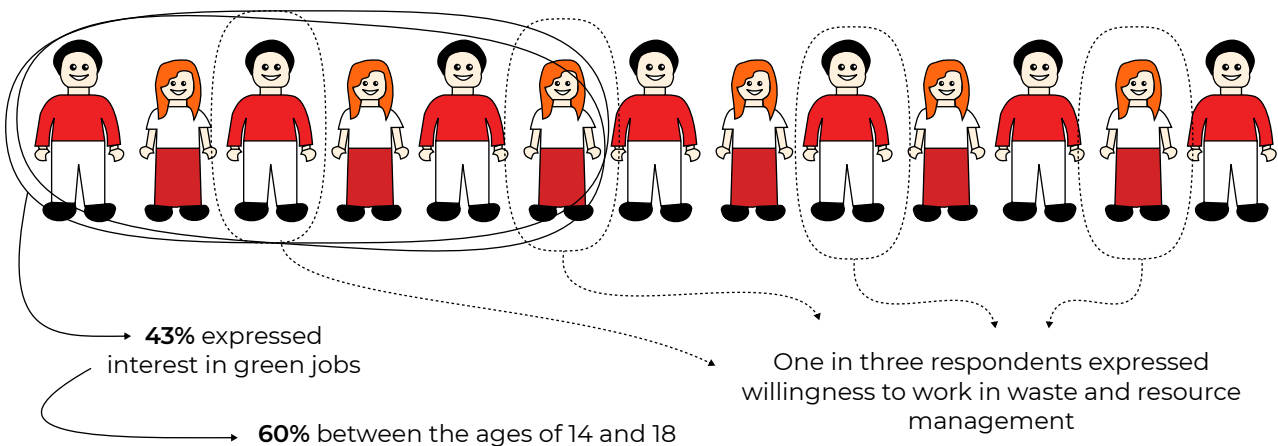
Annex I: Green Job Generation in Europe.



Austria Pilots' Green Jobs' Initiative for Long-term Unemployed

The Job.ReAct program in Lower Austria offers employment opportunities in environmentally friendly and sustainable sectors of the economy, co-financed by the EU. This initiative receives full financial support from the European Social Fund (ESF), the EU's flagship program for promoting regional cohesion.

In 2021, a **study** conducted by VOEB revealed that 43% of respondents expressed interest in green jobs, with young individuals between the ages of 14 and 18 displaying even higher enthusiasm at 60%. Furthermore, **one in three respondents expressed willingness to work in waste and resource management**, as reported by VOEB.



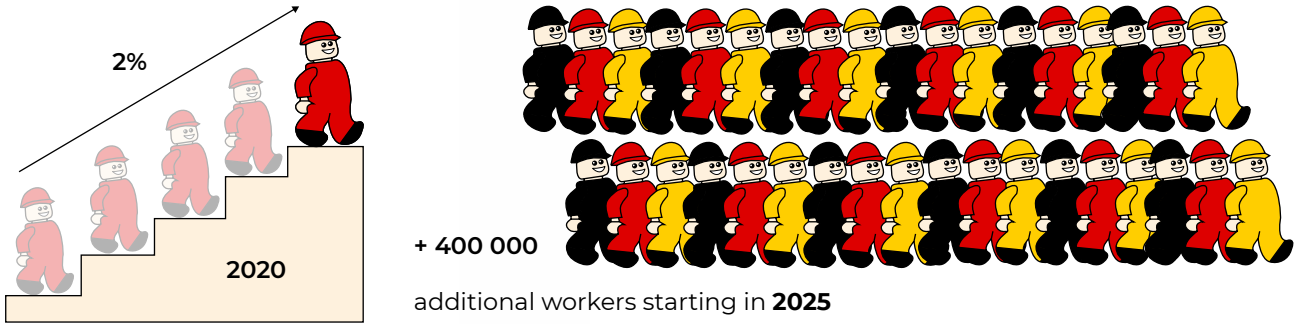


Germany

Green Job Growth in Germany Amidst a 2% Increase in 2020 Industrial Turnover

Projections from the Institute for Employment Research in Nuremberg (IAB) indicate that shifting towards a green economy will usher in many new employment opportunities. Consequently, Germany will require approximately 400,000 additional workers starting in 2025 to align with its climate objectives.

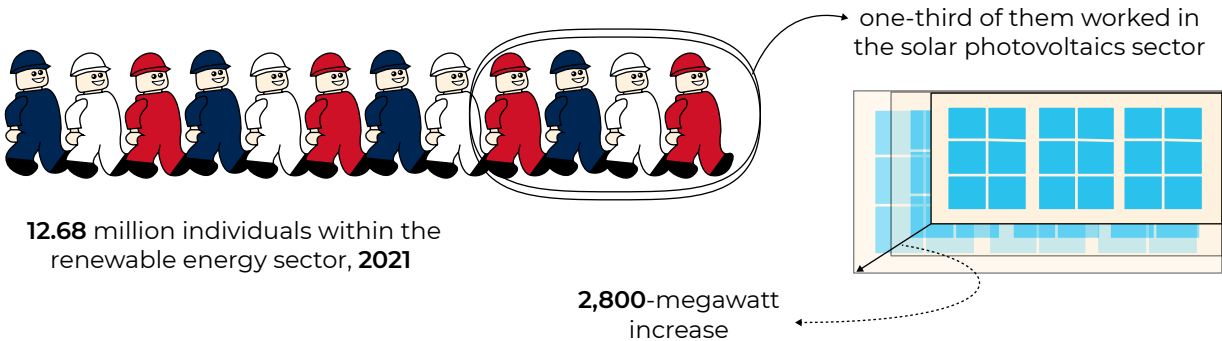
Notably, the primary online platform for job seekers in the renewable energy sector is [green-energy-jobs.net](https://www.green-energy-jobs.net). Other cross-sector portals include [Jobverde.de](https://www.jobverde.de), [Nachhaltigejobs.de](https://www.nachhaltigejobs.de), and [goodjobs.eu](https://www.goodjobs.eu). EU occasionally features job listings that extend beyond the environmental sector. While these platforms primarily operate in German, [MakeitinGermany.com](https://www.makeitingermany.com), the federal government's portal for international skilled workers, offers approximately 32,000 vacancies in English, French, and Spanish. This portal emphasizes green job opportunities while also providing information on visa regulations and sources of guidance.



France

Green Hydrogen in France: A Potential for 50,000 to 100,000 Jobs

In 2021, France witnessed the employment of 12.68 million individuals within the renewable energy sector. Approximately one-third of these professionals found jobs in the solar photovoltaics sector. This sector continues to experience annual growth, highlighted by a noteworthy 2,800-megawatt increase in [solar photovoltaic capacity in France](#) during 2021. France's liquid biofuels and hydropower sectors contributed substantially to employment, providing jobs for around two million individuals.

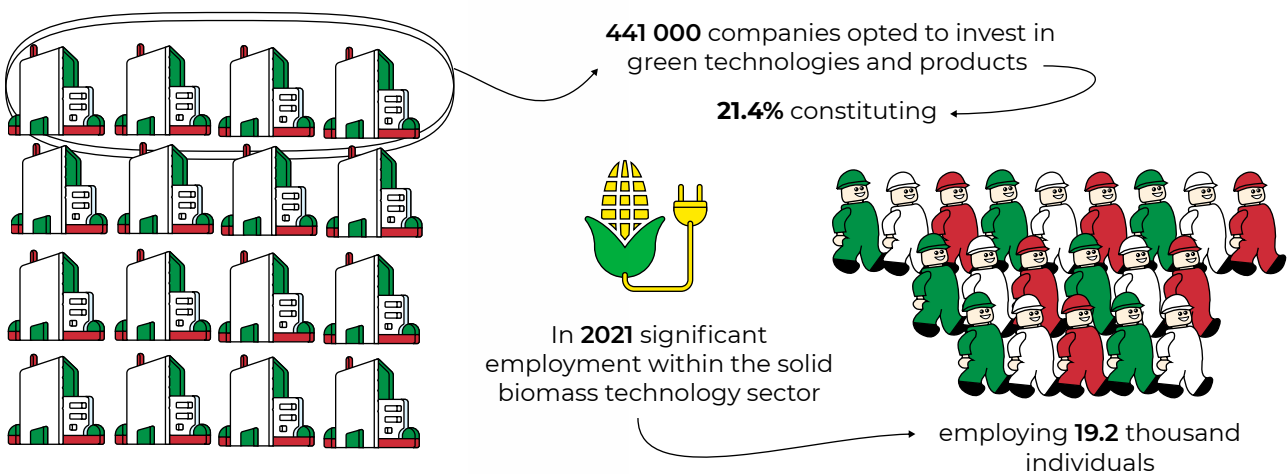




Italy

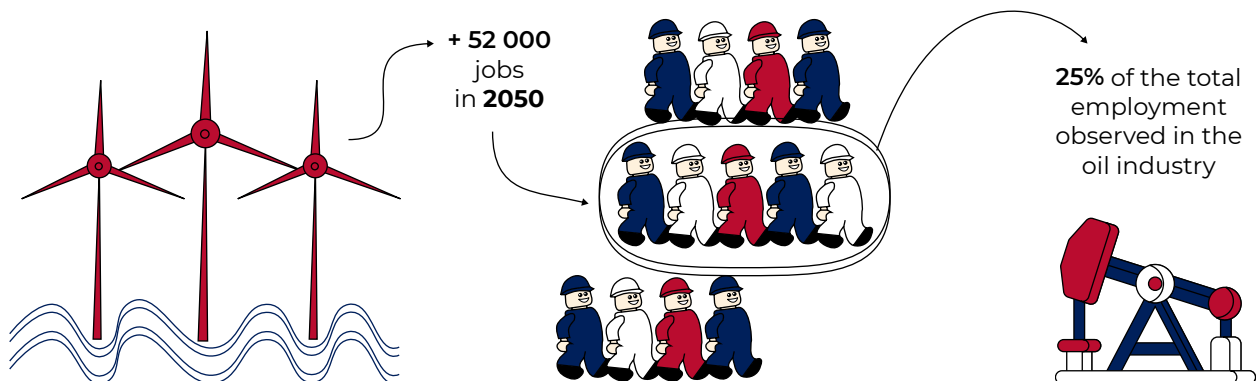
The annual **GreenItaly Report 2021**, jointly developed by Fondazione Symbola and Unioncamere, reveals that over 441,000 companies opted to invest in green technologies and products between 2016 and 2020, constituting 21.4%. Furthermore, the report anticipates that between 2021 and 2025, 38% of professions will necessitate essential green skills, translating to a demand for approximately 1.3 to 1.4 million jobs.

In 2021, Italy experienced significant employment within the solid biomass technology sector, employing 19.2 thousand individuals. Notably, in 2020, Italy's **energy production from solid biomass** amounted to 7.12 million tons of oil equivalent. The **Italian renewable energy sector also employed approximately 68 thousand individuals** in 2021.



Norway

A recent report by Menon Economics underscores the potential significance of floating offshore wind energy as a source of employment in Norway by 2050. This report posits that the floating offshore wind industry **alone** could **facilitate the creation of over 52,000 jobs in the year 2050**. This figure accounts for approximately 25% of the total employment observed in the oil industry in 2019.





Spain

In Spain, **the wind energy sector sustains over 30,000 jobs** and is projected to surpass 67,000 jobs by 2030. Additionally, the offshore technology sector in Spain is expected to witness a gradual increase in annual job opportunities between 2025 and 2050. Projections range from 7,500 jobs annually between 2025 and 2030 to 17,500 jobs between 2045 and 2050. However, it is noteworthy that in 2020, the Spanish **renewable energy sector generated nearly 92,000 jobs**, of which 58,700 were categorized as direct employment. Regrettably, this marked a decline of about 3.3 percent compared to the preceding year.

Spain: "Green Jobs and the Recovery and Resilience Plan"

NextGenerationEU, designed as a temporary recovery mechanism in the EU to address the economic and social repercussions of the COVID-19 pandemic, is centered around the Recovery and Resilience Fund. EU member states must formulate and adopt national recovery and resilience plans to access the funding. Research estimates project the creation of approximately 356,000 green jobs in Spain during 2021-2023, attributed to the Recovery and Resilience Plan, which Spain submitted and received EU approval for in June 2021.

[Reference: García Vaquero, M.; Sánchez-Bayón, A.; Lominchar, J. European Green Deal and Recovery Plan: Green Jobs, Skills and Wellbeing Economics in Spain. *Energies* 2021, 14, 4145.]

(https://www.researchgate.net/publication/352215687_European_Green_Deal_and_Recovery_Plan_green_jobs_skills_and_wellbeing_economics)

