

Green Jobs and Trading

Paul A. Adekunle¹, Matthew N. O. Sadiku², Janet O. Sadiku³

¹International Institute of Professional Security, Lagos, Nigeria

²Roy G. Perry College of Engineering, Prairie View A&M University, Prairie View, TX, USA

³Juliana King University, Houston, TX, USA

ABSTRACT

Green jobs are occupations that help to protect the environment, reduce pollution, conserve natural resources, or support sustainability and climate resilience. Such jobs cut across many sectors like renewable energy, agriculture, construction, transport, waste management, and manufacturing. Green jobs are important in the reduction of environmental damage, lowering greenhouse gas emissions (GHG), promote renewable energy use, support sustainable economic growth, and create employment opportunities. While green trading generally refers to commercial activities involving environmentally friendly products, services, or environmental markets, such as buying and selling of eco-friendly goods, carbon trading, and renewable energy trading. The paper looks at the pros and cons of green jobs and trading to the overall benefit of humanity.

KEYWORDS: *Green jobs, green trading, environment, pollution, natural resources, sustainability, climate resilience, greenhouse gas (GHG) emissions, eco-friendly goods, carbon trading, renewable energy, artificial intelligence (AI), machine learning (ML), robotics, IoT, greenwashing, black box problem, ethical issues, circular economy, environmental markets.*

INTRODUCTION

Green jobs are roles that contribute to preserving or restoring the environment, mitigate climate change, and supporting the transition to low-carbon economy, as shown in Figure 1. They include renewable energy, energy efficiency, waste management, sustainable agriculture, and increasingly, roles in finance, procurement, and tech where green skills are applied. According to ILO and UNEP, green jobs is broadly defined by them to include any job that reduces environmental impact, even if “green” is not in the title. In 2025, it was said that over half of green hired were in jobs that traditionally did not require green skills. The green workforce is expanding faster than overall employment, as per global projection, hiring demand, and regional examples.

In the case of green trading, this refers to the exchange of environmental assets, services, and compliant products that enable low-carbon transition. This are in the key areas of carbon markets, sustainable finance, renewable energy trading, and sustainable supply chain.

Both green jobs and green trading matters now due to: policy push, corporate demand, and labor

advantage. However, the key challenges lie in the skills gap. The supply of green skills grows at approximately 4% annually while demand grows at approximately 8%. While energy efficiency, renewables, and ESG compliance roles face persistent shortages [1-4].

Environmental markets place a price on ecological impacts and services so that private capital can flow into conservation, emissions reduction, and restoration. They are not a fix-all, but they are becoming a core tool in climate and nature policy. The different types of environmental markets are: carbon markets, under which are compliance markets, voluntary carbon markets (VCM), and Article 6 of the Paris Agreement [5, 6]; biodiversity markets, under which are voluntary market, compliance schemes, and stacking/bunding [5-8]; and other environmental markets, under which are water quality/quantity trading, wetland mitigation banking, plastic credits, and ecosystem services/nature credits [8, 9].

Biodiversity credit basics: This is measured via area, species, or ecosystem health indicators. Additionality is complex: it must show uplift, avoid loss, or

How to cite this paper: Paul A. Adekunle | Matthew N. O. Sadiku | Janet O. Sadiku "Green Jobs and Trading" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-10 | Issue-3, June 2026, pp.592-601, URL: www.ijtsrd.com/papers/ijtsrd102083.pdf



Copyright © 2026 by author (s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (<http://creativecommons.org/licenses/by/4.0>)



maintenance beyond business-as-usual. As at now, there is no global standard yet, but BCA definition and NPI metrics framework are emerging [7, 9-13].

HISTORY OF GREEN JOBS AND GREEN TRADING

The idea of environmentally related employment began to gain attention during the environmental movements of the 1960s and 1970s. The rising concerns over pollution, industrial waste, deforestation, and resource depletion encouraged governments and organizations to create environmental protection agencies and conservation programs. The 1972 United Nations Conference on the Human Environment in Stockholm marked the first global efforts linking environmental protection with economic and social development. This period saw the emergence of jobs in waste management, environmental conservation, forestry protection, and pollution control.

Green jobs emerged from the broader environmental and sustainable development movement of the 1970s and 1980s. In the 1980s, environmental policies expanded to concerns about ozone depletion, acid rain, and global warming. This made governments to introduce regulations that created employment opportunities in renewable energy, recycling, and environmental engineering. Early concerns about pollution, climate change, and resource depletion encouraged governments and international organizations to promote environmentally sustainable economic activities. The concept became more visible after the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, where sustainable development was strongly emphasized.

The term “green jobs” generally refers to employment that contributes to preserving or restoring the environment. Green jobs are also known as green-collar jobs, sustainability jobs, eco jobs or environmental jobs – tends towards preserving or restoring environmental quality, protecting the ecosystems and biodiversity [14, 15], as shown in Figure 2. These jobs exist in sectors such as renewable energy, recycling, sustainable agriculture, forestry, environmental protection, energy efficiency, and waste management. A major milestone occurred in 2008 when the United Nations Environment Programme (UNEP), International Labour Organization (ILO), the International Trade Union Confederation (ITUC), and the International Organization of Employers (IOE) launched the Green Jobs Initiative. This initiative prompted the transition to a low-carbon economy while ensuring decent employment opportunities [16].

Green jobs after the Paris Agreement in 2015 led to the acceleration of investments in clean energy and sustainable infrastructure. Countries increasingly shifted toward low-carbon economies, creating employment opportunities in:

- Solar and wind energy
- Electric vehicle production
- Sustainable manufacturing
- Environmental consulting
- Climate technology

In the US alone, studies show that the green economy supports millions of jobs and generates substantial annual revenue [17].

The history of Green Trading: Green trading refers to market-based systems that encourages environmental protection through financial incentives. This includes carbon trading, renewable energy credits, emissions trading systems, and other environmental financial markets. Green Trading accelerates change to a cleaner environment by using market-based incentives whose application is global. Some examples are the carbon market or market for SO₂, the market-based systems are more environmentally effective as market systems will direct abatement to relatively larger and more heavily utilized sources with relatively high emission intensities [18, 19].

Environmental Markets:

Environmental markets put a price on ecological impacts and services so that private capital can flow into conservation, emissions reduction, and restoration. They are not a fix-all, but they are now becoming a core tool in climate and nature policy.

Types of Environmental Markets

- A. Carbon markets:** The most mature carbon markets trade credits representing 1 tonne CO₂e reduced or removed. Under this are:
 - **Compliance markets:** These are mandated by governments under cap-and-trade or ETS. As of March 2025, 38 ETSs operated covering approximately 19% of global GHG emissions and raised ~\$70B in auction revenues in 2024. Some examples are: EU ETS, China’s national ETS, California-Quebec, UK ETS.
 - **Voluntary carbon markets (VCM):** In this case, companies buy credits voluntarily for net-zero claims. Market value hit \$10.8B cumulative 2005-2023, but fell 56% to \$723M in 2023 due to integrity concerns. Demand is shifting toward high-integrity, Article 6-aligned credits.
 - **Article 6 of the Paris Agreement:** It sets rules for international transfer of emission reductions. Ghana released 5.2M tCO₂e authorized credits in

2025. Singapore signed deals with 7 countries for ITMO transactions [5, 6, 20].

- B. Biodiversity markets:** Early stage biodiversity credits represent a measured, durable, additional positive biodiversity outcome. The **market** is the overall system/mechanism for financing biodiversity outcomes through buying and selling. The **biodiversity credit** is the actual tradable unit, which is defined by the Biodiversity Credit Alliance as: “A certificate that represents a measured and evidence-based unit of positive biodiversity outcome that is durable over a determined period of time and additional to what would have otherwise occurred.” One credit = a quantified gain in biodiversity; but there is no single global unit yet.
- **Voluntary market:** \$8M in 2023, projected \$2B by 2030. 2024 sales quintupled to \$5.6M. Niue sold \$2.5M in oceanic credits.
 - **Compliance schemes:** Larger than voluntary. Estimated ~\$10B/year globally. 20+ countries are developing national frameworks. Examples are: UK Biodiversity Net Gain, EU Nature Credit System.
 - **Stacking/bundling:** Carbon projects often add biodiversity data to claim co-benefits or issue separate biodiversity credits on the same land [5-8, 21-23].
- C. Other environmental markets:** This consists of:
- Water quality/quantity trading: Nutrient credits, water rights.
 - Wetland mitigation banking: Common in the US.
 - Plastic credits: This is emerging, e.g., Sri Lanka project under Verra. The different types of credits are: waste collection credits (WCCs), waste recycling credits (WRCs), and upcycling credits [24].
 - Ecosystem services/Nature credits: EU’s proposed Nature Credit system aims to reward water regulation, soil fertility, and habitat restoration [8, 25-27].

Relationship or Nexus Between Green Jobs and Green Trading

Green jobs and green trading are closely interconnected components of the global transition towards a sustainable and low-carbon economy. Green trading creates markets and financial incentives for environmentally friendly products, services, and technologies, while green jobs emerged as a result of the increased demand generated by these sustainable economic activities. Green trading encompasses all forms of environmental financial trading, including

carbon dioxide, sulfur dioxide (acid rain), nitrogen oxide (ozone), renewable energy credits, and energy efficiency (negawatts). All of these emerging and established environmental financial markets have one thing in common, which is making profits in the emerging emissions offset economy by investing in “clean technology” [18]. -

Green Trading Creates Employment Opportunities

- Green trading generates investment in sustainable industries.
- Sustainable industries create green employment opportunities.
- Carbon markets encourage firms to adopt cleaner technologies, increasing the demand for skilled workers.

For example:

- Carbon trading can finance renewable energy projects, and can create employment for environmental analysts, auditors, and sustainability consultants.
- Renewable energy projects create jobs for engineers, technicians, and environmental experts.

Green jobs and green trading in Nigeria: In Nigeria, opportunities are increasing for green jobs and green trading in sectors such as:

- Solar energy – trade in solar panels can create jobs for engineers, installers, and technicians.
- Waste recycling
- Sustainable agriculture where the exportation of organic agricultural products increases the demand for sustainable farming workers, and
- Clean transportation.

It should be noted that green trading acts as an economic driver for green job creation.

Expansion of Renewable Energy Markets

International trade in renewable energy technologies has accelerated employment growth globally. This has led to countries involved in exporting or importing solar panels, wind turbines, and battery technologies now experience increased demand for skilled and semi-skilled labor. The International Renewable Energy Agency (IREA) has reported that renewable energy employment has grown significantly due to increased global investment and trade in clean energy technologies.

Promotion of Sustainable Industrial Development

Green trading encourages industries to adopt environmentally sustainable production methods in order to remain competitive in international markets.

As industries shift toward cleaner technologies and environmentally friendly production, firms employ workers with green skills such as:

- Environmental engineering
- Waste management
- Energy efficient management
- Sustainable manufacturing

This creates a direct relationship between environmental trade policies and labor market transformation.

Carbon Markets and Environmental Employment

Carbon trading systems generate specialized green employment opportunities. Organizations participating in emissions trading, as shown in Figure 3, require experts in:

- Carbon accounting
- Environmental auditing
- Climate policy analysis
- Sustainable reporting

The development of carbon markets therefore contributes to the growth of professional and technical green occupations.

Green Supply Chains and Decent Work

Global green trade encourages firms to establish sustainable supply chains. Companies demand for environmentally certified products and ethical production standards. This process supports decent work conditions and environmentally sustainable employment practices. As per the United Nations Environment Programme, sustainable trade policies can promote inclusive economic growth while simultaneously protecting environmental resources.

Innovation and Skills Development

Green trading increases technological innovation, leading to demand for new technical skills and workforce training. This makes educational institutions and vocational centers respond by developing programs focused on renewable energy, environmental management, and sustainable business practices. Consequently, green trading contributes directly to:

- Human capital development
- Skill acquisition
- Technological advancement
- Workforce transformation

Poverty Reduction and Economic Diversification

With respect to developing countries, green trade sectors such as sustainable agriculture, recycling, forestry, and eco-tourism create income-generating opportunities for local populations. These sectors help diversify economies while reducing environmental degradation. Countries that invest in exports would experience:

- Increased employment
- Reduced dependence on fossil fuels
- Improved environmental sustainability, and
- Enhanced economic resilience

Challenges Affecting the Relationship or Nexus

Despite the strong relationship between green jobs and green trading, several challenges exist which are:

- Limited access to green technologies in developing countries
- Inadequate green skills and training
- Poor funding
- High cost of renewable energy infrastructure
- Unequal distribution of green employment benefits
- Trade barriers and protectionist policies, and
- Weak environmental regulations/implementations in some countries

Hence, these challenges can slow the ability of green trading to generate sufficient green jobs globally. The global economies transitioning toward sustainability, will therefore make green trade and employment become important for economic growth, environmental protection, poverty reduction, and climate change mitigation. Despite these challenges, Nigeria's growing renewable energy sector offers strong potential for employment creation and sustainable economic growth, as well for the global transition to a low-carbon economy and social well-being in the modern world [28-37].

PROS AND CONS OF GREEN JOBS AND GREEN TRADING

1. Green Jobs: Pos and Cons

Pros:

1. Wage premium and job quality: Studies from the US and UK find green jobs pay higher wages than non-green jobs, especially for middle- and low-skilled workers. They are also at lower risk of automation.
2. Net job creation: ILO and UNEP estimate a greener economy could create 15-60 million jobs globally over two decades. WRI finds 1.5-3.7x more jobs per \$1M than fossil fuels.
3. Local and labor-intensive: Green jobs in efficiency, renewables, and restoration are often local and harder to outsource. Construction and manufacturing sectors benefit.
4. Career pathways: Can provide entry-level jobs linked to training and advancement [38, 39].

Cons:

1. Job losses and transition costs: 'Dirty' jobs will disappear as 'green' jobs are created, with

unequal effects. Skill mismatches can leave workers unemployed.

2. Quality varies: Not all green jobs are good jobs.
3. Measurement issues: There is no agreed definition of “green jobs”, leading to reclassification of existing jobs. Evidence on net employment effects is mixed and modest.
4. Higher costs: Critics argue that labor-intensive green tech can lower productivity and raise consumer costs [38, 40].

2. Green Trading: Pros and Cons

Green trading refers to emissions trading/cap-and-trade and similar markets. Emission trading is the broad family of market-based systems that let entities buy and sell the right to emit pollutants. Cap-and-trade is one specific type of emissions trading. All cap-and-trade systems are emissions trading systems. Not all emissions trading systems are cap-and-trade [41, 42].

Pros:

1. Cost-effectiveness: Allows firms cut emissions where it is cheapest, lowering total cost of achieving targets. OECD finds ETS has lower cost per ton abated than many other instruments.
2. Emissions certainty: Cap sets a hard limit, so total emissions fall as the cap declines.
3. Innovation incentive: Price on carbon rewards firms that develop low-carbon tech. This can accelerate renewable energy investment.
4. Revenue and flexibility: Auctioning allowances generates revenue for governments. Firms get flexibility on when/how to reduce emissions.
5. International cooperation: Systems can be linked to reduce costs and leakage [41, 42].

Cons:

1. Complexity and fraud risk: Systems are complex to administer and verify, with loopholes and fraud possible.
2. Market volatility: Allowance prices fluctuate, creating uncertainty for business planning.
3. Offset problems: Overreliance on offsets can delay real emission cuts and sometimes increase emissions. Critics call it a “smokescreen” for lack of action.
4. Equity issues: Wealthier firms buy allowances more easily. Low-income communities near emitters may see less benefit.
5. Weak caps: If caps are set too high, prices stay low and do not drive change. Carbon leakage can occur if industries relocate [41-43].

Key tension:

- Green jobs can be a co-benefit of environmental policy, but job creation should not be the primary goal – environmental effectiveness matters more.
- Green trading guarantees emissions quantity but not necessarily innovation or equity. Effectiveness depends on cap stringency, monitoring, and enforcement [44].

AI APPLICATIONS

AI applications in green jobs and green trading are scaling fast because both fields deal with huge, complex datasets and real-time decisions. AI technologies such as machine learning, deep learning, robotics, natural language processing (NLP), and predictive analytics are helping industries improve environmental efficiency, reduce waste, create sustainable employment opportunities, and support environmentally friendly trade practices.

1. AI in Green Jobs: AI is changing what “green jobs” look like and how fast they grow:

A. Creating new roles and expanding demand

- AI enables efficiency gains in renewables, smart agriculture, waste recycling, and energy-efficient construction, which drives investment and creates direct/indirect jobs, as shown in Figure 4.
- It augments tasks for professionals, raising productivity and safety, and reshapes occupations toward environmental judgement and energy optimization, as shown in Figure 5.
- A World Bank study using AI found nearly 700 unique green job titles, many not in traditional taxonomies [45, 46].

B. Examples of AI-enabled green jobs

- Grid management specialists: Use AI to model decentralized grids with high renewables.
- Logistics optimization analysts: Design AI routing to cut fuel and emissions.
- Climate data analysts, AI product managers for carbon tracking, precision agriculture specialists.
- AI climate modelers, climate risk specialists, circular economy systems, auditors using digital twins [46].

C. Risks and skills gap.

2. AI in Green Trading/Carbon Markets

- AI is now being integrated into emissions trading and voluntary carbon markets to improve integrity, efficiency, and pricing:

A. Monitoring, Reporting, Verification (MRV)

- AI automates data collection from satellites, IoT, and sensors for real-time emissions tracking.

- Machine learning detects deforestation, land-use change, and drainage status for rice projects, cutting verification time and cost.
- AI reduced reporting errors by 85% and monitoring costs by 40% in California's digital MRV system [46, 47].

B. Market efficiency and trading

- Predictive analysis forecast carbon prices using market patterns, historical data, and policy signals.
- Algorithmic trading improves liquidity and matches buyers/sellers based on sustainability goals and risk appetite.
- Machine learning uncovers differences in pricing mechanisms across ETS and improves forecast accuracy [48, 49].

C. Integrity and fraud prevention

- AI detects anomalies in credit transactions and flags discrepancies between reported and actual reductions.
- Combined with blockchain, AI enables tamper-proof records and smart contracts for automated verification, reducing double-counting.
- End-to-end frameworks using LSTM, GNN, and federated learning achieved $R^2 > 0.92$ accuracy and 27.6% emission reductions in pilot cities [47, 49-51].

D. Challenges

Some of the identified challenges include:

- Data privacy and cybersecurity risks: Carbon credit data is sensitive; AI systems need secure handling.
- Ethical concerns and algorithmic bias: Models trained on incomplete data can misprice credits or exclude certain project types.
- Regulatory uncertainty: Standards for AI-verified credits are still evolving.
- Black box problem: Over-reliance on AI automation can create "black box" systems making pricing and allocation opaque to market participants.
- High energy consumption of AI systems.
- Risk of job displacement through automation.
- Unequal access to AI technologies between developed and developing countries [46, 50 52-54].

Black box problem and **greenwashing** are often discussed in relation to AI, sustainability, and corporate ethics, as shown in Figures 6 and 7.

Greenwashing refers to the practice where companies, organizations, or governments falsely present themselves as environmentally responsible or sustainable when their actual practices do not significantly support environmental protection. This is mainly a **deceptive marketing** or **public relations strategy**.

Black Box Problem refers to the lack of transparency in how certain AI or machine learning systems make decisions without clearly explaining how they arrived at those conclusions. This is mainly a **technical and ethical issue in artificial intelligence** [55-57].

CONCLUSION

Both Green Trading and Green Jobs are complementary, but not substitutes. Green trading sets the price signal and cap that drive emissions down at lowest cost. Green jobs are the labor-market outcome when that investment and policy shift happens. Emissions can be cut without creating good jobs, and good jobs can be created without cutting emissions. However, the biggest benefit comes when both are designed together. Green trading works for emissions certainty and cost control. Green jobs tend to be good jobs, but not automatically. When both are well designed, they reduce climate risk while creating higher-quality employment as well as sustainable development/environment. Emphasis is now focused on "Green AI" on developing energy-efficient AI systems that minimize environmental impacts. However, policymakers and organizations must address challenges such as energy consumption, ethical concerns, and workforce displacement to ensure that AI contributes effectively to sustainable development goals. More information can be obtained in books in [58-63] and the following related journals:

Ecological Economics

Energy Policy

Climate Policy

Journal of Cleaner Production

International Labour Review

Environmental and Resource Economics

Journal of Environmental Economics and Management

Energy Economics

International Journal of Environmental Research and Public Health

Sustainable Futures

Energy Research & Social Science

Environmental Research Letters

Resources, Conservation and Recycling

Business Strategy and the Environment

Environmental Science & Policy

World development

Development and Sustainability in Economics and Finance

ACS Sustainable Chemistry & Engineering

Economic Letters

Resources Policy

REFERENCES

- [1] LinkedIn Economic Graph, *Global Green Skills Report 2025*.
- [2] Forrester, *Global Green Jobs Forecast, 2025 to 2030*.
- [3] Enable Green, *2025 Sustainability Recruitment Market Report*.
- [4] International Energy Agency & IRENA, *Renewable Energy Employment Reports 2024*.
- [5] J. Clifton & K. S. Manez (2025), *A framework based on payments for ecosystem services to support the delivery of high integrity carbon and biodiversity credits*. Elsevier B. V. <https://www.elsevier.com>
- [6] Valuing the priceless: Carbon and biodiversity market insights March 2025, <https://www.wildlifeworks.com/valuing-the-priceless-carbon-and-biodiversity-market-insights-march-2025>
- [7] S. Gradeckas (January 21, 2025), Biodiversity markets: Reviewing 2024 and looking into 2025, <https://newsletter.bloomlabs.earth/p/biodiversity-markets-reviewing-2024>
- [8] J. L. Suarez and J. Garcia, "A new tool to motivate the conservation and restoration of nature: the European Union's Emerging Market for Nature credits," June 2, 2025, <https://blog.iese.edu/finance-and-nature/2025/a-new-tool-to-motivate-the-conservation-and-restoration-of-nature-the-european-union's-emerging-market-for-nature-credits>
- [9] FAO, *Pulse and biodiversity*.
- [10] N. Upadhyaya & S. Bachrach (March 19, 2025), Understanding biodiversity and carbon credits, <https://www.onebillionresilient.org/understanding-biodiversity-and-carbon-credits>
- [11] Biodiversity Credit Alliance, *Definition and Principles 2024*.
- [12] IUCN, *World Conservation Congress Resolution 2025*.
- [13] World Economic Forum, *Nature and Biodiversity Credit Markets 2023*.
- [14] K. Doyle, "What jobs are included in the environmental field?" *Grist*. Retrieved 16 August 2019.
- [15] M-R. Stanef-Puica et al. (2022), "Green jobs – A literature review," *International Journal of Environmental Research and Public Health*, vol. 19, no. 13, 7998.
- [16] "Green job," Wikipedia, the free encyclopedia, <https://en.wikipedia.org/wiki/Green-job>
- [17] L. Georgeson & M. Maslin (15 October 2019), "Estimating the scale of the US green economy within the global context." *Palgrave Communications*, vol. 5, no. 121.
- [18] "Green trading," Wikipedia, the free encyclopedia, <https://en.wikipedia.org/wiki/Green-trading>
- [19] D. Ellerman (October 2003), "Are cap-and-trade programs more environmentally effective than conventional regulation? (PDF). *Moving to markets in environmental regulation: Lessons from twenty years of experience*. Retrieved 26 October 2014.
- [20] "Carbon market analysis 2025: The global shift toward policy-driven carbon trading," 24.12.2025, <https://www.offset8capital.com/articles/carbon-market-analysis-2025-the-global-shift-toward-policy-driven-carbon-trading-2/>
- [21] Wunder et al. (2025), *Biodiversity Credits: An overview of the current state, future opportunities, and potential pitfalls*, Business Strategy and the Environment.
- [22] Biodiversity Credit Alliance, *High-level Principles to Guide the Biodiversity Credit Market*, 2024.
- [23] World Economic Forum, *High-level governance and integrity principles for emerging voluntary biodiversity credit markets*, 2023.
- [24] "Plastic credits: Potential to unlock "Second Growth Curve" for chemical recycling," <https://www.bestongroup.com/industry-news/plastic-credits-potential-to-unlock-second-growth-curve-for-chemical-recycling>
- [25] World Bank, *Plastic credits at a glance*, 2024.
- [26] Verra, *Plastic Waste Reduction Standard*.

- [27] Fauna & Flora, *Plastic Credits White Paper*, 2023.
- [28] UNEP (2008), *Green jobs: Towards decent work in a sustainable, low-carbon world*. Nairobi: United Nations Environmental Programme.
- [29] P. Poschen (2015), *Decent work, green jobs and the sustainable economy*. Geneva: International Labor Organization.
- [30] V. Jones (2008), *The green collar economy: How one solution can fix our two biggest problems*. New York: HarperOne.
- [31] United Nations Environment Programme (2011), *Towards a green economy: Pathways to a Sustainable Development and Poverty Eradication*. Nairobi: UNEP.
- [32] International Renewable Energy Agency (2023), *Renewable Energy and jobs: Annual Review*. Abu Dhabi: IRENA.
- [33] Paris Agreement (2015), United Nations Framework Convention on Climate Change.
- [34] OECD (2017), *Investing in Climate, investing in Growth*. Paris: Organization for Economic Co-operation and Development.
- [35] World Bank (2022), *Inclusive green growth: The pathway to Sustainable Development*. Washington, DC: World Bank.
- [36] A. Bowen & K. Kuralbayeva (2015), "Looking for green jobs: The impact of green growth on employment." *Grantham Research Institute on Climate Change and the Environment*.
- [37] M. Jacobs (2012), *Green growth: Economic theory and political discourse*. Centre for Climate Change Economics and Policy.
- [38] J. Jaeger et al. (October 18, 2021), "The green jobs advantage: How climate-friendly investments are better job creators," <https://www.wri.org/green-jobs-advantage-how-climate-friendly-investments-are-better-job-creators>
- [39] B. Hendricks, A. Light & B. Goldstein (April 22, 2009), "Why the most productive jobs of the future will be green jobs," <https://www.americanprogress.org/article/seven-questions-about-green-jobs>
- [40] LSE/CCCEP, *Are 'green' jobs good jobs?* 2022.
- [41] S. Jones (September 12, 2024), "Carbon tax vs emissions trading: Understanding the pros and cons," <https://www.lythouse.com/carbon-tax-vs-emissions-trading-understanding-the-pros-and-cons>
- [42] "Carbon emission trading," Wikipedia, the free encyclopedia, <https://en.wikipedia.org/wiki/carbon-emission-trading>
- [43] A. Forbes (February 22, 2010), "Carbon trading: pro and con," <https://www.elektormagazine.com/Carbon-trading-pro-and-con>
- [44] "Cap and trade: Understanding the pros, cons, and challenges of a market system for reducing emissions," May 2, 2024, <https://www.financefacts101.com/cap-and-trade-understanding-the-pros-cons-and-challenges-of-a-market-system-for-reducing-emissions>
- [45] B. T. Makhmud (2025), "The role of artificial intelligence in expanding employment opportunities within the green economy," *Scientific electronic journal Labor Economics and Human Capital*, vol. 4, no. 3, 2025. <https://laboreconomics.uz>
- [46] Sustainable Directory (04.12.25), "AI's role in fostering green job growth," <https://prism.sustainability-directory.com/scenerio/ai's-role-in-fostering-green-job-growth>
- [47] O. A. Adigun et al. (2024), "Enhancing carbon markets with fintech innovations: The role of artificial intelligence and blockchain," *World Journal of Advanced Research and Reviews*, vol. 23, no. 02, pp. 579-586.
- [48] M. Parhamfar et al., "Artificial intelligence in carbon trading: Enhancing market efficiency and risk management," *Journal of Computing and Data Technology*, vol. 01, no. 01, June 2025, pp. 19-39.
- [49] D. Makariou (2025), "Towards fair and efficient carbon trading with machine learning," <https://www.unisg.ch/towards-fair-and-efficient-carbon-trading-with-machine-learning>
- [50] Z. B. A. Mangroo, R. S. Tupsee & J. D. Pierre, "Case study of technology adoption in carbon market MRV systems," The UNFCCC Methodological Expert Panel (MEP).
- [51] Original Research Article, "Artificial Intelligence-Powered Carbon Market Intelligence and Blockchain-Enabled

Governance for Climate-Responsive Urban Infrastructure in the Global South,” <https://files.sdiarticle5.com>

- [52] IJSRED, *AI in Carbon Credit: Integrating artificial intelligence in Carbon Credit Markets*, 2024.
- [53] FII Institute, *AI-Enabled Carbon Markets 2024*.
- [54] “Artificial intelligence in Carbon Trading: Enhancing Market Efficiency and Sustainability,” 2024, *Journal of Modern Technology*.
- [55] “Greenwashing – the deceptive tactics behind environmental claims,” <https://www.un.org/en/climatechange/science/climate-issues/greenwashing>
- [56] “Stopping greenwashing: how the EU regulates green claims,” <https://www.europarl.europa.eu/stopping-greenwashing-how-the-eu-regulates-green-claims>
- [57] “Introduction to Vertex Explainable AI,” <https://docs.cloud.google.com/vertex-ai/docs/explainable-ai/overview>
- [58] World Bank, *State and Trends of Carbon Pricing annual report*.
- [59] OECD, *Effective Carbon Rates and Employment Implications of Green Growth reports*.
- [60] A. Mathieu (2024), “Foundations and conditions of green jobs in developing economies: Systematic literature review and bibliometric analysis,” <https://www.sciencedirect.com>
- [61] Y. I. Alzoubi & A. Mishra (25 August 2024), “Green artificial intelligence initiatives: Potentials and challenges,” *Journal of Cleaner Production*.
- [62] R. Verdecchia, J. Sallou & L. Cruz (5 May 2023), “A systematic Review of Green AI.” arXiv:2301.11047 (cs.AI).
- [63] C. Clemm et al. (May 2024), “Towards Green AI: Current status and future research.” arXiv:2407.10237 (cs.CY)



Figure 1. Green job

Source: https://en.wikipedia.org/wiki/Green_job



Figure 2. Green collar worker

Source: https://en.wikipedia.org/wiki/Green-collar_worker



Figure 3. Emissions trading

Source: https://en.wikipedia.org/wiki/Emissions_trading



Figure 4. Sustainable agriculture

Source:

https://en.wikipedia.org/wiki/Sustainable_agriculture



Figure 6. Black box

Source: https://en.wikipedia.org/wiki/Black_box



Figure 7. Greenwashing

Source:

<https://en.wikipedia.org/wiki/Greenwashing>

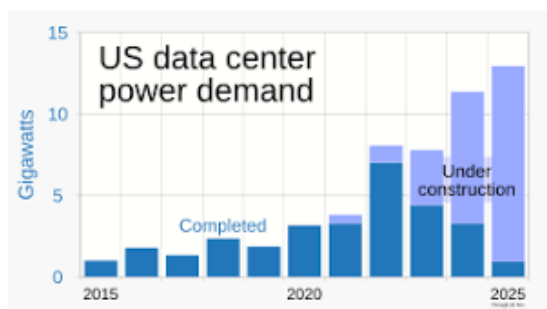


Figure 5. Environmental impact of AI

Source:

https://en.wikipedia.org/wiki/Environmental_impact_of_AI

