Green Career Centre

Cleantech and AI

EMERGING WORKFORCE TRENDS AND SKILLS

PREPARED BY

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1. Background

Clean technology is playing a growing role across Canada's economy, alongside broader changes in energy systems, technology and industry. These developments are also affecting the technologies used by businesses and the skills required of workers. In 2024, the broader environmental and clean technology (ECT) products sector contributed approximately $70 billion in real GDP and supported 363,094 jobs, accounting for 3.0% of Canada's national GDP (Statistics Canada, 2024). At the same time, digital technologies are becoming increasingly embedded in environmental and clean technology activities, reflecting a broader "twin transition" in which digitalization is advancing alongside efforts to reduce emissions and improve environmental sustainability (Clark et al., 2024).

This research brief examines how the growing intersection of artificial intelligence and clean technology is affecting Canada's workforce. It looks at how Artificial Intelligence (AI) is being used across cleantech industries, the skills employers are seeking, barriers facing underrepresented entering the sector, and the implications for workforce development. While the focus is Canada, global evidence is used where relevant to provide context.

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Key Definitions

Clean technology

Across a range of definitions, **clean technology** is generally understood as goods or services designed primarily to prevent or remediate environmental damage. It can also refer to goods or services that are less polluting or more resource-efficient than conventional products providing a similar function (Statistics Canada, 2024). Cleantech therefore extends well beyond renewable energy, covering areas such as energy efficiency, environmental monitoring, cleaner industrial processes, resource management, water and wastewater, sustainable transportation and other forms of environmental protection.

Clean AI

Clean AI, or AI-enabled cleantech, broadly refers to the use of artificial intelligence to improve the performance, efficiency or development of clean technologies and environmental solutions, with applications ranging from energy and grid optimization to environmental monitoring, resource management and materials discovery. The concept can also extend to efforts to reduce the environmental footprint of AI systems themselves (Sendilkumar, 2026).

Growing Importance of Cleantech to the Green Economy

Clean technology is becoming increasingly important across Canada's economy as governments, businesses and industries respond to climate goals, energy-system changes and growing demand for lower-emission technologies and services. Across different sectors, it can help organizations reduce emissions, improve resource efficiency, modernize infrastructure and develop new low-carbon products and services. This is also expected to reshape employment. Canada's clean energy sector could grow from approximately 509,000 jobs in 2025 to 2.7 million by 2050 (Clean Energy Canada, 2023).

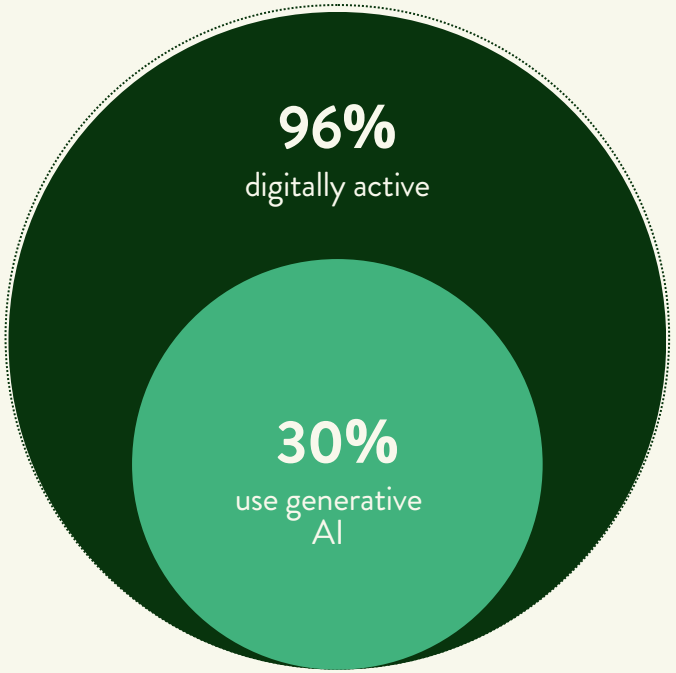
The Information and Communications Technology Council (ICTC) finds that digital-green competencies are increasingly being added to existing occupations. Workers in construction, engineering, manufacturing, environmental consulting and energy management, for example, are taking on new digital tools alongside sustainability-related responsibilities (Clark et al., 2024).

Rapid AI Adoption and Its Intersection with Cleantech

AI is becoming part of day-to-day operations across a range of industries. Research from the Business Development Bank of Canada (BDC) found that 96% of Canadian small and medium-sized enterprises are digitally active, with 30% using generative AI in their operations (BDC, 2026).

Within cleantech, AI is being used to analyze large volumes of data, improve forecasting and make complex systems more responsive. Power grids can use machine learning to forecast renewable generation and balance electricity demand; industrial facilities can use predictive models and digital twins to manage energy use; and environmental monitoring systems can combine remote sensing and AI to detect changes in forests, water systems and emissions.

International environmental initiatives provide further examples. UNEP uses digital technologies and AI across initiatives such as the World Environment Situation Room, the International Methane Emissions Observatory and GEMS Air to collect, analyze and make environmental data more useful for monitoring and decision-making. To further elaborate on one example, GEMS Air, developed in partnership with IQAir, uses AI and air-quality monitoring data to provide insights into the effects of air pollution on populations and help inform health-protection measures.



2. Context

Sector and Workforce Trends

Canada's cleantech sector includes renewable and low-carbon energy, energy storage and grid technologies, clean transportation, carbon capture, water management, sustainable agriculture, advanced manufacturing and circular-economy solutions. The federal government has also identified clean technology as an important area of economic development across sectors such as energy, mining and forestry (NRCan, 2026).

AI is also becoming more common across many of these cleantech areas. In the energy sector, for example, it is being used for demand forecasting, grid optimization and maintenance planning, while buildings and manufacturers are using AI-enabled systems and digital twins to improve efficiency. Similar applications are emerging in environmental monitoring, climate-risk assessment, agriculture and natural-resource management, where AI and other data-driven tools are helping organizations track conditions, identify changes and manage resources more effectively.

The important workforce trend is therefore not simply the creation of a new category of "AI jobs." Rather, AI is transforming existing cleantech occupations and the tasks performed within them. In other words, there is a growing demand for people who can understand environmental or sector-specific issues and who can also work with data, digital tools, and AI-enabled systems.



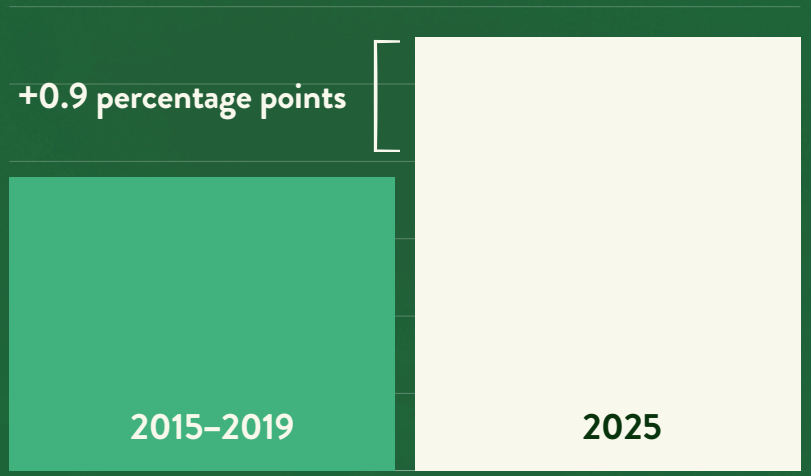
How AI Is Changing the Workforce

The effects of AI are already becoming visible in the labour market. Workers in highly AI-exposed occupations, including reception, accounting and customer service, are experiencing greater difficulty finding employment, with the estimated unemployment-risk gap increasing from 1.9 percentage points in 2015–2019 to 2.8 percentage points in 2025 (Bank of Canada, 2026). One contributing factor is that employers may reduce hiring for some tasks or roles as AI becomes more capable of automating routine work. Younger workers may be particularly affected because they are disproportionately represented in areas such as customer service and sales support, while occupations that rely more heavily on physical interaction, specialized expertise or human judgment remain less exposed (Bank of Canada, 2026).

At the same time, higher AI exposure does not necessarily mean that all affected occupations will be phased out. In many sectors, and notably in cleantech as discussed earlier in this brief, AI is more often being integrated into existing roles by changing how certain tasks are carried out. Environmental, technical and operational positions may increasingly involve the use of AI-enabled tools for activities such as data analysis, monitoring, forecasting and decision support, without replacing the underlying occupation itself.

The distinction is especially important in relation to cleantech, where AI is often being incorporated into existing environmental, technical and operational work rather than replacing the underlying occupation.

As a result, workforce development and continuous learning will become increasingly important in helping workers adapt to an AI-enabled economy. The following section illustrates this shift in more detail by showing how AI applications are reshaping selected cleantech sectors, the hybrid roles emerging from those changes, and the types of employers likely to demand these combined skills.



3. Key Issues and Considerations

Employer Demand and Emerging Skills Needs

Employers are increasingly looking for combinations of skills rather than a single technical specialization. ICTC identifies two competencies that cut across digital-green occupations: an understanding of climate change and environmental sustainability, and the ability to analyze, manage and interpret data (Clark et al., 2024)

Electricity Human Resources Canada's 2025 employer survey provides a more detailed picture. Data analytics was identified by 78% of respondents as a top skill for effective AI implementation, followed by change management or organizational design (68%), systems integration (64%), data reporting (62%), cybersecurity (58%) and project management for digital initiatives (54%). Programming or scripting, including Python, was identified by 36% of respondents, while 28% identified cloud computing (EHRC, 2025).

Across the research, employer needs fall broadly into three areas:

Technical and digital skills

Data analysis, AI-enabled systems, systems integration, cybersecurity, programming, GIS, automation and digital monitoring. The emphasis varies by occupation; many roles require the ability to work with AI-enabled tools rather than advanced AI development.

Climate and cleantech knowledge

Understanding of areas such as climate mitigation and adaptation, energy systems, greenhouse-gas accounting, environmental management and resource efficiency remains important alongside digital skills (Clark et al., 2024).

Professional and transferable skills

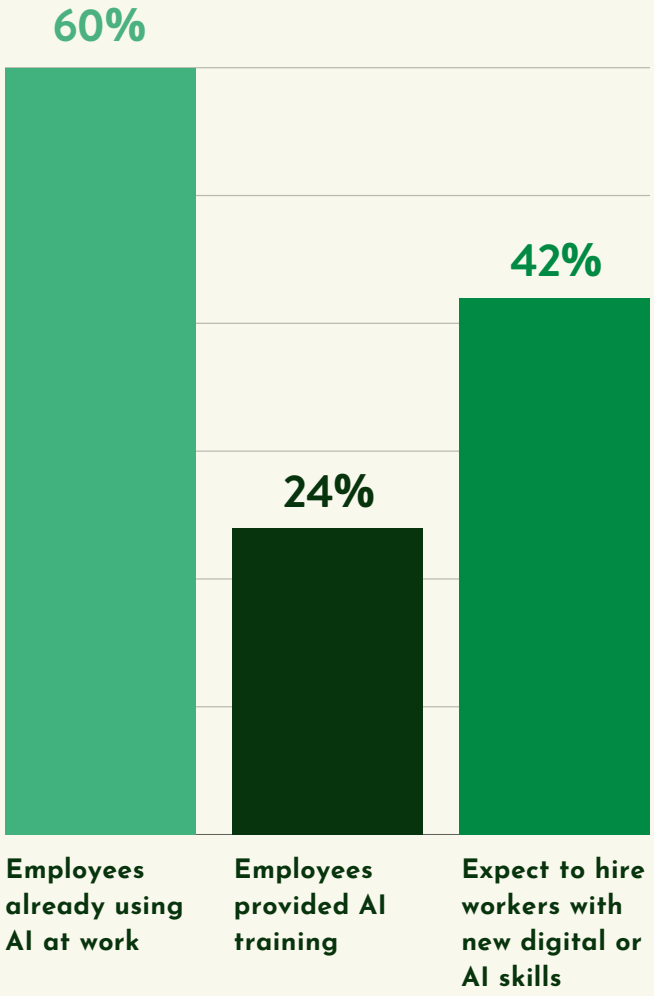
Communication, project management, adaptability, systems thinking and the ability to explain technical findings to non-technical audiences are also important.

Employers increasingly need people who can bring technical and digital capabilities together with environmental knowledge and professional skills. The gap is also reflected in EHRC's finding that, while 60% of surveyed employers reported employees already using AI at work, only 24% had provided formal AI training and 42% expected to hire workers with new digital or AI skills (EHRC, 2025).

Another challenge is the gap between how these skills are often developed and how employers increasingly expect them to be used. Cleantech roles may require environmental knowledge, digital and data skills, and professional competencies at the same time, but education and training pathways do not always provide opportunities to build or apply these capabilities together.

ICTC's research on digital-green skills similarly finds that these competencies are increasingly being added to existing occupations and need to be better integrated into education, training and work-integrated learning. As cleantech roles change, workers may need to use data analysis, digital tools and AI-enabled systems alongside knowledge of energy, sustainability, environmental management or other sector-specific areas.

These changes can be seen across different areas of the cleantech sector. The table below provides examples of how AI is being applied, the roles that are evolving alongside these applications, the skills that may be increasingly relevant, and the types of employers involved.



Examples of AI Applications and Evolving Roles

Cleantech Area	Examples of AI Applications	Examples of Emerging or Evolving Roles	Key Skills	Potential Employers
Renewable Energy & Power Utilities	Grid balancing, storage optimization, demand and outage forecasting	Smart-grid specialists, renewable asset analysts, energy data analysts	Data analysis, energy-systems knowledge, AI and machine-learning literacy, systems thinking, communication	Utilities, independent power producers, energy-storage developers
Smart Buildings & Built Environment	HVAC optimization, building modelling, automated energy and carbon monitoring	Building energy analysts, digital-twin specialists, sustainability data roles	Data interpretation, digital-twin tools, building and energy knowledge, automation, project management	Engineering firms, property companies, municipalities
Agriculture & Bio-economy	Crop monitoring, precision agriculture, autonomous systems	AgTech data roles, GIS and monitoring specialists	GIS, remote sensing, data analysis, sensor technologies, environmental and agricultural knowledge	AgTech firms, producers, equipment and sensor companies
Natural Resources & Forestry	Remote sensing, environmental monitoring, wildfire forecasting	Environmental data analysts, GIS and remote-sensing roles	GIS, remote sensing, data management, environmental monitoring, critical thinking, systems thinking	Environmental consultancies, resource companies, governments
Carbon Management & Climate Tech	Carbon accounting, emissions analysis, supply-chain monitoring	Carbon and ESG data analysts, climate-tech business and technical roles	GHG accounting, data analysis, sustainability reporting, AI literacy, communication, regulatory awareness	Climate-tech firms, consultancies, corporate sustainability teams

Environmental Consequences of AI

AI can support environmental objectives, but its growing use also carries environmental costs, ranging from electricity consumption to the water and land required for data centres to the growing volumes of electronic waste. Some impacts are also concentrated in the communities and regions where AI infrastructure and its supply chains are located.

Energy consumption

Data centres consumed an estimated 415 TWh of electricity globally in 2024, approximately 1.5% of global electricity consumption. The IEA projects that this could more than double to approximately 945 TWh by 2030 (IEA, 2025). Day-to-day use of AI models, rather than their initial training alone, can account for a significant share of their energy demand.

Water and land use

Data centres also require water for cooling and land for facilities and supporting infrastructure. Large facilities can use millions of gallons of water per day, while some of the largest developments occupy hundreds of acres and require additional transmission infrastructure (Wroth, 2025).

Broader environmental pressures

Research from United Nations University points to the importance of considering AI's water and land footprint alongside greenhouse gas emissions. This is relevant in areas already facing resource constraints, where measures that reduce emissions may still create pressures on water or land.

Critical minerals and electronic waste

Expanding AI infrastructure also increases demand for the minerals and hardware used in servers and computing equipment. The resulting supply chains can carry environmental and social impacts, while the replacement of computing hardware is expected to contribute to growing volumes of electronic waste (UNCE, 2026).

For the cleantech sector, these impacts raise a broader question about how AI should be used in support of environmental goals. The potential benefits of AI need to be considered alongside the energy, water, material and infrastructure demands associated with the technology itself, as well as the trade-offs that may result from its use.

Youth Barriers, Access and Pathways

Youth and underrepresented groups face significant barriers to entering Canada's AI-enabled cleantech sector, even as labour shortages and new roles continue to emerge. These barriers include the "experience paradox," where entry-level postings often require several years of specialized experience; financial barriers linked to tuition, certifications, unpaid or low-paid placements, and private AI training; limited access to structured AI learning outside school; and the geographic concentration of cleantech and AI employers in major urban centres. These challenges are compounded for underrepresented youth, including women, Indigenous, Black, racialized, rural, remote, northern, and disabled youth, who may face fewer informal networks, fewer local employers, and less access to work-integrated learning or mentorship opportunities (Clark et al., 2024).

Work-integrated learning, mentorship, and paid employment opportunities can help address some of these barriers by giving young people relevant experience, opportunities to apply their skills, and stronger connections to employers. However, access to these opportunities varies. Some programs remain tied to post-secondary enrollment, which can limit access for young people outside formal education pathways, while others have started to broaden their eligibility or introduced additional support.

For example, Natural Resource Canada's Science and Technology Internship Program – Green Jobs removed its post-secondary education requirement, increased wage subsidies for placements in Northern and remote communities, and added training support to address barriers identified by youth. These changes were followed by increased participation among historically underrepresented groups, including Indigenous and Northern youth.



4. Implications for Workforce Development

The findings in this brief suggest that the cleantech workforce will increasingly depend on people who can combine AI literacy, cleantech knowledge, applied data skills and strong professional competencies. As clean energy employment grows and employers look for skills ranging from data analytics, machine learning and GIS to communication, adaptability and responsible use of AI, workforce development will need to remain closely connected to changing employer needs (Clean Energy Canada, 2023; Clark et al., 2024; EHRC, 2025).

Training alone, however, is unlikely to address all of these needs. Young people also need opportunities to gain relevant experience and demonstrate their skills to employers. Co-op placements, internships, apprenticeships and applied projects can help, but many existing pathways remain linked to post-secondary enrolment.

Expanding paid, employer-connected opportunities beyond education pathways could help address barriers related to experience, cost, geography and access, thereby providing employers access to a broader pool of emerging talent (Actua, 2024; CEWIL Canada, n.d.; Statistics Canada, 2024).

For organizations working in youth employment, skills development and the green economy, the research points to a need for stronger connections between skills development, work experience and access. Programs can help young people build cleantech and AI capabilities and provide mentorship and direct exposure to employers. They can also help participants understand the environmental impacts and trade-offs associated with AI, rather than treating AI literacy as purely a technical skill.

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