To Alberta and Back Again:

A Case Study into Cape Breton's Pathway to a Just and Green Energy Economy

By

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Abstract

Cape Breton has a long history of extractive industry. Industrial decline in the region has led to high employment and significant social and economic problems. Cape Breton is also at the forefront of Nova Scotia's green energy transition, being the site for multiple large scale green energy infrastructure projects. This thesis seeks to uncover employment gaps in the green energy sector in post-industrial Cape Breton and analyze the industrial and community viability of green energy projects in the region. Through the application of a just transition framework, this study aims to explore how industrial development for green energy can be approached as a means of community revitalization rather than as just an economic process. A variety of gaps in the Cape Breton labour force were identified, and current programs and approaches were analyzed using the Employment Diagnosis Analysis Framework (EDA), developed by the International Labour Organization. A just transition framework was used to apply the EDA data to current green energy programs in Cape Breton, with a particular focus on green hydrogen development in Port Hawkesbury. The study provides direction for the application of a just transition for Cape Breton communities.

Keywords: Just Transition, Green Energy, Green Hydrogen, Cape Breton, Deindustrialization, Workforce

List of Abbreviations

CEST: Custom Employment Support Training bursary

COMFIT: Community Feed-In Tariff

DEVCO: Cape Breton Development Corporation

DOSCO: Dominion Coal and Steel Company

EDA: Employment Diagnosis Analysis

EDSC: Employment and Social Development Canada

EGCRA: Nova Scotia Environment Goals and Climate Change Reduction Act

FTEs: Full Time Equivalent Jobs

IPP: Independent Power Producer

NSCC: Nova Scotia Community College

OPEC: Organization of Petroleum Exporting Countries

SYSCO: Sydney Steel Corporation

Chapter 1: Introduction

Home to Indigenous communities, fishing villages, the world's deepest natural harbour, (mostly closed) coal mines, and a big fiddle, Cape Breton has a long history of extractive and manufacturing industries which have been in decline for decades. Today, the world is shifting away from fossil fuels towards green energy. The number of jobs in the green energy sector has been growing, fostered by the development of new energy infrastructure, which has been creating new opportunities for communities to thrive. Yet there are significant barriers to participation in a green energy transition. While opportunities for jobs are growing, residents in many communities lack the skills necessary to join the green labour force. In Cape Breton, high rates of unemployment and poverty are a legacy of former industries reliant on fossil fuels. Ensuring that local workers can participate in new industry powered by renewable energy is essential to a just transition.

The legacy of industrialism in Cape Breton continues to have an impact on the trajectory of the region today. This introductory chapter will trace the industrial history of Cape Breton, define a few key concepts – including a just transition and green energy – and explain the direction of Nova Scotia climate policy. This history, and those concepts, provide background for analyzing the province's contemporary labour force. This thesis develops a labour force analysis and assesses the potential impact of forthcoming green energy projects in Cape Breton, focusing specifically on the development of green hydrogen plants. I argue that Cape Breton is not ready to implement a new energy boom within a just transition framework.

1.1 Industrial Cape Breton

Cape Breton, an archipelago in northern Nova Scotia, has a long and complicated industrial history. Going as far back as the 19th century, industry was a fundamental part of the community identity of many Cape Breton towns. At the turn of the 20th century, coal and steel were produced under corporate control. At its peak, Cape Breton produced over 40% of the nation's coal output. The Dominion Coal Company operated up to 15 collieries, representing 75% of the total output of coal mined in Cape Breton. After undergoing various economic challenges, Dominion eventually became the Dominion Steel and Coal Corporation (DOSCO) in 1930 (MacKinnon & Parnaby, 2024).

After the Second World War, Cape Breton grappled with the finite reality of the coal industry. In 1945, Cape Breton union leader C.B Wade commented on coal running out: "There can be no possible sense in trying to make a coal mine last 150 instead of 100 years. To attempt to postpone the inevitable is like trying to grasp the infinite; alright for theologians I dare say" (Frank, 2024, p. 166). During the 1950s, DOSCO cut Cape Breton mining operations and invested in new steel production beyond the island (MacKinnon & Parnaby, 2024). In 1960, the Rand Commission recommended "a slow phasing out of coal as the main source of employment" in the Cape Breton region (MacKinnon, 2024, p. 250). Furthermore, in 1966, JR Donald wrote: "One is forced to the reluctant but overwhelming conclusion that no constructive solution to unemployment and the social needs of Cape Breton can be based upon coal mining" (Watson, 2016, p. 222). Donald was suggesting that the government should encourage the winding down of coal and instead emphasize other forms of industrialization. An industrial transition for Cape Breton was anticipated.

On 13 October 1967, a day commonly known as "Black Friday," DOSCO announced their plans to close operations in Cape Breton. Prime Minister Lester B. Pearson acknowledged that: "The closing of the steel plant would sound the death knell for industrial Cape Breton, and it would lead to almost total depopulation of the industrial area. The demoralizing effect upon individuals, families, and other institutions would be beyond human calculation" (Parnaby, 2019). The federal government created the Cape Breton Development Corporation (DEVCO) to take over the mines, while the provincial government assumed ownership of the Sydney steel mill (Parnaby, 2019). DEVCO was tasked with gradually ending coal mining while simultaneously fostering alternative economic development (Langford, 2021).

However, energy markets were reshaped by global geopolitics in the 1970s, with consequences for Cape Breton. In 1973, Arabic OPEC countries decided to raise their benchmark oil prices 70% to a variety of countries, including Canada and the United States. The result was a broad energy crisis in North America – driven by sudden spikes in the price of oil (Rapid Transition Alliance, 2019). This oil shock was mirrored to a lesser extent in 1979. This is important, because at the same time, the share of coal used for energy production had been decreasing, as the share of oil increased to take its place. The oil shocks, and related energy crisis, created a sense of resurgence for coal – broadening the available market as coal came in to fill the gap in energy. The oil shocks, however, also had an impact on green energy. President Carter made a speech in 1977 calling for the adaptation of alternative energy modalities, and that same year the US saw its first entirely solar powered village in Tohono O'odoham reservation in Arizona (Rapid Transition Alliance, 2019). The impact of the oil shocks was significant in Cape Breton. As a result of the rapid increase the price of oil, DEVCO abandoned its plan to end mining and instead reinvested in further coal extraction. This complicated the region's transition away from coal industry. (MacKinnon, 2024). High oil prices also led DEVCO to search for offshore petroleum sources (Langford, 2020). New energy projects emerged across Canada in diverse forms, including nuclear, hydroelectric, renewables, and bitumen.

Following the Second World War, the federal government invested significantly in the development of nuclear resources, creating the Atomic Energy Board of Canada in 1952 to oversee research and development of nuclear energy resources. In the early 1960s, in conjunction with the early collapse of the coal industry, Nova Scotia began to discuss nuclear as an opportunity for new modern industry. Cape Breton participated in these fledging nuclear energy efforts. While the Nova Scotia government contemplated authorizing uranium mining and building a nuclear power plant, two heavy water plants were constructed in Cape Breton (Heavy water, or H3O, was needed for the operation of CANDU reactors) (Leeming, 2017). One of these plants was the Glace Bay heavy water plant located in the industrial center of Cape Breton near Sydney; the other was in Point Tupper, built by DEVCO at the Point Tupper Industrial Park. The Industrial Park was developed as part of the attempted nuclear boom in Cape Breton, as industry tried to divest from coal in the early 1970s. In 1963, the Deuterium of Canada Corporation submitted a bid for a heavy water plant in Glace Bay. The bid was later acquired by Industrial Estates Limited, a Nova Scotia Crown Corporation. In September 1964, the construction of the Glace Bay Heavy Water plant began with a project cost of $28.5 million. By 1970, the plant had still not opened and had cost Nova Scotia a total of 100 million dollars. Glace Bay Heavy Water did eventually open for a short time in the late 1970s, but was never profitable and eventually closed (MacDonald, 2018). The plant is a microcosm of Cape Breton's failures in new economic revitalization programs.

Broadly, Cape Breton was met with a difficult situation after 1945. Its economy needed to undergo some form of energy and economic transition, but the oil shocks and the failure of nuclear energy ultimately meant that coal extraction persisted. For a while, from the late 1950s through the early 1970s, a transition towards alternative industry, employment, and energy sources seemed possible. In the end, however, the coal industry survived, at least until it completely collapsed at the end of the 20th century, leaving Cape Breton to face industrial ruin (Parnaby, 2024).

1.2 Employment Migration

By the early 2000s, much of the coal industry in Cape Breton had disappeared. The last mine closed 1998, and SYSCO – the steel plant – closed in 2001, signalling the end of fossil fuel extraction as a major source of Cape Breton employment (MacKinnon, 2024). The shutting down of industry once again sparked conversations about an energy and employment. However, the dialogue was different in the early 21st century than it had been in the 1970s. Awareness of the local environmental and health impacts of coal, as well as the global impacts of climate change, led to added contemplation of a post-fossil fuel future. Nonetheless, in practice, many Cape Breton workers responded to local unemployment by finding fossil fuel industry jobs elsewhere (Ferguson, n.d.).

Many of those previously involved in Cape Breton mining found employment in the oil and gas industry in Alberta. By 2008, over 2000 tradespeople from Cape Breton were commuting to work in Alberta (Ferguson, 2011). Atlantic Canadians represented nearly 25% of all workers in Fort McMurray; 6.7% of the entire Cape Breton labour force worked in Fort McMurray. More still, between 2006 and 2011, about 45% of all workers working in Alberta oil and gas came from Nova Scotia (Lionais, et al., 2020). These numbers only consider commuters, labourers who worked in Alberta while maintaining a full-time residence in Nova Scotia. An estimated 200,000 Atlantic Canadian workers permanently emigrated to Alberta in the opening two decades of the 21st century (Lionais, et al., 2020) Given the competitive salaries, and the rising number of workers seeking them out, Cape Breton unions began to work in Albertan oil towns. A direct charter flight from Sydney airport began to transport Cape Bretoners to and from the Alberta oil fields (Ferguson, 2011).

Long-distance commuting turned out to be only a temporary solution to Cape Breton employment concerns. Following the global recession of 2008, many of the workers who had been traveling west for decades were laid off, as jobs in the oil patch declined. Once again, Cape Breton was facing significant employment and labour issues.

1.3 Contemporary employment situation in Cape Breton

The 2008 recession, therefore, appeared to signal that fossil fuel industry – both coal and bitumen – would not resolve Cape Breton's labour and unemployment problems. A new post-fossil fuel era emerged out of economic crisis. This era has been defined by high unemployment, high poverty, and high rates of emigration (especially among youth). Unemployment is persistently high. In 2023, unemployment in Cape Breton was 11.3%. While this was the lowest unemployment rate in Cape Breton in the last decade, it was higher than that of Nova Scotia generally. Unemployment varies across communities. Mi'kmaw communities have the highest unemployment rates in Cape Breton at nearly 25% (Nova Scotia Department of Labour, 2016). Cape Breton's workforce also has an age problem. In the 2016 census, it was reported that over a quarter of the Cape Breton workforce was over the age of 55, meaning that 25% of the workforce from 2016 would be eligible for retirement in 2025 (Government of Canada, 2019). For decades, Cape Breton has had problems retaining young people, in large part due to the lack of employment opportunities. Cape Breton has seen a large population decline, driven primarily by the outmigration of young people seeking work and opportunities elsewhere. Those who leave remove themselves from the island's labour force.

1.4 Green Energy

Around the time of the 2008 recession, discussions and awareness of climate change grew, and ideas about green energy became more mainstream. As in the 1970s, demand for energy was high, but Cape Breton's contribution to supply was low. Green Energy now had the possibility of providing a solution to the 50-year-old energy and employment dilemma in Cape Breton.

Despite awareness of anthropogenic climate change, fossil fuels remain deeply entrenched in energy generation. In 2013, coal-fired electricity represented about 20% of all GHG emissions globally (Government of Canada, 2018). Three years later, Canada committed to phasing out coal-fired electricity by 2030, recognizing its negative impacts for both human health and the environment (Government of Canada, 2018). Nova Scotia's climate plan also commits to phasing out coal-fired generation by 2030, with a target of 80% renewable energy by the same year. Nova Scotia's Climate Plan includes a strong focus on employment rights and job creation, while enhancing green energy infrastructure in the province (Nova Scotia, 2022).

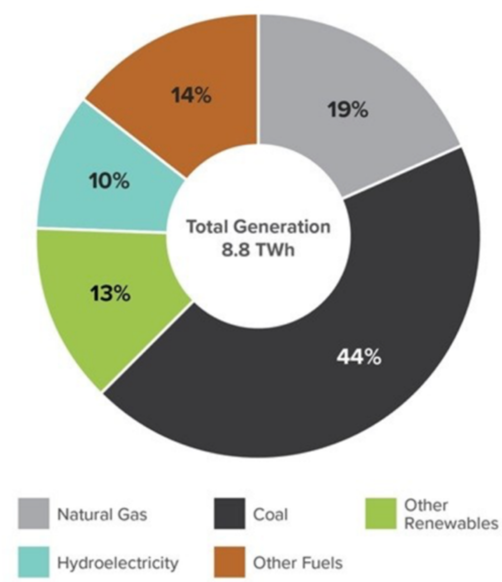

Figure 1.1 *Electricity Generation by Source in Nova Scotia, 2019 (Government of Canada, National Energy Board, 2019)*

Power generation in Nova Scotia has long relied on coal combustion (see Figure 1.1.). However, since 2018, the share of renewable electricity in Nova Scotia has grown, primarily from large-scale investment in onshore wind infrastructure. In 2018, wind represented about 13%

of Nova Scotia's total energy generation, with hydro, tidal, and biomass representing an additional 13%. This represented an increase of 25% in the share of renewable generation since 2013. Yet Nova Scotia still represented 10% of total Canadian GHG emissions from electricity, despite having only about 2.5% of the country's total population (Government of Canada, 2022). Since 2018, Nova Scotia has greatly decreased the share of electricity generated from coal. In 2024, only about 30% of Nova Scotia's power was generated from coal (with an additional 18% from natural gas), although this still represents the largest percentage of coal-generated electricity in any Canadian province (Nova Scotia Power, n.d.).

In the context of this thesis, "green energy" includes renewable energy sources: wind, solar, hydroelectric, and certain zero emissions alternative fuels (specifically green hydrogen). As there is currently no commercial nuclear development in Nova Scotia, it will be excluded from this study, especially as its place as a "renewable" energy is debated. As well, most alternative fuels (such as brown hydrogen or natural gas) will be excluded due to the emissions associated with their use, but also because the Nova Scotia Climate Plan focuses on energy sources applicable to electricity generation.

1.5.1 Green Hydrogen

Green Hydrogen may become a key part of the energy and economic transition in Cape Breton and for Nova Scotia as a whole. Recently, two large scale green hydrogen projects have received approval to begin construction at Point Tupper, near Port Hawkesbury. These projects are part of a local, provincial, and federal push to build a green hydrogen industry in Cape Breton, which is being incentivized through public subsidy, tax incentives, and rebates (Nova Scotia, 2023).

Green Hydrogen is a low or zero emission replacement for fossil fuels. Hydrogen stores energy. It is "green" when it is produced using renewable electricity and water (see Figure 1.2).

Green hydrogen is produced through hydrolysis, a process of running an electric current generated from renewable energy though fresh water, splitting the water into hydrogen and oxygen. Unlike other forms of hydrogen production (and other forms of alternative fuels), green hydrogen does not emit greenhouse gases. Nitrogen is often added to the hydrogen to create green ammonia, an end product which is easier to store and transport long distances (Nova Scotia, 2023).

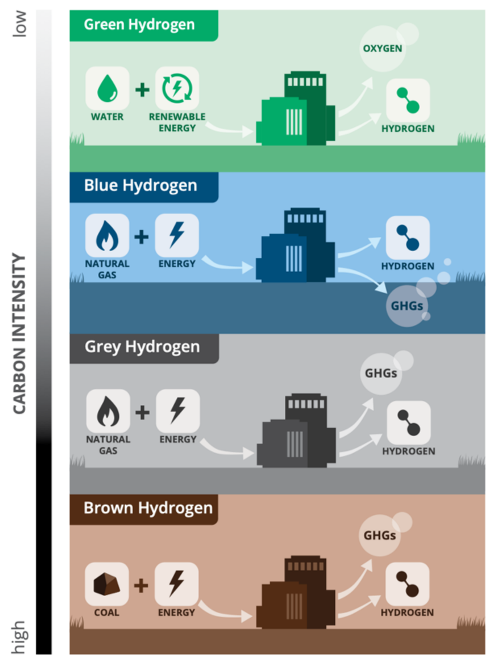

Figure 1.2 Classifying hydrogen by carbon emissions involved in production (Nova Scotia, 2023).

Globally, hydrogen is used for a variety of things, but the main market is in Europe. Nova Scotia plans to use hydrogen as a “flex fuel” to help meet emergency demand in the electricity system, as an export to other jurisdictions, and as an alternative to fossil fuels in hard to abate applications including aviation, heavy duty transportation, and marine shipping. (Nova Scotia, 2023).

The green hydrogen development in Cape Breton is the first of its kind in North America. The development involves two different sites, each owned by a different company: first, a plant owned by Everwind, and second a plant owned by Bear Head. The number of jobs these projects will generate is somewhat unclear, though Everwind estimates the figure at over 100 (Ever Wind Fuels, n.d.).

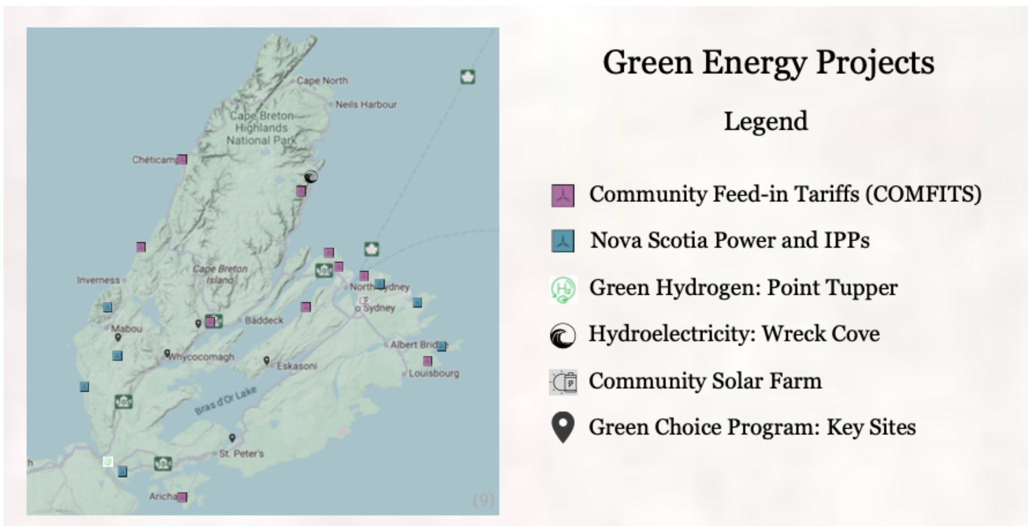

Figure 1.3 Locations of Green Energy projects in Cape Breton

Green Hydrogen is a government priority. In December 2023, Nova Scotia released a Green Hydrogen Action Plan, which outlines the province's efforts to facilitate the development of a green hydrogen industry. The plan includes seven goals and an additional 23 actions items. Some programs have already been initiated to incentivize investment (Nova Scotia, 2023).

1.5.2 Wind

Wind power is a key part of the Nova Scotia energy transition, as it is needed both to power green hydrogen plants and to replace electricity production from coal. According to the Nova Scotia Department of Renewables and Natural Resources, there is significant opportunity for Nova Scotia to play a role in the 200+ gigawatt (GW) of offshore wind planned globally before 2030 (Government of Nova Scotia, 2024). Importantly, 1 GW of offshore wind can power roughly 750,000 homes. Nova Scotia has started the process to foster 5 GW of offshore wind energy generation by 2030, either electricity or green hydrogen production. Geographically, Nova Scotia is well suited for offshore wind. The province sits on a large continental shelf, creating relatively vast areas of low water levels for the installation of fixed bottom offshore wind, which is significantly cheaper and easier to install than floating offshore wind (Cape Breton Partnership, 2023).

Thanks to relatively high average wind speeds, Cape Breton and Nova Scotia are also well suited to onshore wind projects. For context, in Nova Scotia, each megawatt of onshore wind powers about 350-400 homes. As of August 2024, there were about 300 commercial wind turbines in the province, most of which are opened and operated by Independent Power Producers (IPPs). The Nova Scotia Clean Power Plan calls for 1000 MW of onshore wind capacity by 2030, which would represent about half of the province's power usage. Currently, Cape Breton operates 16 wind farms, generating roughly 68 MW. Seven of these farms are owned in part or entirely by IPPs, who sell the power to NSPI. IPPs represent the majority of Nova Scotia's current onshore wind portfolio. The other nine farms are owned through Community Feed-in Tariffs, meaning they are owned either in part or entirely by community organizations. Further wind projects are planned for Cape Breton, some currently undergoing the environmental impact assessment process, while others are in the early stages of development (Nova Scotia Power, n.d.).

1.6 Nova Scotia Climate Policy

There are three relevant categories of climate policies and programs that support green energy in Nova Scotia: the Climate Plan, the Electricity Act, and provincial funding programs. In 2022, Nova Scotia released its Climate Plan, a framework for meeting the Climate Targets legislated in the Environmental Goals and Climate Change Reduction Act (EGCRA). The act set legally binding benchmarks for the province's transition away from fossil fuels. The Climate Plan laid out a series of steps to transition to green energy, to adapt to the impacts of climate change, and to mitigate climate risks (Nova Scotia Department of Environment and Climate Change, 2022). The provincial plan is more extensive than local ones, including in the formerly coal-producing Cape Breton Regional Municipality.

The Electricity Act was amended in 2023 to better support the transition to renewable energy. The Act regulates the province's privately-owned electricity utility – Nova Scotia Power – and sets the structural parameters for power infrastructure. The amendments introduced new regulatory and administrative bodies to facilitate an energy system with diverse production mechanisms. For example, the amendments allowed for sleeved power purchase agreements, which facilitate the sale of energy from the renewable generator to a customer, using Nova Scotia Power's infrastructure to deliver the power (Randell, 2024).

A variety of provincial programs exist to facilitate the energy transition. The Nova Scotia Green Choice Program is designed to allow large scale consumers to purchase renewable electricity, helping to generate demand for green energy projects. Recently, the Program has announced a variety of large scale wind development projects, co-owned primarily by Mi'kmaw communities. One of these projects is in Cape Breton, The Rhodena Farm, in Inverness County. It was developed by ABO Energy Canada in partnership with Eskasoni, Potlotek, We'koqma'q L'nue'kati, and Wagmatook First Nations (Coho, 2025). The province also administers funding programs such as Low Carbon Communities, which provides funding for pilot projects and feasibility studies.

There are also a variety of green economy employment-based programs funded by the province and primarily administrated by the Clean Foundation. These include the Clean Leadership Program (which provides internships to over 100 youth each summer), Science Horizons and Green Jobs (which provide longer-term internships to youth across the country), the CEST (a subsidy program to help young professionals acquire the skills they need to enter the green workforce), and the Indigenous Energy Advisor Program (which trains indigenous youth as energy advisors to support building retrofit programs) (Clean Foundation, 2025). All these programs are helping to address the skills gap in green energy (Nova Scotia Department of Environment and Climate Change, 2022).

1.7 Green Jobs

Green Jobs are identified by a federal employment agency as jobs "that contribute to positive environmental outcomes (such as preservation, conservation and restoration)" (Government of Canada, 2021a). Many different kinds of jobs can be classified as green jobs, but examples include wind turbine technicians, heat pump installers, and electric vehicle drivers. Job Bank Canada relies on a list developed by the Department of Employment and Social Development Canada, in cooperation with the Organization for Economic Co-operation and Development. The list contains categories from the National Occupation Classification System (NOC), which includes "different jobs with primary duties and responsibility that may directly or indirectly help the environment." The definition of green jobs is broad and primarily relies on self-reporting by employers.

1.8 Research Question and Approach

As Cape Breton approaches 2030 – the target deadline set by the province for the large-scale adoption of green energy (80% renewables) – the region will need to confront its industrial history and the socio-economic issues its communities continue to face. Nova Scotia policymakers and residents need to consider a key if complex question: how can the green energy transition in Cape Breton be designed to address employment barriers, skills gaps, and community development, while ensuring a just transition and fostering industrial development as a means of broader community revitalization rather than merely as an economic process? For Cape Breton, a community development focus will be especially important, as history has shown that blind industrial investment cannot address employment problems. Cape Breton needs to question how existing programs and approaches can be evaluated to identify best practices and inform future policy and community-driven initiatives. This study will aim to address some of these tasks and to provide a broad analysis of how Cape Breton can approach community development while transitioning to green energy.

1.9 Thesis

This thesis will aim to answer the above research question through a multi-step analysis of the Cape Breton labour force and the prospects for green employment. Chapter 2 offers a literature review, examining some of the historical scholarship on industrial decline in Cape Breton and engaging with key concepts such "green jobs" and "just transition". Chapter 3 describes the methods employed in the analysis and discussion.

In Chapter 4, the analysis will have three main sections. Firstly, Employment Diagnosis Analysis, from the International Labour Organization, shows that there are strong gender divides in the labour market in Cape Breton. It also demonstrates that men are undereducated compared to women, and that men work in the private sector at a much higher rate than women. It shows that women mostly work in healthcare and education, with men primarily holding blue-collar jobs in fields such as construction. EDA also shows that Cape Breton has very high unemployment, and a very high rate of working poor. The second section of the analysis focuses on green hydrogen projects as a specific lens to outline what green energy might look like, practically, for the Cape Breton region. It shows that green hydrogen projects could bring many jobs to Cape Breton, specifically to the Port Hawkesbury area, but that there are significant barriers to the implementation of large-scale green hydrogen projects in the region, which will put significant strain on local communities. Finally, in Chapter 5, the discussion interprets the analysis in relation to the principles of a just transition. It found that green hydrogen projects could be better accomplished using a just transition framework by implementing targeted programs and incentives to better support local communities and by insuring access to necessary services such as housing, education and healthcare – while also facilitating access to skills training and employment support.

This study argues that the development of green hydrogen (and green energy broadly) in Cape Breton is not currently being done in a sustainable, community-focused way. Current energy projects do not include employment policies and programs that would ensure that the projects will be part of a just transition. However, if employment policies and programs focused on the needs of Cape Breton workers, green energy could provide an important pathway to income and community revitalization in Cape Breton.

Chapter 2: Literature Review

There is a variety of relevant literature on the history of the Cape Breton economy and on the contemporary labour force and green energy situation. Historical accounts provide an important background for tracing the industrial history of the region. Additional scholarship on deindustrialization and the impacts of labour migration contextualizes the challenges associated with transitioning labour markets. The purpose of this literature review is to provide a broad basis for understanding the Cape Breton labour force in order to understand the present transition crisis of the region.

The literature review will also provide an outline of key concepts. It will examine the "just transition" concept and describe the six key principles that will guide the later analysis. The chapter will also introduce the Employment Diagnosis Analysis and highlight how this approach can help explain the contemporary employment situation in the Cape Breton region. The literature review will also define green jobs, and explain the challenges associated with creating a succinct and complete definition and figuring out which jobs should be included within this definition.

2.1 Unraveling of Industry

Cape Breton's industrial past continues to shape current labour force dynamics. There is significant literature on the coal and steel industries and their unraveling. Historians have also debated the causes and impacts of industrial decline. Historians Lachlan MacKinnon and Andrew Parnaby link a regional industrial crisis to a loss of market share of coal in Canada during the 1950s, especially as diesel-powered trains replaced coal-powered engines. Corporate strategy was also influential, as DOSCO elected to adopt a two-pronged strategy of "retrenchment in mining" and a "re-orientation" on steel (MacKinnon & Parnaby, 2024). Government policy likewise mattered. Parnaby indicates that the repeal of the Coal Equality Act in 1960 withdrew the subsidy to Cape Breton mines. The Rand Commission confirmed the decline of coal and steel in the region and, as Parnaby notes, led to at least fourteen mine closures by 1966, decreasing employment in the island's coal sector by nearly 40% (Parnaby, 2019).

Governments tried to save Cape Breton industry and diversify the regional economy. DEVCO, a federal agency, assumed control of coal mining operations in 1967. Historians have been particularly interested in questions about the impacts of federalizing coal in Cape Breton, debating whether it was the best approach to assuring the economic and cultural sustainability, and tracing how choices made during the 1960s and 1970s created a situation for high unemployment and significant employment migration in the decades that followed (MacKinnon & Parnaby, 2024).

Sullivan Macdonald (2018) has discussed how an alternative energy project was part of the effort to develop new industry in Cape Breton. He assesses the Glace Bay Heavy Water Plant. Macdonald explains how the federal government invested significantly in the development of nuclear resources, creating the Atomic Energy Board of Canada in 1952 to oversee research and development of nuclear energy resources. In the early 1960s, a nuclear project seemed like an opportunity to modernize Cape Breton's fading energy sector. Through public-private partnership, a heavy water plant was built in Glace Bay, at significant cost, between 1963 and 1967. Macdonald describes how the plant never opened due to variety of concerns with the construction. By 1970, the plant had cost Nova Scotia a total of 100 million dollars. Despite a federal bailout that year, the plant was never successful (Macdonald & Beaton Institute, 2018).

As industrial employment contracted in Cape Breton, labour migration was one common response. Donatelli et al. (2017) explore the impacts of migration, largely to Alberta oil fields.

They argue that rather than advancing an alternative to fossil fuel industry, large-scale employment migration itself contributed to the economic and industrial decline in Cape Breton. Migrant work delayed some economic issues for individuals, but did not alter Cape Breton's fossil fuel lock-in. Brooks et al. (2023, p. 5) describe "carbon lock-in" as a series of "technological and institutional blockages to energy transition that can be traced back to economic and political choices made in the past." They suggest that Atlantic Canadian fossil fuel lock-in was strengthened by dependence on employment in the west (Brooks et al., 2023). Sharpe et al. (2007) highlight that interprovincial employment migration can impact living standards, as investment in community infrastructure occurs in the place of industry rather than in the communities where migrant labourers originate. This can exaggerate regional disparities within Canada (Sharpe et al., 2007). Amirault et al. (2013) agree by noting the inefficiency and inequities in the regional nature of labour markets in Canada. One inequity, Finnie (1999) notes, is that younger male workers tend to migrate, while other demographics remain behind. Sharpe et al. (2007) also warn that interprovincial migration is dependent on the availability of work and, in the case of Alberta petroleum industry, is dependent on the price of oil.

2.2 Deindustrialization

Deindustrialization is an important concept for understanding the context of fossil fuel lock-in in Cape Breton. High and MacKinnon (2023) view deindustrialization as an integral part of capitalism. Under the competitive pressures of capitalism, extractive industries seek to remain profitable by cutting labour costs and increasing automation, undermining employment opportunities. When these industries collapse, employment vanishes and communities are left on their own to contemplate a transition into an economy based on more value added materials (MacKinnon & High, 2023).

Scholars offer several different definitions of deindustrialization. Feltrin, et al. (2022) prefer seeing deindustrialization as a process where manufacturing makes up a declining share of total employment, regardless of industrial output. Steve High (2023, p.53) places more emphasis on the disappearance of industries themselves, though he cautions that the impacts extend beyond economic processes, meaning that deindustrialization relates to "social and community factors alongside economic and political considerations of industrial change." High highlights the need for a regional understanding of deindustrialization. He also focuses on how long-term underdevelopment creates the social and economic situation for deindustrialization (High 2023). Parnaby (2019) similarly notes that deindustrialization can be considered as a broad organizing principle, with a longer temporal frame stretching to the period before complete industrialization. While Cape Breton, directly dependent on fossil fuel industry, has long faced the process of deindustrialization, Gibbs (2021) notes that the prospect of phasing out fossil fuels under the targets established by the Paris Accords may lead to further deindustrialization. Feltrin et al. (2022) link increasing automation and technological investments to deindustrialization.

Alice Mah focuses on the human and environmental health impacts of industry and the lasting impacts of deindustrialization. She uses the term "noxious deindustrialization," which refers to the disappearance of industries that involve environmental, social, and cultural harm. Noxious deindustrialization goes beyond just the toxic legacies of past production. For example, rather than just considering the soil and water contamination from the tailing ponds in Cape Breton, the framework would also include spikes in depression and addiction that come from health inequities after industrial plants close (Mah, 2016).

2.3 Just Transition

Academics, governments, and labour leaders have been talking about how the large-scale introduction of green energy will impact workers and jobs for years. The term "Just Transition" was coined by union leader Tony Matzzochi in the early 1970s. Matzzochi and his colleagues with the Oil, Chemical, and Atomic Workers Union acknowledged the environmental harms being caused by their industries and favoured thinking that did not pit “jobs vs environment” (Pai et al., 2020). Mertins-Kirkwood explains that the concept of a “just transition” only entered the global discussion about climate change policy during the 2000s (Mertins-Kirkwood, 2018). In 2013, the International Labour Conference (ILC) adopted a resolution and a set of conclusions concerning sustainable development and decent, green jobs, titled *A Just Transition*. By 2015, the ILC convened a tripartite meeting of experts to develop a framework for a just transition (ILC, 2015). According to the International Labour Organization, a just transition refers to a “framework for minimizing the potential harm to workers and communities caused by the shift away from fossil fuels while maximizing the potential benefits that decarbonization entails” (ILO, 2015).

The just transition process has two parts: minimizing harm through reactive policies and maximizing benefits through proactive policies. Mertins-Kirkwood and Duncalfe (2021) argue that the policy emphasis should be on the latter, highlighting the importance of a sufficiently proactive and well-managed transition for workers. Minimizing harms involves an emphasis on protecting those currently employed in “vulnerable sectors” (in this case sectors, such as oil, gas and coal, that will be phased out by climate commitment). Maximizing benefits involves proactively planning a thriving economy that provides opportunities in a green energy sector (Duncalfe et al., 2021).

According to Duncalfe et al. (2021), a just transition also requires social dialogue and public consultation. It focuses on promoting participation from those people (workers and their unions, but also broader community members) impacted by decarbonization. This thesis offers context for more participatory processes by describing the history of extractive labour in Cape Breton, analyzing the emergent green energy sector, identifying the current labour force in relation to green energy employment, and discussing how a just transition might offer a path forward.

Scholars and labour organizations insist that a just transition encompasses a set of principles. A first principle is a recognition of rights, which sets out the principle of justice. In a legislative context this requires a recognition of human rights, labour rights, Indigenous rights and migrants' rights. There must be a specific focus on workers who are facing displacement or forced migration. A just transition must uphold the basic human right to "clean, healthy and adequate air, water, land, food, education and shelter" for both current and future workers (Mertins-Kirkwood & Duncalfe, 2021).

A second principle is that a just transition must be centered on the workers and the affected communities themselves, creating avenues for active participation. This idea has been described in a variety of ways: social dialogue, public consultation, and democracy. The specific focus here is to make sure that all voices are included. Typically, organized labour has the strongest voice in conversations about labour rights – and so a just transition must go beyond just organized fossil fuel workers (Trade Unions for Energy Democracy, 2018).

A third principle is that a just transition must go beyond just a focus on workers' rights. A full just transition also requires a focus on a strong social security system. This includes supports for workers' careers, but also supports beyond that – healthcare, housing, education (Stark et al., 2023). As a fourth principle, a just transition must include a certain level of economic growth. A just transition provides not only new opportunities but also should create economic diversification (Citizens for Public Justice, 2019).

Montmasson-Clair (2021) builds on this point by suggesting that mutual understanding and shared solutions should be at the forefront. One approach would be adopting a differentiated responsibility approach, where different sectors have specific responsibilities for the different aspects of a just transition framework (Montmasson-Clair, 2021).

There is significant literature focused on the position of coal miners within a just transition, with approaches varying by study region (Brown & Jeyakumar, 2022; Chesmore et al., 2021; Citizens for Public Justice, 2019; Hulse, 2019; Baran et al., 2020). Each anticipate coal miners adapting to low-carbon alternative industries. Sheer et al. (2022) underline the precarity of extractive fossil fuel industries in Canada and prioritize jobs needed within a decarbonized energy transition. (Scheer et al., 2022). Baran et al. (2020) use Poland as a case study to explain how workers failed to transition into other industries after coal. They trace a variety of factors, including education levels and income disparities. Importantly, they outline macroeconomic forces and net job loss that occur during a green energy transition, no matter what specific scenario is implemented (Baran et al., 2020).

Additionally, Brown and Jayakumar (2022) highlight the importance of focusing on the inclusion of Indigenous communities, and uplifting communities who are not typically included in discussion about large-scale infrastructure planning. They also focus on the need for strong transition financing mechanisms not limited to carbon pricing policies. Finally, they focus strongly on the need to work with federal governments, something Cape Breton communities are frequently wary of, due to the legacy of nationalization (Brown & Jeyakumar, 2022).

Chapman et al. (2021) recommend a shift in thinking about industry and employment in a post-Covid world. They note that the pandemic shook economies and disrupted many labour systems (Chapman et al., 2021). This thesis will take note of the dichotomy between pre- and post-Covid labour dynamics. Strachan et al. suggest that the ongoing recovery from COVID provides an opportunity to break with fossil fuel lock-in and build new systems that can help to address the problems facing post-industrial communities (Strachan et al., 2023).

2.4 Green Jobs

Green jobs are hard to define. The ILO defines green jobs as "decent jobs that contribute to preserve or restore the environment, be they in traditional sectors such as manufacturing and construction, or in new, emerging green sectors such as renewable energy and energy efficiency" (ILO, 2016). The ILO says that these jobs may improve efficiency (of energy and resource use), work to limit greenhouse gas emissions, minimize waste and pollution, protect and restore ecosystems, and/or support adaptation to the impacts of climate change. The ILO suggests that the jobs will vary by economic sphere. For example, some green jobs might provide goods or services that benefit the environment, without being rooted in "green" production processes (ILO, 2016).

According to the Canadian government, green jobs are those which "contribute to environmental preservation, conservation, and restoration. Their impact on the environment varies depending on the specific requirements of the job: it may be direct (such as a solar panel installer) or indirect (such as a financial advisor who recommends eco-friendly investment options)." In the federal job bank, a job is marked as a "green job" when the employer indicates that the job contributes to positive environmental outcomes (such as helping Canada meet its "Net-Zero Targets") (Statistics Canada, n.d.).

Stantef-Puica et al. (2022) provide a further definition when they describe "green jobs" as any decent work that contributes to maintaining and restoring the quality of the environment, whether in agriculture, industry, services, or administration. This outcome may be achieved by reducing energy consumption and raw materials, minimizing pollution and waste, protecting and restoring ecosystems, and enabling companies and communities to adapt to climate change (Stanef-Puică et al., 2022). Still, the European Union defines green jobs more directly in relation to information, technologies, or materials that preserve or restore environmental quality. This work requires specialized skills, knowledge, training, or experience (e.g., verifying compliance with environmental legislation, monitoring resource efficiency within the company, promoting and selling green products and services) (European Union, 2024). A last definition is dynamic, holding that a "green job features characteristics that contribute to a socio-ecological transition in focus and activity through supporting an increase in the use of renewable energy or a reduction of the use of non-renewable energy" (Colijn, 2014).

Despite a diversity of understandings, a green job is generally associated with methods that aim to lower the environmental impact of the job to acceptable levels to assure the sustainability of communities. Definitions also typically include some focus on decarbonization of the economy. The ILO notes that some of the uncertainty in the green jobs discourse comes from the novelty of key concepts. "Green jobs" strategies have only arisen in the last two decades (ILO, 2018). Novello and Carlock (2019) also draw a connection between the concept of green jobs and the "Green New Deal." Some scholars have wondered about the degree of "greenness" needed to consider a job green (Apostel & Barslund, 2024).

A variety of academics have written about the inconsistencies involved in enumerating green jobs. Estimates vary considerably depending on the methodology employed. Yet differences are typically less to do with uncertainty about the jobs themselves (outlook, number of jobs, etc) and more about different conceptualizations and measurements. However, there is still confusion due to shortcomings in some measurement techniques. Stanef-Puică et al. (2022) find uncertainty in the level of environmental and social protections that should be included in definitions of green jobs, as well as about the necessary inclusion of sustainable development goals. There is no broad and universal literature establishing exactly what a green job is – and what sector they exist in. However, some sources suggest that there are some economic sectors that seem to more prone to green job creation (Stanef-Puică et al., 2022).

While the characteristics, skills, and education involved in these jobs vary, the literature does suggest a few important trends. Apostol and Barslund (2022, p. 11) note that green jobs "require technical skills, are higher-skilled, demand more educational attainment, are male-dominated, and are relatively high-quality (e.g. higher-paid, full-time, permanent contract)."

2.5 Employment Diagnosis Analysis

The ILO has developed several approaches for understanding labour policy. For example, the Skills Needs Anticipation System (SNAS) "relies on various methods that collate and summarize labour market information (LMI) to analyse skill shortages and labour market imbalances. They are often forward-looking and can be combined to provide a more detailed and multifaceted picture of the labour market." SNAS provides a process for analysing the skills needs on a federal level and can be used for policy recommendations and planning. Another approach, Employment and Labour Market Analysis (ELMA), allows for study of approaches promoting productive and decent employment (Mummert, 2016).

The approach adopted in this thesis follows Employment Diagnosis Analysis (EDA). It provides a unique approach because it can be scaled to a provincial or regional level and does not require analysis on the federal level. EDA is a mixed methods approach (qualitative and quantitative) and a "tool for context-specific analysis of the dynamics and characteristics of employment and to identify and understand the causes behind the main constraints and challenges, as well as opportunities for increasing productive employment in an inclusive and sustainable manner" (ILO, 2012, p. 1). The main objective of EDA is to provide a sound knowledge base for effective policies, institutional reforms, and other interventions aimed at reducing barriers to inclusive and job-rich growth. Typical EDA studies draw information partly from in-person workshops. However, that data collection technique is beyond the scope of this study. Instead, publicly available data will be analyzed. EDA provides a variety of factors for understanding labour dynamics, including a series of key quality of life indicators that allow for understanding employment. EDA also provides important direction as to possible and relevant sources for key data points.

2.6 Conclusion

As Cape Breton has undergone deindustrialization over the last 75 years, there have been multiple attempts to transition away from fossil fuel industries. So far, these efforts have to some extent failed, leaving Cape Breton suffering from industrial ruin. Yet as this literature review also discussed, “green jobs within a just transition” can help guide discussions about facilitating a post-fossil fuel economy for workers in Cape Breton in the 21st century. An EDA analysis can offer insights on the labour force dynamics that will be part of the policy process.

Chapter 3: Methods

The purpose of this study is to determine how policies for a green energy transition in Cape Breton can be designed to address employment barriers, skills gaps, and community development. This would ensure a just transition for workers and local communities by fostering industrial development that serves community revitalization rather than mere economic growth.

The study's methods involved data collection, statistical analysis, and interpretation. Data was collected primarily from Statistics Canada, supplemented with data from the Nova Scotia statistical program and provincial reports. Data about green jobs programs was also collected, especially in relation to green hydrogen projects at Point Tupper. Data was cleaned, prepared, and then analyzed primarily by graphing labour force indicators over time. Chi-Square and Phi were used to analyse statistical correlations, and to suggest the strength of relationships between different factors in the labour force.

Data interpretation followed three interrelated steps. First, an Employment Diagnosis Analysis was conducted to map the contemporary employment situation in Cape Breton and identify the existing gaps in skills and opportunities. Using the EDA as a guide allowed for a statistical analysis of the Labour Force Survey and Census Data to create a picture of the 21st century employment situation in Cape Breton. Second, an assessment of the opportunities presented by green hydrogen development was carried out in light of present labour force dynamics. Third, in the Chapter 5 discussion, the findings were interpreted in relation to just transition principles. Conclusions were drawn about the data, and recommendations will be offered on current policy approaches.

3.1 Data Sources and Confirmatory Statistical Processes

A variety of data sources (Census Data, Economic Data, Employment Data, and some health data) were consulted. The primary data source was Statistics Canada, with particular focus on the 2021 Census and the Labour Force Survey. Data from 2021-2025 was prioritized, allowing for an interpretation of the impacts of COVID-19 on the labor force. Some data covering a longer time frame (2005-2025) permitted analysis of how the 2008 recession impacted the Cape Breton, Nova Scotian, and Canadian labour forces. Data was also collected from additional sources, including the Nova Scotia Statistical Program and a variety of government reports and budgets.

Several considerations shaped how the data was prepared for analysis. The Labour Force Survey data was recoded to address changes in the survey questions over time. Most of the data was analyzed on a Nova Scotia wide level, primarily due to data availability. Much of the labour force data for Cape Breton is either confidential or the sample is too small to provide significant analysis. Census data (for example, the age pyramid or gender dynamics) were mostly considered on the Cape Breton level, where the scale, and therefore data availability, is much higher. Data was only analyzed on a scope larger than Cape Breton when the available data did not allow for Cape Breton to be the sole focus.

A few steps were taken to prepare the data used in the primary analysis (guided by the EDA). First, the data was split and information was retained for January of each year. This decision was taken because the labor force survey is quarterly. Therefore, data for 2025 is not yet complete. Without this temporal coding, data and associated results would be skewed due to the small number of responses from 2025. It is, however, important to acknowledge that there may be some constraints associated with only considering data from the winter season. January data reflects holiday season employment trends. Additionally, the seasonal nature of many of the industries in Cape Breton – such as tourism – influences the data. The statistical difference between using all months and only one month was found to be minor. Z-score was calculated to show this statistical difference.

There are a few key limitations associated with recoding the data. In 2024, Statistics Canada changed the Labour Force Question concerning Sex/Gender. Originally, the variable was "sex," referring to the "sex of respondent." The options were Female or Male. However, starting in 2024, the variable became "gender," referring to "gender of respondent." The options were man+ or women+. The plus here allows for gender queer individuals to self-identify. For this study, these two variables are being treated as the same, where sex-male and gender-male+, as well as sex-female and gender-women+, have been combined into one variable to facilitate analysis over a larger time period. This does present some limitations to the study and could result in errors in the analysis. However, as the general concern when disaggregating by gender is men compared to women in the workforce, it is reasonable to combine these variables. Sexuality, by contrast, is beyond the interpretative scope of the study, in part because Statistics Canada does not collect employment data regarding LGBTQ+ individuals in Cape Breton.

Throughout the analysis, results were disaggregated by gender to allow for a richer understanding of labour force dynamics. This is based on the recommendations by the ILO, in the Employment Diagnosis Analysis methodology section. Despite significant effort throughout the last few decades to work towards education and employment equality, there are still serious barriers for women in the labour sector. Beyond barriers, this analysis will show that there is notable divergence in type of employment (occupation and industry) across gender, which is extremely important in creating recommendations for future analysis.

Additionally, this study has some limitations as a result of the localized and small size of Cape Breton. As a result, in some places, data on the Nova Scotia level was used instead. This is the case for most Labour Force Survey data, where most Cape Breton level data is censored to maintain the confidentiality requirements of Statistics Canada. However, while most labour force data was taken at the Nova Scotia level, community indicators were determined at the Cape Breton level.

3.2 Employment Dynamics Analysis

Employment Dynamics Analysis provides a framework for understanding labour force dynamics in a given place. Demographic and employment data provide a foundation, while income inequality, educational achievement, and other indicators of well-being are also part of the framework. Figure 3.1 summarizes the key indicators of the EDA approach used in this thesis.

Quantitative analysis corresponding to the other EDA indicators was conducted. Primarily, Labour Force Survey data was analyzed using SPSS, a statistical software program. The RDS tabulation engine was used for census data. At times, Excel was used to analyze Cape Breton-specific data. A variety of statistical relationships were tested and investigated using the Chi-Square test of independence, and strength of correlation was tested using Phi. When data sampling was done, Z-scores were calculated to ensure that sample results matched population results. In the first part of Chapter 4, which develops this study’s findings, most of the quantitative data is presented through graphs and tables, complemented by explanation.

- *External employment dynamic factors:*
    - Population: Age and Sex compositions
    - Migration
- *Labour Force Characteristics:*
- Working age population
- Labour force participation
- Informal employment
- Working Poor Rates
- Unemployment
- *Human Resource Base:*
- Qualitative aspects of human resources
    - Highest education level
    - Employment Breakdown by Industry and Occupation
    - Health Indictors: Life Expectancy, housing access, child poverty rates
    - Employability: Sector of Work
- *Income inequality and Poverty:*
- Income Inequality - Gini Coefficient
- Poverty and the working poor

Figure 3.1 Employment Dynamics Analysis indicators

The EDA approach permits an analysis of productive employment. Productive employment refers to working persons whose income is sufficient for a standard of living above the poverty line. In turn, the deficit encompasses members of the labour force unable to meet their basic needs, encompassing two categories: the working poor and the unemployed. While the EDA outlines two potential methods for making the calculation, this study opts for a simplified method, summing data on unemployed persons with an estimate of the working poor (ILO, 2012).

Determining the proportion of people comprising a working poor required calculation. The ILO's formula suggests that the working poor equals the total employed population aged 15 and over multiplied by the per capita poverty rate x 100. This simplified formula for working poor has some limitations as it assumes that "the actual average intra-household dependency ratio (i.e. the number of mouths each breadwinner has to feed) is the same in non-poor and in poor households" (ILO, 2012, p.41). The simplified formula also assumes that the "the poverty rate of working age people is equal to that of the population as a whole, the labour force participation rate is the same for the poor as it is for the population as a whole, the employment rate is the same for the poor as it is for the population as a whole" (ILO, 2012).

3.3 Green Energy Jobs Hydrogen

A subsequent section of the analysis provides an assessment of current and future green jobs in Cape Breton, drawing on Statistics Canada and provincial sources. Proposed green hydrogen projects are one focus. The employment outlook for green energy jobs is analyzed in relation to the findings of the EDA.

3.4 Just Transition

As established in the literature review, a just transition is a "framework for minimizing the potential harm to workers and communities caused by the shift away from fossil fuels while maximizing the potential benefits that decarbonization entails" (Mertins-Kirkwood & Duncalfe, 2021). A just transition framework calls for understanding how to plan and implement successful programs and policies to ensure that green energy industry benefits Cape Breton workers and communities. In light of the statistical analysis developed in Chapter 4, Chapter 5 discusses how green hydrogen development, and green jobs more generally, can be implemented in a way that supports regional workers and their families.

Chapter 4: Analysis

Applied to Cape Breton, the Employment Dynamics Analysis framework provides an overview of the labour force between 2017 and 2025. It also highlights the significance of key social and community indicators beyond workplaces. Such analysis then facilitates an assessment of the employment impacts of proposed green energy projects in the region – with specific focus on green hydrogen development. These two lines of analysis offer insights on the prospects for a just transition in Cape Breton.

Cape Breton's labour force is aging and already struggling with high unemployment. Employment in Nova Scotia, including Cape Breton, is concentrated in a few key sectors—construction, healthcare, administration, and sales and services. While the number of employees in each field differs by gender, there remains a strong reliance on these industries. Cape Breton faces both high unemployment and a significant need for housing, coupled with low life expectancy. Life expectancy can be indicative of various health and community factors and broadly reflects a region that is struggling to meet the needs of its population.

However, new industries are emerging in Cape Breton, particularly in the field of green energy, especially green hydrogen. Green hydrogen projects in Point Tupper are expected to bring hundreds of temporary and full-time jobs in critical sectors such as administration and construction.

4.1.0 An Employment Dynamics Analysis for Cape Breton

Figure 4.1 illustrates the pathway of this chapter's EDA analysis. Each indicator will be analyzed and explained in keeping with the framework devised by the ILO.

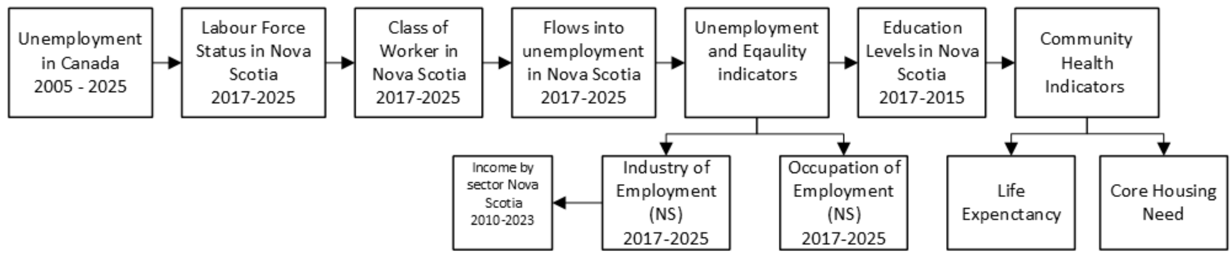

Figure 4.1 Flowchart showing EDA process

4.1.1 Canadian Labour Force Trends

The Cape Breton labour force is a part of the Canadian labour force. Figure 4.2 illustrates country-wide employment status over the last 20 years. Employment decreased significantly in 2020-2021 because of COVID-19 and health-related shutdowns. The drop had significant impacts on labour trends and may have skewed analysis across the longer temporal period. However, COVID-19 is still very important to consider when analyzing green jobs. There is evidence to suggest that COVID-19 pushed forward some aspects of the green energy transition. Moreover, as ensuing data will show, some Cape Breton employment indictors and industries have not recovered to their pre-pandemic levels. Therefore, policies and plans developed prior to Covid may not correspond to more recent conditions.

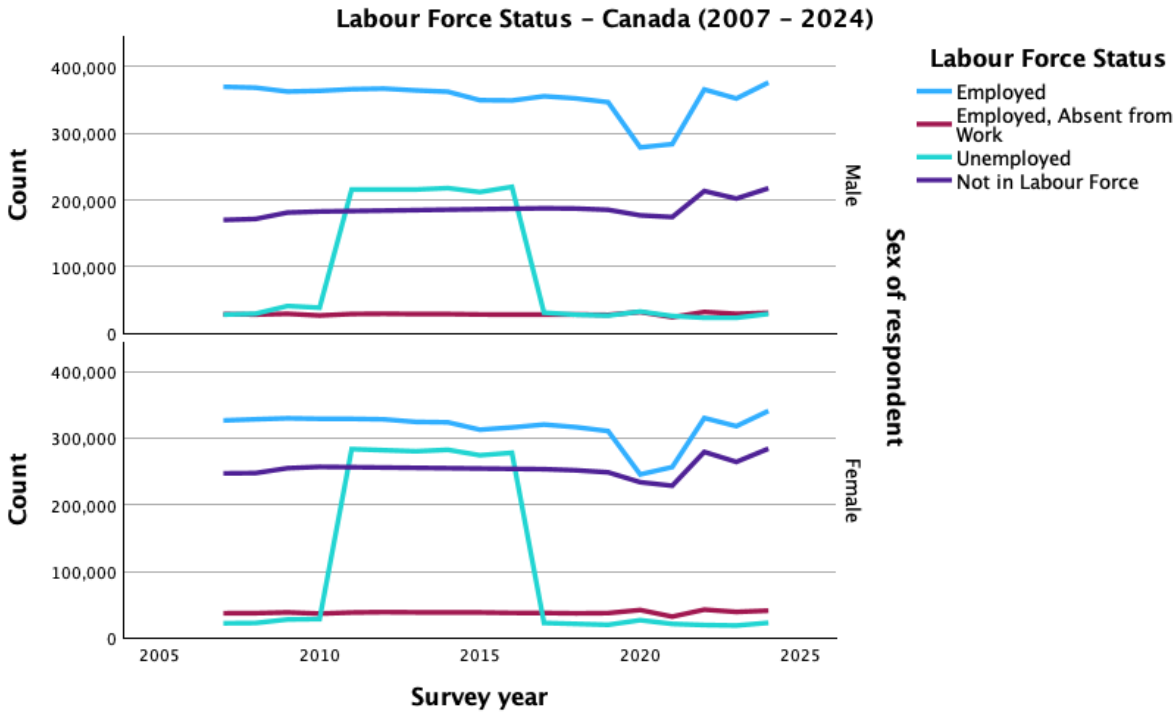

Figure 4.2 Labour Force Status, Canada 2007-2024

However, the figure also shows how sudden changes are not atypical. Unemployment increased markedly during the recession that began in 2008-2009. Unexpected shifts in employment level are likely to recur going forward.

Additionally, climate change will also impact employment by changing the types of jobs and industries that make up the labour force. While jobs will be lost from the winding down of fossil fuels, green energy will also provide new jobs going forward. The policies created for a just transition, if created, will partly influence future employment trends.

4.1.1 Labour Force Status in Nova Scotia

Labour force dynamics at the provincial level, discernable through an analysis of Labour Force Status data, contextualizes Cape Breton trends.

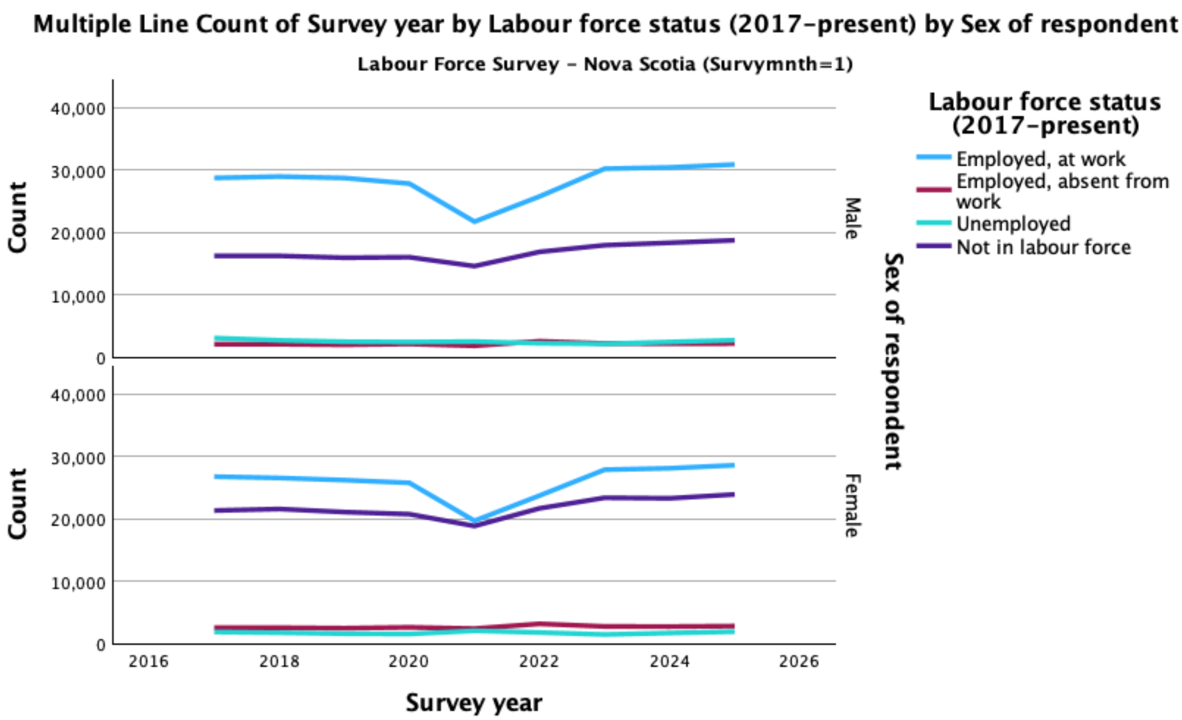

Figure 4.3 Labour Force Status in Nova Scotia, disaggregated by Gender

Labour sector relates to a variety of other indicators that will be explored later in this section, but it is important to establish a baseline for understanding rates of employment in relevant communities. Figure 4.3 shows the labour force status of Nova Scotians from 2017-2025. The ratio of those employed to those not in the workforce differs by gender, especially in 2020 where the number of women not in the workforce and the number of women at work is almost the same.[1] For men in the same time period, there is a drop in overall employment, However, more men than women remained in the workforce during the Covid period. There are many possible explanations, but evidence would suggest that it is likely due to women taking on responsibilities for care at home (Scott & Scott, 2024). An interesting take away here, which will

[1] Not in the labour force refers to a variety of possible people: those who are retired, or too young to enter the labour force, students, as well as people who are not employed for other reasons. The difference between 'not in the labour force' and 'unemployed' is primary due to weather someone is seeking work (as in they want to employed but are not, vs a choice to not work). (Government of Canada, 2024)

be explored in more depth later in this paper, is that Covid reinforced many gender dynamics and stereotypes in the workforce (Scott & Scott, 2024).

4.1.2 Class of Worker in Nova Scotia

Next, this study will analyze the statistics for class of worker in Nova Scotia. Classifying workers demonstrates, broadly, where people work. The key here is whether people work in the private or public sector, which can indicate who will get new green energy jobs. Most new jobs in green energy are in the private sector – especially in green hydrogen. In 2025, 15.9% of men worked in the public sector and 69% worked in the private sector. Among women, 31.2% worked in the public sector and 58.6% in the private sector. Figure 4.4 shows the divergence in sector of employment by gender.

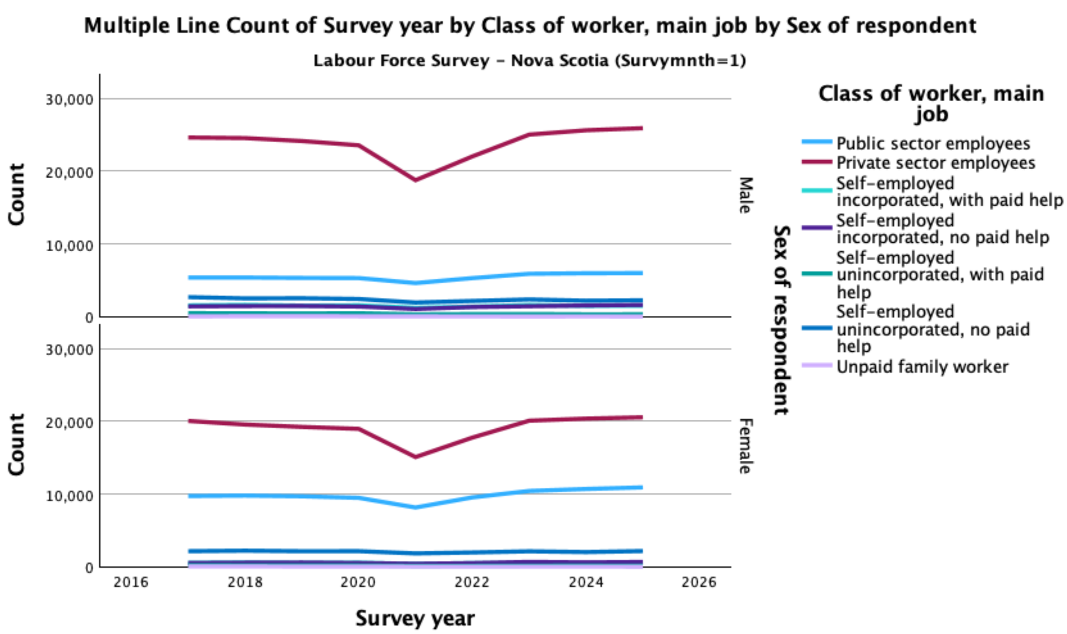

Figure 4.4 Class of Worker in Nova Scotia, disaggregated by gender

While the majority of workers laboured in the private sector, the proportion is noticeably higher for men. Later in this chapter, this study will show that employment by industry depends substantially on gender, which could explain some of the sectoral trend. However, to take one example, men work in trades, which is primarily work for companies and so in the private sector. This is supported by the data which shows a strong statistical correlation between NAICS/NOC and sector of employment. Therefore, as further developed below, there is a correlation between industry, occupations, and gender. Women are more likely to labour in the public sector because they have skills relevant to areas such as education and health care. Since green energy jobs will primarily be in the energy field and the private sector, there may be significant barriers for women to enter the green energy workforce.

4.1.3 Flows into Unemployment in Nova Scotia

Unemployment is a key factor for understanding the impacts of the new green energy industry in a given region. It demonstrates the number of people able to work. Flows into unemployment also indicate whether workers have been laid off temporarily, permanently, or on a part-time basis.

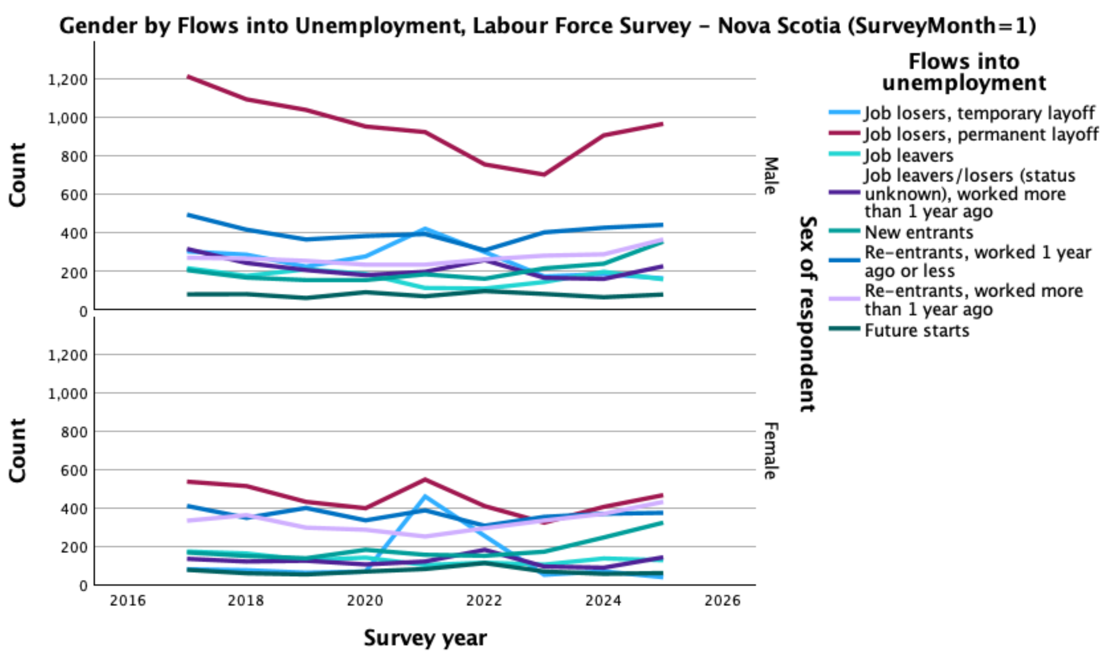

Figure 4.5 Flows into unemployment in Nova Scotia, disaggregated by gender

Figure 4.5 shows the reasons an individual became unemployed within the reference year. The data shows a decreasing trend of men who were being laid off from permanent jobs until 2022, followed by a sharp spike in the last three years. This could be the result of an overall decrease in unemployment, or due to people who were temporarily laid off during covid not having jobs to return to in industries that never recovered. (Scott & Scott, 2024). Interestingly, the trend is different for women. The increase in those temporarily laid off during covid is much higher for women than it is for men. The rate of re-entrants who worked more than one year ago, as opposed to less than one year ago, also differs between men and women.

4.1.4 Unemployment and Equality Indicators in Cape Breton

Bringing labour force sector and unemployment trends together suggests that there is high unemployment in Cape Breton, and potentially a significant opportunity for green energy to provide new opportunities. However, there are a few other indicators that the EDA suggests are important to understand the specific nature of unemployment.

One of these indicators concerns the working poor, which refers to those with full time employment who are still below the poverty line. This is calculated based on employment levels from the 2021 census and poverty rates established by Statistics Canada. The rate of working poor in Cape Breton was calculated to be about 4.5% of adults, which translates to roughly 2,500 labour force adults, or about 2.7% of the total population of Cape Breton.

The proportion of working poor is an important statistic that contributes to understanding the deficit in productive employment (the sum of unemployed adults, who should be in the labour force, and working poor). The definition of working poor is based on Market Basket Measure (MBM), which is the share of families who do not have sufficient income to afford a basket of essential goods and services in specific communities. Here, a working poor rate was not calculated using the LIT-AM (which is the metric for low income) because the purpose is to identify those who are unable to meet their basic needs from their current employment. A simplified method for calculating the working poverty rate was borrowed from EDA, although it has some limitations. The calculation assumes that the ratio of working and non-working members of the household is, on average, the same in poor and non-poor households. The EDA suggests that this ratio is not always equal in the case of middle- and high-income countries since there are other causes of poverty apart from low income returns on labour. While this is certainly the case in Cape Breton, other sections of this chapter consider the variety of factors that contribute to regional poverty. The purpose of the working poor calculation is to demonstrate that, firstly, unemployment is not the only cause of poverty and, secondly, that there are gaps and barriers that prevent Cape Breton from adequately utilising its human resources. In a developed country like Canada, there is no justifiable reason (although there may be explanations) for fully employed households to be unable to meet their basic needs. Lowering the working poverty rate involves primarily improving individual economic circumstances, but policies must also provide access to social protection and combat institutional factors that prevent people from accessing suitable income (sexism, racism, etc).

Cape Breton has a Gini coefficient of 0.325 (Statistics Canada, 2022). Gini coefficient is a measure of inequality between those who have the highest and the lowest income in a regional location. Essentially, it measures how much the real income distribution deviates from equal income distribution. A Gini coefficient of 0 would indicate perfect equality, while a coefficient of 1 would be perfect inequality (where one individual has 100% of the income). Gini coefficient is important for understanding whether poverty and labour force problems are specific to only a small portion of individuals or spread across most of the population. The Gini coefficient for "adjusted household total income" in Cape Breton is 0.325, and for "adjusted household-after tax income" is 0.282.[2] These coefficients would suggest low-to-mid inequality. It would put inequality into the first percentile, which suggests that income is relatively evenly distributed, as economic problems are endemic and widely distributed.

According to the 2021 census, Cape Breton has a population of 98,318. Of that, Cape Breton has about 61% working age adults, meaning the possible Cape Breton labour force (adults aged 15-64) is about 60,000 people (Immigration Canada, 2021). Not all of those people, however, are employed or are seeking work. The census enumerated about 35,000 employed residents. Within the remainder, 13% of individuals were children under 15, and another 26% were seniors (Immigration Canada, 2021).

Migration patterns shape the labour force. About 3% of those employed in Cape Breton are immigrants holding temporary visas (people who do not have permanent residency or citizenship) who have landed within the last three years. Between 2011 and 2021, Cape Breton experienced a 26% increase in the number of immigrant workers. In the same period, Cape Breton saw a 3.2% decrease in overall population, and an 8.0% decrease in working age population. Without immigration, Cape Breton could see as much as an 8.5% decrease in proportion of working age adults by 2031, which, according to the Canadian Department of Immigration, could severely limit the availability and quality of local services (Immigration Canada, 2021).

Cape Breton has a very high unemployment rate, between 10-11.5% in recent years, which is about 10,000 individual workers. For additional context, this is almost twice the

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[2] "adjusted income is computed by dividing the household income by a factor equal to the square root of the household size (known as the equivalence scale). This adjustment for different household sizes takes into account economies of scale. It reflects the fact that the needs of a household increase, but at a decreasing rate, as the number of members increases. (Statistics Canada, 2024)"

unemployment rate for the whole country, which has sat between 5-6.9% over the last 5 years (Statistics Canada, 2025). High unemployment in Cape Breton can be attributed to a loss of jobs, but potentially also to an increase in population. Employment saw a total decline of 4.8% from 2022 to 2023. In Cape Breton, with its service driven market, employment is tied to consumer and client demand. Immigration in the Cape Breton region has been climbing, up 21% from 2021-2022. In 2022, 15% of those employed were immigrants. Cape Breton also has notable dynamics in the age of its population. In 2023, 36.3% of the working age population in Cape Breton were between 55 and 65, which will translate to a loss to retirement of one-third of workforce-aged adults in the next 10 years. The labour force is therefore likely to shrink, which could exacerbate the overall crisis or could, with the correct policies, open opportunities for skilled younger workers.

4.1.5 Occupation and Employment in Nova Scotia

There are two types of systems used for classification and analysis of jobs in Canada: the National Occupation Classification System (NOC) and the North American Industry Classification System (NAICS). Both systems offer insights on the dynamics of employment for different fields and are useful for thinking about the labour force impacts of green energy projects. NOC is a Canadian system creating a hierarchal classification of occupations through a variety of different categories. An occupation is defined as "collection of jobs that are sufficiently similar in work performed to be grouped under a common label for classification purposes. A job, in turn, encompasses all the tasks carried out by a particular worker to complete their duties" (Government of Canada, 2021a). NAICS is similar to NOC, but classifies jobs across North America (Canada, US and Mexico). It "is a comprehensive system encompassing all economic activities. It has a hierarchical structure. At the highest level, it divides the economy into twenty sectors. At lower levels, it further distinguishes the different economic activities in which businesses are engaged" (Government of Canada, 2018).

NOC categories are gathered into unit groups based on "six Training, Education, Experience and Responsibilities (TEER) categories and ten broad occupational categories." NOC numbers are typically 6 digits, where each digit represents an occupation category and modifies the category before it. The model groups occupations into different hierarchal employment categories. For reference, Figure 4.6 shows the hierarchy and breakdown of NOC Codes (Statistics Canada, n.d.).

Title of Hierarchy	**Format**	**Digit**	**Represents:**
Broad Category	X	First Digit – X	Occupational categorization
Major Group	XX	Second Digit xX	TEER categorization
Sub-major Group	XXX	xxX	Top level of the Sub-Major Group
Minor Group	XXXX	xxXX	Hierarchy within the Sub-Major Group
Unit Group	XXXXX	xxXXX	Hierarchy within the Minor Group

Figure 4.6 Breakdown of NOC code structure from Statistics Canada (Statistics Canada, n.d.)

The EDA framework suggests that the breakdown of employment by occupation allows for a more in-depth labour force analysis, leading to a more specific set of conclusions and allowing for better understanding of the labour dynamics for different sexes/genders (ILO, 2012). Figure 4.7 shows the main occupation of Nova Scotians, disaggregated by sex. Data shows that gender has a statistically significant impact on classification of dominant occupation, based on having a Chi-Square coefficient of 1186.597 at 72 *df.* There is significantly less diversity in the main occupation of men compared to women. Occupations in trades (defined as trades, transport, and equipment operators and related occupations) and sales and service are dominant for men. In 2025, 28.3% of men worked in trades, with 18.3% working in service and sales. Additionally, 11.5% of men worked in management occupations, compared to only 6.5% of women. In 2025, 22.3% worked in business or administration occupations, 24.8% worked in sales or services, and 18.2% worked in community and government services.

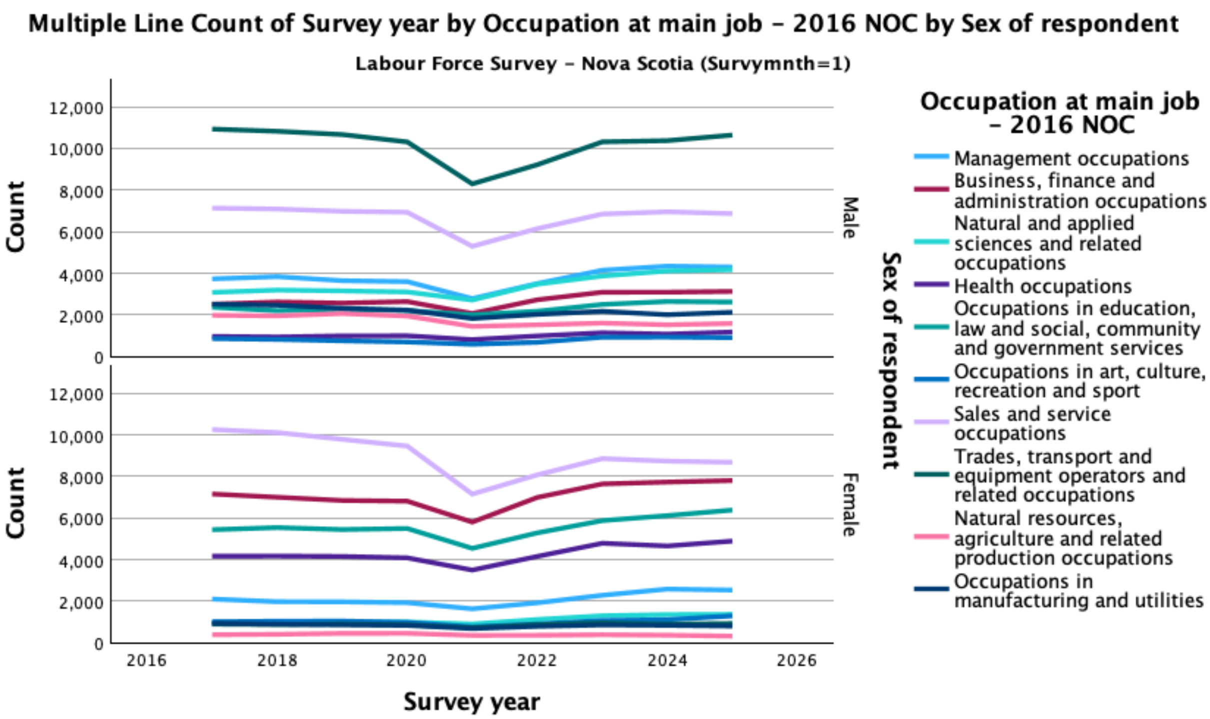

Figure 4.7 Nova Scotia Occupation at Main Job, based off NOC 2016 Classifications, 2015-2025, disaggregated by gender

4.1.6 Industry and Employment in Nova Scotia

Beyond occupation, data also permits understanding employment by industry. The distribution of work by industry also shows divergences between genders. Figure 4.8 shows the industry distribution of Nova Scotian workers, following the NAICS classification scheme.

There is a very strong correlation between industry and gender, with a Chi-sqaure value of 1806.413 at 160 *df*, with a significance of <0.001. In 2025, 13.6% of men work in construction, with an additional 11.4% working in manufacturing. For women, 24% work in health care and social assistance, while 12% work in education. Very few women work in construction or utilities, which represented only 2.6% of women in 2025. Employment in health care has increased overall, with the exception of 2020, when most industries saw a decline due to Covid. Accommodation and food services saw the most significant pandemic decline for both men and women. While employment in this field has mostly recovered for men, many women working in this field have not returned to work.

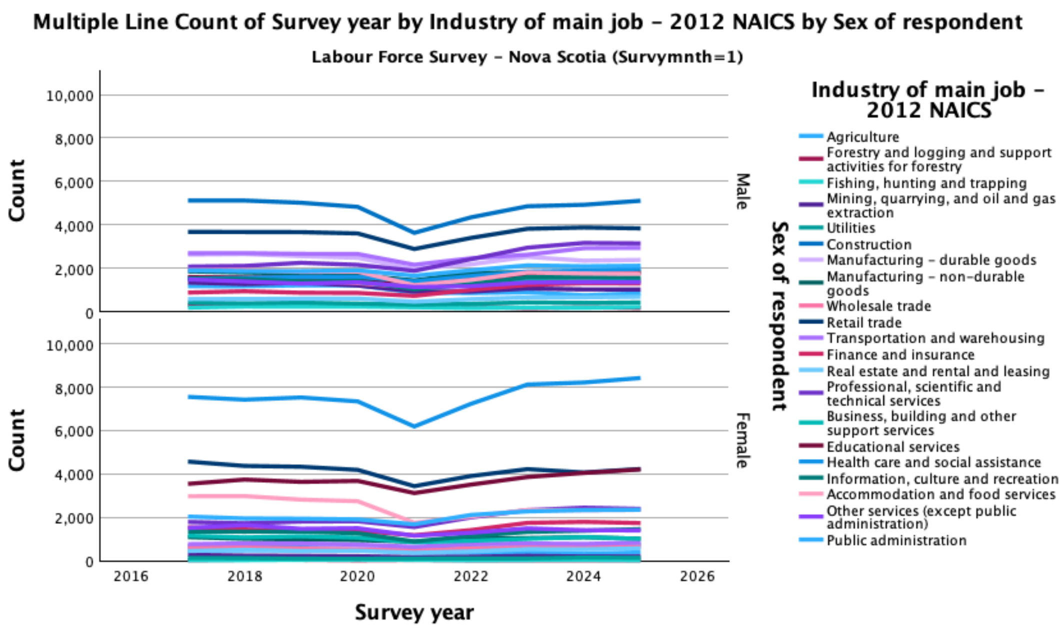

Figure 4.8 Industry of Main Job (NAICS 2012), by year in Nova Scotia, disaggregated by gender

When discussing green jobs and industrial transitions, it is important to think about income, the quality of the jobs being lost, and the jobs being gained (ILO, 2012). Figure 4.9 shows the average weekly income in different dominant industries in Nova Scotia. Trends in Nova Scotia show that, overall, income has increased across industries since 2010. Yet some industries have seen higher rates of increase than others. Professional as well as scientific and technical services saw the biggest increase. Later in this analysis, this study will show exactly what industries new green jobs will fall under. Broadly, however, new jobs in green hydrogen and green energy are in construction, manufacturing, and service industries.

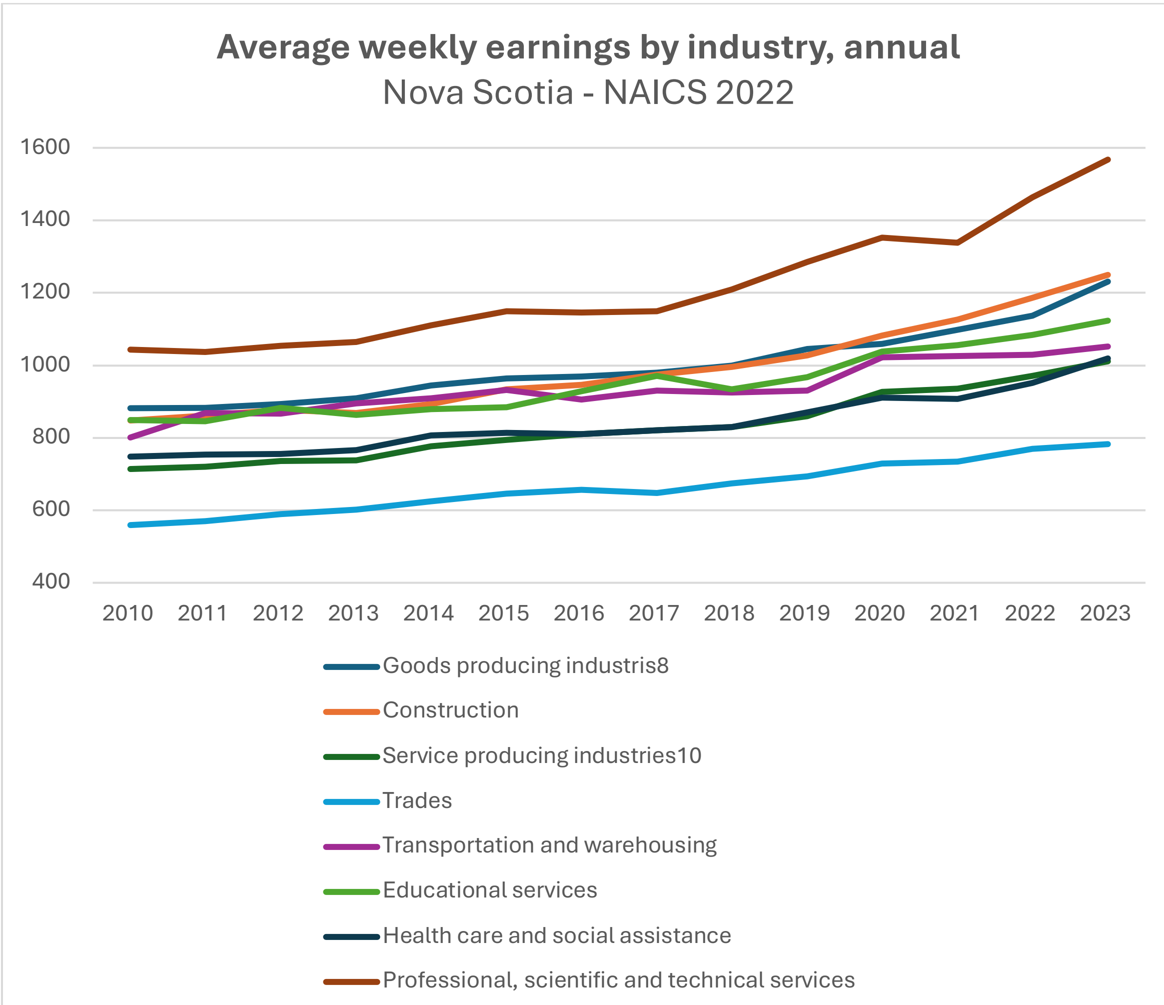

Figure 4.9 Average Weekly earnings by Industry, Nova Scotia, 2010-2023 using NAICS 2022 codes (Statistics Canada, 2024)

4.1.7 Level of Education in Cape Breton

Education is a key indicator for understanding labour force dynamics. Education is a key determinant of access to employment, field of employment, and income (ILO, 2012). EDA puts significant emphasis on the importance of understanding the education levels of individuals. This study has also found that there is a significant correlation between education and other employment factors such as employment status, industry, and occupation.

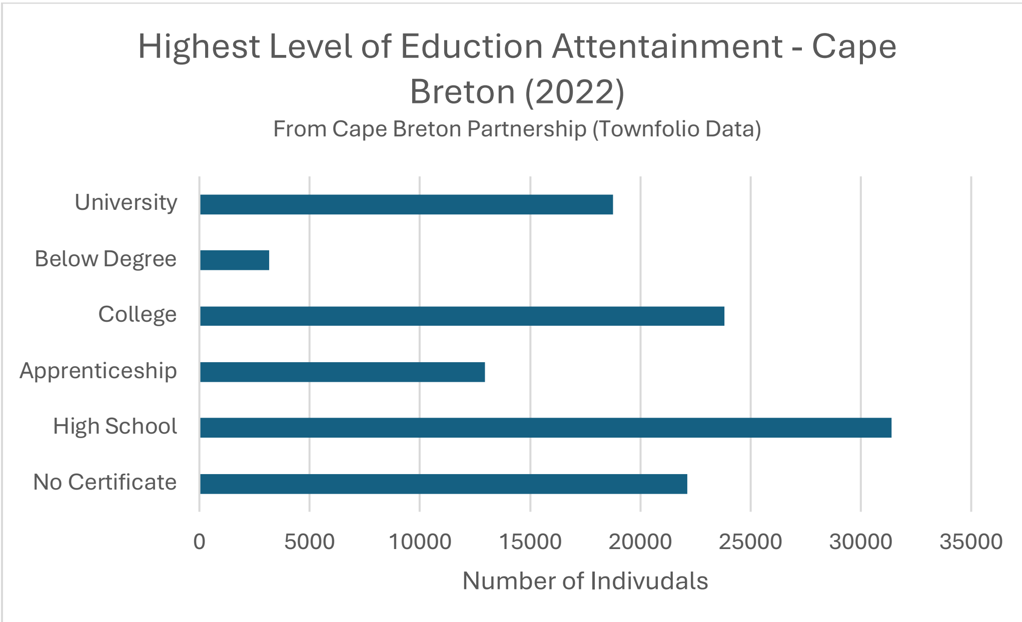

Figure 4.10 Highest Level of Education in Cape Breton, 2022

Data shows significant education deficits in Cape Breton. Figure 4.10 shows the highest level of educational attainment of individuals in Cape Breton in 2022, while Figure 4.11 shows the change in highest level of education since 2017. In 2022, 19% of the population had no college certificate (this is primarily the result of age) and 27% of the population had only high school. Only 11% and 21% had apprenticeship and college diploma respectively, and just 16% of people had at least a bachelor's degree. Cape Breton is undereducated compared to the rest of Canada, where 35% of adults had at minimum a university degree in 2021, with another 26% having either a college diploma or trades certificate. Only 20% of the Canadian population had just a high school level of education (Statistics Canada, 2024).

Data shows that there is a strong correlation between education and industry/occupation, with a Chi-Square value of 79246.158 at 120 *df*, with <0.001 significance. Data shows that there is statistical correlation between gender and level of education, with a Chi-Square value of 2671.274 at 6 *df*, with a significance of <0.001. There are, however, some important observations that can be made about gender and education. Firstly, in Nova Scotia, men complete bachelor's degrees at a lower rate than women. In fact, the number of women who receive a bachelor's degree has recently surpassed the number of women who complete only high school. This is an important observation – typically, gender disparities in education are associated with women lacking access to education (World Bank, 2022). Data shows that there is also correlation between highest level of education and class of worker: the Chi-Square value is 46315.847 at 36 *df* with <0.001. Data also shows strong correlation between education level and the industry and occupation of a worker.

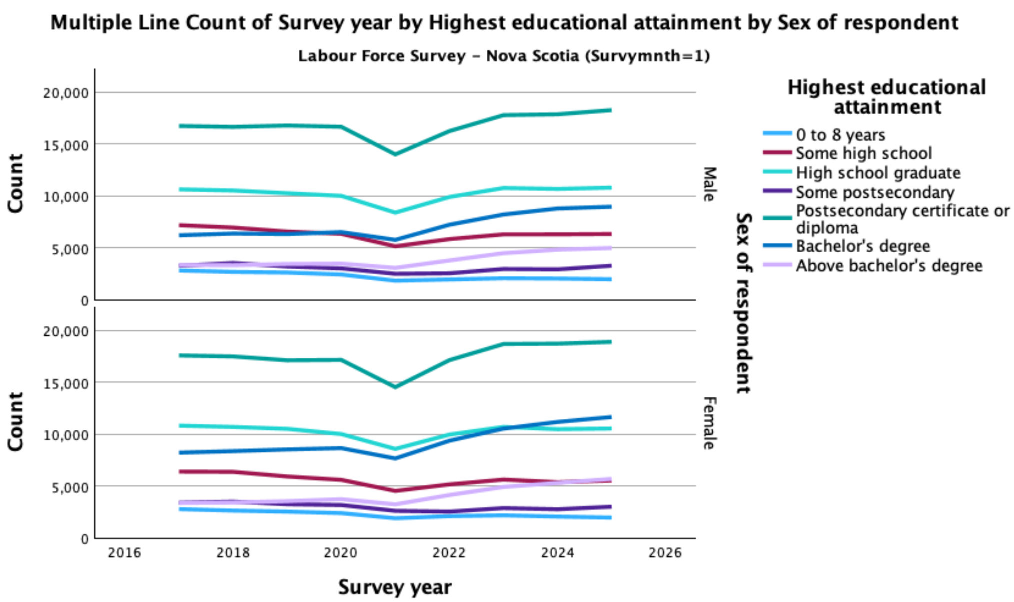

Figure 4.11 Nova Scotia Highest Level of Education, disaggregated by gender

These correlations may explain some of the discrepancy in education for men. As data has shown, men are more likely to work in trades, an employment path that typically does not require post-secondary education. It is likely that, because of difference in employment field across genders, education levels reflect the skills needed for specific jobs.

4.1.8 Community Indicators

EDA suggests that it is not enough to only consider labour market forces when analyzing employment dynamics (ILO, 2012). Since employment is closely related to and influenced by so many other factors, effective analysis requires attention to a variety of social indicators. For this study, two main indicators were included: core housing need and life expectancy. These indicators can help to paint a picture of the current health of a community and also help predict the additional strain new industrial development might create.

4.1.8.1 Core Housing Need in Cape Breton

Core housing need is a metric used to analyze access to suitable housing. The metric considers three factors: adequacy (the physical state of repair of the dwelling), suitability (the number of people dwelling in the unit), and affordability (measured by whether housing, including utilities, costs more then 30% of before-tax household income). Housing is considered affordable when it costs less than 30% of before-tax household income (CMHC, 2024). Data for housing suitability includes housing that is not on farms, band-owned or on reserve, and where the household "reported positive incomes and shelter cost-income ratio is less then 100%" (CMHC, 2024, n.p.). Decent housing would then refer to housing that is not in need of major repairs, has an adequate number of bedrooms and bathrooms, and is affordable. Figure 4.12 shows the number of houses sampled in Cape Breton that do not meet CMHC standards. Judging by the trend, Cape Breton should have a suitability rate of about 66% in 2025 (CMHC, 2024).

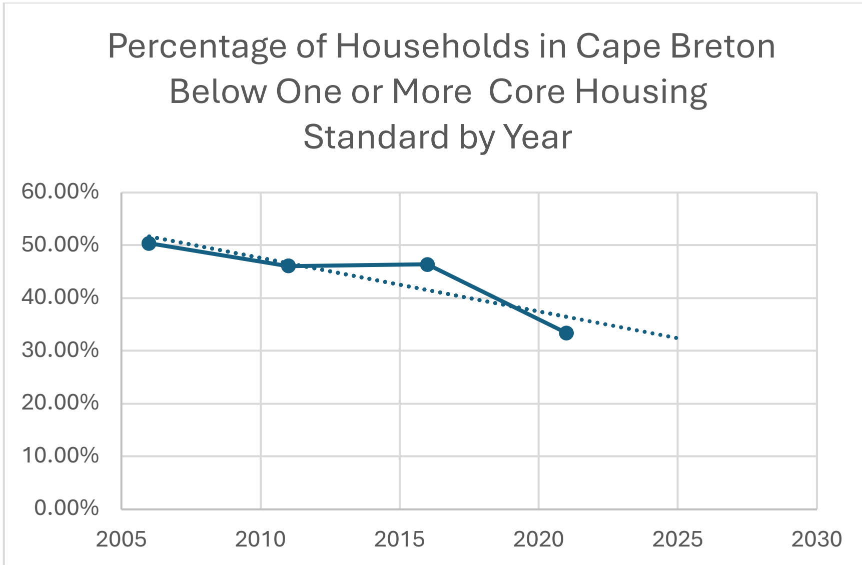

Figure 4.12 Cape Breton Core Housing need, 2005 – 2021, with a regression trendline suggesting current trends

4.1.8.2 Life Expectancy in Cape Breton

Life expectancy is an important indicator within the EDA framework. Demographers calculate life expectancy as the average of how long a baby is expected to live and the number of people who have reached 60. It is indicative of a variety of important health factors, since it can be influenced by exposure to toxins in the environment, access to healthcare, social factors, and a variety of other variables (Government of Canada, 2022a). Figure 4.13 shows that Cape Breton has a lower life expectancy than the rest of Nova Scotia. In 2015, life expectancy in Cape Breton was about 78.5, compared to 80-81 across the rest of the province. At the same time, life expectancy in Canada was 82 years (World Bank, 2023). Interestingly, life expectancy in Cape Breton decreased between 2011-2015, while it increased in the rest of the province. Some background literature suggests this divergence was the result of high levels of smoking, low access to health care, and high exposure to toxins (mainly from historical exposure to industrial waste) (Shields & Tremblay, 2002). Post-industrial communities like those in Cape Breton are significantly more likely to have lower life expectancy rates.

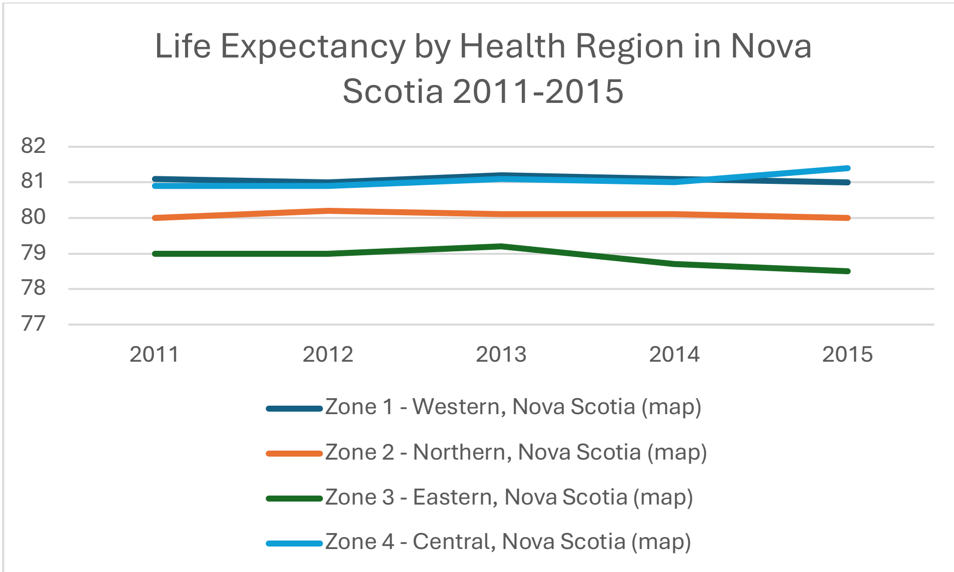

Figure 4.13 Life expectancy, at birth and at age 65, by sex (Average over three years) – Nova Scotia Health Regions.

4.2.0 Green Jobs Outlook

Labour force dynamics are fundamentally important for understanding the practical impacts of green energy projects. The indicators discussed in section one of this chapter provide a baseline picture of labour dynamics in Cape Breton and help to guide analysis of the possible impacts of green jobs on the existing labor market. Analysis presented in Figure 4.14 indicates that there are a few key occupations (NOC) where green jobs will typically be created. Importantly, these can be matched to unemployment trends and to dominant industries and occupations in the region, which will help show the path to future productive employment. Recall that green jobs are identified by the job bank as jobs “that contribute to positive environmental outcomes (such as preservation, conservation and restoration)” (Government of Canada, 2021a).

Occupation	NOC 2022	Outlook - Nova Scotia	Outlook- Cape Breton	Wages - Region Level	Low ($/hour)	Median ($/hour)	High ($/hour)
Government managers - economic analysis, policy development and program administration	40011	Moderate	Moderate	NS	$ 52.82	$ 65.13	$ 74.62
Electrical power line and cable workers	72203	Good	Good	NS	$ 25.95	$ 45.03	$ 50.00
Hydro-electric engeneer	21300	Moderate	Moderate	CB	$ 29.08	$ 43.67	$ 60.78
Power System Electrician	72202	Moderate	N/A	NS	$ 38.00	$ 42.27	$ 43.40
Nuclear Engineer	21301	Moderate	N/A	NS	$ 26.12	$ 42.02	$ 67.78
FACILITY OPERATIONS MANAGER	70012	Moderate	Moderate	NS	$ 26.00	$ 41.10	$ 61.54
Industrial and manufacturing engineers	21321	Good	N/A	NS	$ 28.45	$ 40.22	$ 59.72
Environmental Issues Lobbyist	41400	Moderate	Moderate	NS	$ 22.50	$ 38.52	$ 58.76
POWER SYSTEM OPERATOR	92100	Moderate	Moderate	CB	$ 19.00	$ 36.00	$ 48.00
Construction millwrights and industrial mechanics	72400	Good	Good	CB	$ 19.23	$ 35.00	$ 51.32
Certified Energy Advisor	22233	Moderate	Moderate	CB	$ 24.05	$ 33.62	$ 45.71
Heating and air conditioning mechanics (includes heat pumps, etc)	72402	Good	Good	CB	$ 24.05	$ 31.51	$ 43.24
RESIDENTIAL ENERGY SALES ADVISER	62100	Good	Moderate	CB	$ 17.65	$ 29.04	$ 46.98
Procurement and purchasing agents and officers	12102	Moderate	Moderate	CB	$ 18.84	$ 27.60	$ 44.56
Electricians (except industrial and power system)	72200	Good	Good	CB	$ 19.00	$ 27.00	$ 40.00
SOLAR PANEL INSTALLER	73200	Good	Good	CB	$ 16.75	$ 21.05	$ 28.25
Electronics assemblers, fabricators, inspectors, and testers	94201	Moderate	N/A	NS	$ 16.31	$ 20.00	$ 25.20

Figure 4.14 Sample, Green Jobs By NOC, Outlook over three-year period including wages

Job outlook is measured on a 5-step scale: very limited, limited, moderate, good, and very good. Sorting is determined by Statistics Canada based on four indicators: employment growth rate, replacement needs rate, experienced unemployed workers index, and net needs (which is a composite indicator). These indicators allow for a three-year job outlook that considers the impacts of retirement, immigration, economic changes, and demographic changes. Figure 4.14 shows 17 different green energy related occupations, including their outlook provincially and regionally, as well as income projections. For this table the estimated median wage for green jobs is $36 an hour. While this is not a complete view of the green energy sector – it is a random sampling of occupations – it shows that, broadly, green jobs are well paying.

4.2.1 Energy Advisors

While there are a variety of possible green jobs, Energy Advisors (EAs) is an example of a new occupation that will emerge in Cape Breton. In fact, EAs comprise one of the most important occupations for facilitating a green energy transition, as they are able to provide the technical expertise to design new systems. They work at a variety of levels – including residential, industrial and even for governments. To become an EA, individuals need to pass an exam administered by NRCAN, typically after a test preparation course lasting between a few days and a few weeks. In Nova Scotia, the Clean Foundation provides an EA program which pays Mi'kmaw and African Nova Scotians while they complete their training (Clean Foundation, 2025).

The outlook for EAs is moderate, but the evidence is skewed slightly by the NOC code, which encompasses a wider variety of construction inspectors. In terms of industries, 26% of EAs in Cape Breton work in Construction (NAICS 23), 21% in what the NAICS calls "Architectural, engineering, and design services" (NAICS 5413), 29% in some form of public administration (NAICS 912-919), and 5% in real estate. EA work is a very male dominated field: 87% are men and only 13% are women. Data shows good income, with median income being about $33.62 an hour in Cape Breton.

4.2.2 Green Energy Projects

A transition to green energy is underway in Cape Breton. The Rhodena Wind project will result in green employment and electricity generation. Green jobs will also result from the construction of two recently announced green hydrogen plants at Point Tupper.

The Rhodena Wind project should provide approximately 75-125 jobs throughout the construction period (12-18 months), which is set to start in late 2025 (ABO Energy, 2022). There will also be nine permanent jobs associated with the project – including High-Voltage Technicians/Electricians, Wind Technicians, Road Maintenance Workers, and Vegetation Management Service Providers. The project may also bring a variety of indirect jobs (Strum Consulting, 2024).

As for green hydrogen, one production complex at Point Tupper will be run by Bear Head and the other by Everwind. The Bear Head Facility will include several plants, capable of producing 2 million tons of green ammonia per annum (ammonia is the end product typically associated with green hydrogen). The facilities will include electrolysis units for green hydrogen production, air separation units for nitrogen generation, Haber-Bosch ammonia synthesis units, ammonia bulk storage tanks, and a marine terminal. The marine terminal requires new construction as well as upgrades to existing port infrastructure. An estimated 40-60 ammonia carriers per year, as well as smaller ships, will arrive. Construction is anticipated to take about 36 months (6 months of site preparation, 30 months of site construction) (Strum Consulting, 2024).

The Bear Head project will produce a variety of jobs. There will be 70 permanent jobs for people from administrators to janitorial staff. There will be waste and discharge process workers, who will work to assure minimal environmental impact. There will be workers employed in operations and maintenance of the plant – both in the direct hydrogen and in the ammonia sections. There will also be employment related to the shipping of ammonia. Marine employment, already a significant sector in Cape Breton, will increase but it is not clear if jobs related to ammonia shipping will go to Cape Bretoners.

Green hydrogen projects will not just bring new jobs to the Port Hawkesbury region, but will bring jobs that pay well. Jobs defined as green jobs pay more than their non-green job equivalents. Figure 4.17, shown earlier in this section, provides some examples of the hourly income associated with a sample of green jobs. Additionally, a report published by Deloitte about the economic impacts of the Everwind project suggested that jobs in the green hydrogen industry could pay as much as five times their equivalent in the "typical" hydrogen sector (Deloitte, 2024). ECO Canada also suggests that the salary for workers in environmental services is higher than the median income in the country (by as much as $15,000 per year) (Checknita, 2025). Another report by ECO Canada suggests that workers in green jobs make as much as 18% more than the median Canadian income in similar sectors (ECO Canada, 2023).

Each project will add a variety of jobs in the region. According to the environmental assessments submitted by both Everwind and Bear Head, there will be direct, indirect, and induced jobs created by both projects. Direct jobs are typically understood to be "the employment created directly by the infrastructure project, typically in construction and including all workers directly employed by the main contractors and subcontractors" (ILO, 2021, n.p.). Indirect jobs are those "created through the increased demand for inputs from supplying sectors generated by the project (backward linkages), such as tools, materials, plants and equipment along the value chain for the construction of the infrastructure project." (ILO, 2021, n.p.) Induced jobs are the employment created through forward linkages: households benefit from additional income through direct and indirect employment and consume more goods and services, which itself creates jobs in the economy.

While the jobs generated by the new plants will be high paying, there is some question as to whether these jobs will actually go to local people in and around Port Hawkesbury. There are a few reasons for this. Firstly, the electricity generation for the plants will come mostly from wind farms in other regions of Nova Scotia, especially around Colchester. As a result, the jobs generated from the wind project will likely not go to Cape Bretoners.

It is also difficult to know how many of the jobs from the Point Tupper facilities will go to Cape Bretoners as there is no clear division in the numbers between local jobs and those being generated in the rest of Nova Scotia. It is also impossible in many cases to distinguish the direct jobs that will be at the plant and the direct jobs related to the development of the energy generation infrastructure more broadly.

There is also a question as to whether or not there is sufficient local labour to meet the demand associated with the construction of both sites. The environmental assessment submitted by Bear Head claims that there will be no influx of workers to meet the construction and operational needs of the plant. This suggests that there should be enough skilled labor within close proximity of the plant. According to the forecast, the Bear Head project will generate approximately 45 to 70 permanent direct jobs and 175 permanent indirect jobs (sustained for twenty years or more). There may also be approximately 600 to 700 jobs associated with shorter-term construction. Bear Head suggests that all the labour necessary to fill these jobs will come from local labour supply. This is important because Mi'kmaw support for the project was largely dependent on an agreement that there would no construction camps associated with the building phase. Bear Head asserts there is an abundance of skilled labour in the region and that no construction or work camps are required to accommodate workers (Stantec Consulting, 2023).

The population of Port Hawkesbury is about 4,000. Meeting the Bear Head project's labour requirements through local sources poses potential issues. Based on the company's own assertions, 64.7% of the local population is labour-force aged. That would mean, at maximum, there are about 2,100 adults in the labour force. While Port Hawkesbury is not the only town in the region, it does represent the majority of local labour. Relative to the local labour force, 700 temporary construction jobs is considerable. Without even considering the skills or interests of workers, that means that the jobs to build the Bear Head plant would be about 30% of the local workforce. Moreover, about 90% of the labor force is currently employed (Stantec Consulting, 2023). A lack of workers may be a significant issue for the Bear Head project.

The labour scarcity issue is compounded when we consider the jobs associated with the Everwind project. Everwind suggests that there will be as many as 650 construction jobs on plant facilities, as well as 30 full-time jobs in Nova Scotia from the wind farms, associated with the project. As with Bear Head, it is unclear if the Everwind jobs will be in Cape Breton or not (likely, many will be in the Colchester region where the average wind speeds are higher).

Everwind does have one advantage over Bear Head. Everwind already employs a significant number of workers in the Port Hawkesbury region, related to other projects that they own. In fact, Everwind is already one of the biggest employers in the region. As a result, they have some infrastructure workers already. For example, Everwind already employs an industrial emergency response team in the area. When Deloitte was contracted by Everwind to create a report about the economic impacts of the project, they found that phase 1 and 2 of the projects would create 2,480 permeant direct and indirect jobs, and 14,930 short-term construction jobs across Nova Scotia. Importantly, the wind projects that support Everwind operations have 9% First Nations equity, which will support the training and employment of Mi'kmaq workers.

It is important to acknowledge that these numbers are projected full-time equivalents, which are based on profit generation and do not necessarily reflect the actual number of jobs needed for the operation of the plant. However, as with Bear Head, Everwind's job numbers are not well-attuned to the available labour force in the Port Hawkesbury region (Deloitte, 2024).

Yet both Bear Head and Everwind claim that there is, in fact, enough local labour to meet the demands of their projects. The Bear Head environmental assessment does make some claims about these jobs – suggesting that the labour force will be "drawn from a large catchment in the local local area with many employees able to drive to the site individually or in carpools" (Stantec, 2023). Some employees, however, may originate from farther afield and may seek accommodation locally. Point Tupper and the neighbouring communities have accommodated construction labour forces of the same or greater numbers in the past (Pross, 1975). This labour force will place demands on local services including emergency and health care services. The companies insist that that overall impacts for the local community will be positive. The likely increase of population and activity in the area will increase demand on all (SNC Lavalin 2015).

As noted in the above analysis, housing demand and strain on public services in Cape Breton are already significant, even before a large inflow of new workers.

Project Name	Location	Project Type	Jobs	Job Facts
Rhodena Wind Project		Wind Farm	Permanent Jobs: 9 Temporary jobs: 75-125 Indirect jobs produced – No Number	- Construction jobs to begin in Summer 2025 (ABO, 2023)
Bear Head Green Hydrogen	Point Tupper	Green Hydrogen	215-245 Permeant Jobs - 45-75: Direct - 175: Indirect 600-700 Temporary Construction Jobs	- Jobs are similar in numbers and skills to the ones projected for the LNG project also proposed in Point Tupper - Environment Assessment includes some consideration of need for training - Memorandum of Understanding between NSCC and Bear Head to create training opportunities
Everwind Green Hydrogen Project	Point Tupper	Green Hydrogen	Phase 1 and 2: 2480 Permeant Jobs (Direct + Indirect) 14930 Construction and Support Jobs	- 600 jobs related to the construction and operation of the Wind Farms to support the projects – most of the wind energy for the projects will come from farms in Colchester County

Figure 4.15 Summary of Employment Contributions from Cape Breton Green Energy Projects

There is some evidence that the construction labour demands of the projects could be met with adequate programs. In 2023, the construction sector in Cape Breton lost 4,000 jobs (Labour Market Analysis Division, 2024). There are many possible reasons to explain the decline. One possibility is simply a general decrease in large projects. It is also possible that increasing costs of construction have led to a decrease in jobs. Available data does show a province-wide decrease in the construction sector in 2023. The data also shows an increase in men, who make up a significant percentage of the construction workforce, who were permanently laid off. There is a strong positive statistical correlation between the reason for unemployment and occupation or industry – especially for men. Regardless of these dynamics, recent job losses may indicate that some workers might be available for the early phases of project construction, but total labour demand is still unlikely to be met from local sources.

Beyond just how many workers these projects will need, and the possible constraints on the local systems, it is unclear if there are the skills needed to facilitate these projects. Both companies have made commitments to training. Bear Head energy suggests that they will be working with Nova Scotia Community College (NSCC) to provide training courses to help develop skilled workers for various project-related jobs. They "have made commitments to work with the Mi'kmaq of Nova Scotia, representative labour groups in the region, and other relevant stakeholders to ensure the success of their project and to facilitate growth and maximize benefits to the communities of which they have become part" (PNI Atlantic, 2024, n.p.). The focus on working with Mi'kmaq communities is especially important, as these communities tend to have much higher rates of unemployment.

Everwind has also made commitments to training. They have collaborated with Nova Scotia Community College (NSCC) on a new program, to begin in fall 2025. It allows students to graduate after 18 credits of high school (Grade 11) and move right into community college. The idea is to create a quicker pipeline from high school into the NSCC skilled trade programs. In the coming months, notification will go out to all local high schools that Everwind is available to give presentations and tours to students. Everwind is also facilitating shop adjustments which are being made at NSCC campuses to accommodate wind turbine training (Strum Consulting, 2022). However, as noted earlier, education and employment are deeply tied, so a plan for workers to forgo completing high school raises longer-term concerns.

4.3 Synthesis

As the EDA pursued in this chapter demonstrated, Cape Breton's aging labour force has high unemployment and an elevated rate of working poverty. Employment in Nova Scotia, and Cape Breton, is limited to a few key sectors – construction, healthcare, and administration. While the number of employees in each field differs by gender, there is a still strong focus on these industries. Cape Breton also has high housing need coupled with low life expectancy. Although there are a variety of factors that shape these dynamics, they indicate an area struggling to meet the needs of its workers.

However, Cape Breton has new industry coming in the form of green energy, especially green hydrogen. Green hydrogen projects in Point Tupper will bring hundreds of temporary and full-time jobs in key sectors, such as administration and construction. These new jobs will primarily be in the private sector, leading to a strong likelihood that they will go primarily to men. These jobs may benefit younger workers in Port Hawkesbury. Port Hawkesbury will benefit from well-paying green jobs, although there will be strain on housing and other community resources.

Chapter 5: Discussion

In Cape Breton, there is both insufficient labour and inadequate understanding of employment barriers to conclude that green hydrogen projects will be successful. Forthcoming green energy projects do not meet the requirements of a just transition. High unemployment and high poverty are significant issues. New green hydrogen plants in Port Hawkesbury promise to create new employment. They have the potential to improve employment rates and incomes if they make the best possible use of local labour and community resources. The green energy projects can themselves become highly successful but only if they consider, and implement, just transition principles: respect for workers, unions, communities, and families; a recognition of rights; worker participation at every stage of the transition; a transition to good jobs; the fostering of sustainable communities; and a coherent set of national, regional, and local actions. Three interrelated considerations need attention to ensure that green hydrogen development fosters a just transition in Cape Breton: Workers and Skills Training; Community Impacts and Strains; and Commercial Viability.

5.1 Workers and Skills Training

Firstly, there are substantial questions about the availably and quality of the jobs, and about the skills needed to facilitate a green energy transition in Cape Breton. The bulk of the jobs associated with the Point Tupper projects will be construction jobs. Construction often creates temporary work; construction does not provide a guarantee of long-term employment and therefore does not address true unemployment. While Port Tupper plants may provide a temporary pathway out of unemployment, workers hired for construction may find themselves flowing back into unemployment just a few years later.

There are some possible ways of addressing these concerns. As Duncalfe et al. (2020) suggest, proactive policies that incentivize companies to provide services in the project communities can help to assure that workers have access the services they need. It is not unreasonable to expect or even require companies to provide or compensate for the resources drained from the projects in situations where their projects are being incentivized or supported by taxpayer dollars. In practice, this could include requiring companies to provide their own emergency services (such as fire response or medical services – doctors and nurses) or to build housing for the permanent workers they bring in to alleviate the strain on local systems. While these strategies may not be the actual solutions, it is important for policy makers to consider how companies can be incentivised or required to better support the communities that their projects depend upon.

There are also concerns about the availability of workers to build and operate the green hydrogen plants in Point Tupper. Both Bear Head and Everwind do acknowledge the possibility of needing to bring in some outside labour to support the construction – and acknowledge that this will be a burden on local resources - but do not seem to properly consider the deep strain these systems are already under. While there are some steps being taken to focus on providing jobs to local communities, it seems unlikely that there is enough labour force - especially skilled labour force - to sustain these projects. Bear Head and Everwind will require outside labour.

Finally, a major concern for the green energy industry in Cape Breton is the significant issue of training and skills. It is unclear, based on existing information, exactly which skills will be needed to build and operate these plants. As well, it is unclear whether or not the needed labour can be sourced locally. While both companies say that they are working with local educational institutions to train workers, the last chapter's analysis (through EDA) of the Cape

Breton labour force showed that there may be significant barriers to assuring that this work goes to those who need it. Moreover, many Cape Breton residents, including those in former coal mining communities, live too far from Port Hawkesbury to commute, while women, people of colour, Indigenous people, new migrants, and young people all face barriers to employment which must be addressed through the implementation of these projects. Training programs, beyond the green hydrogen projects themselves, will be required if the projects are going to include as many workers as possible from Cape Breton communities.

There are even concerns about the ability of these companies, on their own, to deliver the training already promised within their project plans. Additionally, there is evidence that universities and post-secondary institutions across the country are in a period of crisis and struggling to meet the needs of students. Recently, the federal government put a cap on the number of international students entering the country (Laroche, 2025). While this cap may help to curb some of the stress on local communities in terms of housing and healthcare, it will also limit the funding that post-secondary institutions can access through tuition fees. When combined with stagnant provincial transfers to universities, there have already been significant program cuts across the country. For example, Dalhousie University has cut a variety of majors this year. In this funding context, it is unclear if Nova Scotia Community College - who will likely be a main provider of educational programs to train workers for green energy – will be in a position to expand programs or create dedicated programs for the green energy sector, since it faces a challenging financial situation (Laroche, 2025).

As previously discussed, Nova Scotia Community College is also working with Everwind to provide new programs to train employees for green hydrogen. These new programs will allow students to leave high school at grade 11 and enter directly into labour force specific training programs at NSCC (Cooke, 2025). While this is good in terms of addressing skills gaps, there are concerns with providing avenues for lower education levels. As shown in Chapter 4, men primarily work in the trades in Nova Scotia, and men also tend to be under-educated compared with women. Providing opportunities for students in trades to leave school early may have the secondary impact of contributing to the under-education of men in Cape Breton. Beyond this, the novelty and uncertainty of new industry means that the new jobs are not necessarily guaranteed over a long period. It is, therefore, fundamentally important that individuals should continue to complete a high school education so they have opportunities in other industries, should green hydrogen not meet predicted growth and profit.

There are some programs already attempting to address the gap in skills related to a green energy economy in the region. For example, programs run by the Workforce Development Team at the Clean Foundation are helping to provide training and work experience to young people in the green energy sector. The Clean Leadership Program provides over 100 internships each year to youth across the province, with a particular focus on African Nova Scotian and Indigenous youth – which is supported by the principles of a just transition (Clean Foundation, 2025).

Unfortunately, this initiative is also not without concerns. Many of the jobs provided by Clean Leadership and other similar programs do not have opportunities in the green hydrogen sector. Additionally, in Nova Scotia, most employment programs in the green economy are targeted only to youth. This means that existing programs are missing a huge swath of people – especially those who have previously lost their jobs in oil and gas, as they are likely to be above the 30-year-old cut off for most youth programs. A just transition means that employment programs need to target groups beyond youth – they need to target those who have or will lose there their jobs in other energy industries as the transition to green energy continues.

5.2 Community Strains and Impacts

Secondly, there is concern that new green hydrogen projects will put too much strain on already overburdened infrastructure and services. Cape Breton, at its core, needs to bring in new industry to generate the jobs that will curb the high rate of unemployment. This comes with an assumption that government must incentivize companies to select Cape Breton as the location for projects. There is also a need to ensure that new industry contributes to the local economy and minimizes its drain on local infrastructure and resources. A just transition would suggest that companies should be, in some way, required to provide or subsidize the services they drain. This strategy entails some risk. In the end, companies are driven by profit and so requiring them to build additional infrastructure could push them to look elsewhere. In some ways, this means that large-scale industrial projects could be challenged by a reality where it is not possible to build the necessary infrastructure to address the unemployment and labour needs of rural/remote communities without overburdening public systems. This has been a problem for Cape Breton since the beginning of the industrial decline of coal. There is no clear pathway to balance the strains of developing new industry with the need to have communities that are healthy enough to support that infrastructure.

Housing demand in the Port Hawkesbury region is a particularly important issue. As seen in Section 4.1.8.1, Cape Breton has significant levels of housing need. It has been established that no labour camps will be constructed as part of the new green hydrogen projects (Strum Consulting, 2022 and Stantec Consulting, 2023). Therefore, it remains unclear how and where any influx of workers will be housed. During industrial development more than a century ago, companies provided housing for the workers. Starting in the late 19th century, steel and coal companies in Cape Breton constructed housing, and then leased them to their workers' families. Company housing was criticized for leaving workers dependent on their employers. If the workers went on strike, the company might evict them from their homes (PNI Atlantic, 2016). While company housing may have provided housing to workers, it did not necessarily provide adequate housing (as defined as CMHC) (CMHC, 2024). Addressing the housing concerns associated with green energy projects must not then involve implementing a structure like company houses.

The province may instead choose to incentivize private developers to build more housing in the region to support the influx of workers. While this might help address the housing challenges, constructing new housing requires further skilled construction labour. Skilled construction labour is already under strain. If more workers would potentially need to be brought in to build this housing, then the housing problem will not be solved. It seems that there is a conundrum in terms of the housing strain these communities are facing.

As the environmental assessments for both projects show, the companies acknowledge the likelihood of bringing in some outside labour to support the construction and also acknowledge that in-migration will put a strain on the local resources (Strum Consulting, 2022; Stantec Consulting, 2023). However, the assessments appear to downplay the deep strain these systems are already under. Furthermore, they do not propose remedies to anticipated pressures.

The housing question is directly related to the question of whether resident or migrant labourers will benefit from green hydrogen development. Indeed, Mi'kmaw support for the two projects was contingent on the promise not to construct temporary camps to house workers. Reinforcing the rights of Indigenous communities through respect and consultation is fundamentally related to implementing principles of a just transition. Furthermore, Mi'kmaw communities have large ownership shares in the wind farms that will power these projects – and recognizing their demands is key to the success of these projects.

Green hydrogen is also unique in terms the strain it may put on local communities simply due to its novelty. It is not entirely clear what the projects will look like, who will need to come in to run them, and what actual demands will be placed on communities. Fortunately, the history of the region does provide some insight. In the 1970s, Port Hawkesbury saw a boom of new industry: the completion of the Canso Causeway, the coupled with the opening of a pulp mill, and the construction of an oil refinery brought new industry into the region (McCann, 2015).

Paul Pross (1975) provides some important insight into the challenges Port Hawkesbury faced during previous energy booms. Rapidly increasing industry in Point Tupper in the 1950s and 1960s put significant strain on Port Hawkesbury, whose public utilities, education, and health care systems were unable to meet the increased demand. Inadequate planning and responses to these strains led to significant social problems. Port Hawkesbury was unable to take full advantage of new industrial opportunities, because "it was not allowed to do so" (Pross, 1975, p.46). Lack of housing was a particular issue, as construction workers were housed in temporary construction camps, which struggled with high crime and high rates of drug abuse (Pross, 1975).

With new industry and new jobs and inflow of people which built additional government revenue through a bigger tax base but also brought social disruption. New tax revenue didn't meet the new demand for services. Pross highlights how the upfront costs of new social investments caused by increasing population are sometimes too much for the existing tax base to support (Pross, 1975). According to Raymond Foote:

> The construction of new industry brought the arrival of approximately five thousand construction workers, one hundred managerial workers, and a variety of secondary and tertiary industries, almost tripling the size of the community...Consequently, the atmosphere of Port Hawkesbury from 1966...was essentially that of a boom town. New housing developments, apartment blocks, and stores appeared with great rapidity. But, most important to local residents, different standards of values, life styles and

> occupational groups began to appear in the community. Further, local residents were largely excluded from participation in the economic development of the region...At the local government level, the problems of supplying essential services for the incoming population placed great strains upon community finances (Foote, 1974, 57-58).

These dynamics may be replicated. When there is a new industry, there is often a delay in the ability of municipalities to increase services (PNI Atlantic, 2023). Energy boom towns, which experience a rapid inflow of workers and growth, continue to fall victim to what is called the "resource curse." According to Civittolo et al. (2016), the "resource curse" can lead to significant strain on local business who struggle to find workers in a more competitive market. There is also additional strain put on communitie services such as medical care, schools, recreational facilities, who are unable to meet the new sudden demand for their services. The reality is that new industry is likely to bring high short-term strain to already strained systems in Port Hawkesbury (PNI Atlantic, 2023).

Pross emphasises the need "to integrate industrial and social development policy," as well as allowing local communities to dictate development measures (Pross, 1975, p. 50-51). In a 21st century context, the focus should be developing the necessary supportive infrastructure – housing and public utilities – before the industrial projects are implemented. However, the challenge is that the timelines for these green hydrogen projects are already set. Construction of both plants is set to begin in late 2025 and 2026. Building the housing and infrastructure needed to support these projects would likely delay the projects construction, which could potentially cause the projects to run overbudget.

Cost is also a concern for new green hydrogen projects, as projects going over budget is fairly common. Cost overruns have a variety of impacts on local communities. They can ripple throughout regions, causing delays on other construction projects or impacting the revenue available to meet the demands associated with the project (Forbes & Riso, 2024). Recently, the construction of a new NSCC campus in Sydney, Cape Breton, cost over 10 million dollars more than originally planned (Ayers, 2024). In recent years, the cost of construction in Nova Scotia has increased. Between 2020 and 2022, the cost of non-residential construction increased by nearly 20% (Nova Scotia Department of Statistics, 2024), driven by increasing costs of construction materials and labour, as well as the instability in global supply chains and delays caused by ever-worsening weather (Lam, 2023). Green hydrogen plants are extremely expensive, and cost overruns could pose significant problems for local communities.

5.3 Commercial Viability

As with heavy water and coal, there are also concerns about the sustainability of the hydrogen industry itself. A strong contributing factor to the collapse of coal production in Cape Breton was a lack of local and domestic markets coupled with the winding down of demand from international sources such as the United States. The reality, then, is that international demand has never been sufficient to sustain energy-based industry in the Cape Breton region after the 1920s. Green hydrogen is almost entirely dependent on international trade and demand (Nova Scotia, 2023). Most of the ammonia exports will go to Europe, where there is some commercial demand for green hydrogen but there is already significant generation (Grant, 2025). There are already concerns about the practically of the European market. Last year, a Newfoundland company interested in building a green hydrogen plant cancelled its project, having determined that a European market was not materializing as quickly as hoped (Grant, 2025). Some critics have suggested that the market in Europe may never reach a point where it is sustainable for the Point Tupper plants (Grant, 2025). With doubts about the strength of the international market, the companies that will operate in Cape Breton may need to pivot to considering the domestic market.

However, there is almost no local, provincial, or federal market for green hydrogen at this time. There is some local demand for the end product, green ammonia, which can be used as a fertilizer for farming. Yet agriculture demand is not sufficiently high to support two plants of this size. Moreover, in legislative terms, it remains unclear how green hydrogen could be used in Canada. While both the federal and provincial governments have rolled out green hydrogen strategies in recent years, development of the industry is still very much in its early stages. In Nova Scotia specifically, the climate plan, which is well on its way to implementation, focuses on electrification (for transport and building heating) as an alternative to fossil fuels, rather than on transitioning to an alternative fuel such as green hydrogen (Nova Scotia, 2023). It is possible that there may eventually be a demand for green hydrogen products (for example as an alternative aircraft fuels), it is unclear if this will be technically feasible.

At its core, then, the sustainability of green hydrogen as an industry requires there to be feasible and efficient processes for exporting the hydrogen to other jurisdictions. This could be complicated by growing global instability. The recent tariff war between Canada and the U.S. shows that global trade is never guaranteed (Hopper, 2025). Despite its long history, driven by the North American Free Trade Agreement (NAFTA) and then by United States-Mexico-Canada Agreement (USMCA), the multi-billion-dollar trade relationship between Canada and the United States has collapsed in a matter of weeks (Hopper, 2025). This shows how fragile trade relationships can really be and creates potential concern for green hydrogen.

It is important, then, that there be increased focus on how to develop local demand and uses for green hydrogen. The current Nova Scotia green hydrogen plan is a good first step. It states that "hydrogen is emerging as a complementary option to help strengthen the electricity system" (Nova Scotia, 2023, p.11). The plan assumes that, despite the focus on electrification in the Nova Scotia Climate Plan, there will be a role for alternative fuels as “flex fuels” to help meet peak energy demand in the electricity systems. The Green Hydrogen plan also lists a variety of other possible applications that have some interest from local industry. Firstly, the Plan suggests green hydrogen could replace the existing market for hydrogen locally – however, this is market is rather small. The Plan also suggests green hydrogen could be used to replace fossil fuels in some “hard-to-abate applications,” but it doesn’t go into much detail on practical applications – noting, for example, that the technology to use green hydrogen in vehicles is still in development. Thirdly, the Plan suggests that green hydrogen could be blended into the existing natural gas network, but also points out that existing LNG infrastructure is old, and that adding hydrogen could pose a significant health and environmental risks. Finally, the Plan suggests green hydrogen as a possible input for producing low-carbon value-added products (Nova Scotia, 2023, p.12). While these are all possible local green hydrogen uses, each of these strategies comes with self-acknowledged drawbacks that raise doubts about creating a sustainable green hydrogen industry.

5.4 Recommendations about Green Jobs, and their Enumeration

This study is in no way the only research that needs to be done to implement a just transition in Cape Breton. Many next steps are necessary. This study is limited to Statistics Canada data and provides a broad contextual understanding of the impacts of green energy and green hydrogen development in Cape Breton. A just transition requires a centering of the communities and workers most impacted to assure that approaches will actually improve quality of life. This means that consultation is necessary for a just transition to be implemented. This is also supported by the EDA, which suggests using broad workshops and consultations to paint a full and accurate picture of the labour force in a certain region. A next step would be to conduct interviews and consultations with the workers and communities affected by these projects to confirm the impacts they are already experiencing and provide a better framework going forward.

It is also important to improve the existing recording and analysis metrics for employment to better understand labour patterns in a new and emerging green energy world. Current job categories do not adequately separate green jobs from other jobs in similar sectors. In an open-ended fashion, the NOC defines Green Jobs in the job bank as jobs "that contribute to positive environmental outcomes (such as preservation, conservation and restoration)" (Government of Canada, 2021a). The definition of green jobs is broad and primarily relies on the people posting jobs to select a green designation. The result is a lack of accurate identification of green jobs in Canada.

A major barrier to understanding green employment is that there are no classifications for industries or occupations that are specifically counted as green. For example, NOC classification 22233 refers to construction inspectors. The classification process follows the pathway below:

2 - Natural and applied sciences and related occupations

22 - Technical occupations related to natural and applied sciences

222 - Technical occupations related to applied sciences (except engineering)

2223 - Technical inspectors and regulatory officers

NOC classification 22233 refers to a very broad category of workers. According to Statistics Canada (2024), certified energy advisors, a key part of impending green energy programs, would fall under 22233. However, mine inspectors, plumbing inspectors, bridge inspectors, and a variety of others would also be included in this classification. Poor definition of green jobs means that determining the outlook and skills needs is extremely difficult. In places where fossil fuels are being phased out, classifying jobs as the same when they are, in fact, in conflicting sectors (e.g. fossil fuels and green energy) creates significant barriers to analysis.

This thesis recommends that NOC classifications be updated to add a way of denoting whether or not an occupation is considered green. NOC classifications have been updated multiple times over the years to reflect changes in the labor force. By allowing green jobs to be better classified, updated NOC codes could allow better analysis and understanding of the jobs being created by new projects – and thereby help to create more targeted programs to provide the skills necessary.

This discussion chapter has interpreted the realities of the labour market in Cape Breton in relation to proposed green hydrogen development. Unemployment and poverty are high, as are the barriers that keep workers from accessing good, well-paying jobs. Workers have limited skills, with a strong correlation between gender and skills development. This chapter has shown that while there is ample opportunity to build stronger communities through green energy – especially green hydrogen – the foundation has not yet been laid to implement a strong just transition. There are also significant questions about the commercial viability of green hydrogen. Furthermore, there are barriers to adequate analysis of these new energy industries, based on classification systems that do not properly classify green jobs. However, with precise policies that target workers who need opportunities most and that increase social systems and accountability, Cape Breton has the chance to usher in a new area of industrial and community prosperity.

Chapter 6: Conclusion

This study argues that while green hydrogen and broader green energy developments hold significant potential for the economic revitalization in Cape Breton, they are not currently being implemented in a sustainable, community-focused manner. Without complementary employment policies and programs that prioritize the needs of local workers, these projects risk falling short of delivering a just transition. However, with targeted workforce strategies coupled with investment in housing, green energy could become a powerful opportunity for income generation and long-term community renewal.

While the opportunity for change is certainty there, Cape Breton continues to have employment problems. Its unemployment rate remains high and there is a serious lack of employment opportunities in the local area. As a result, young people are leaving, and social systems are struggling to meet the demand of existing populations. Covid-19 changed a lot for the labour market across the world. Labour trends and patterns were disrupted, shifting the opportunities and approaches needed to build a new green energy economy.

Cape Breton does have one potential advantage. It will be home to the first large scale green hydrogen plants in North America – Everwind and Bear Head in Point Tupper. If these plants can be successful and sustainable, they have the opportunity to provide new opportunity and community revitalization to people across Cape Breton.

Barriers to a successful just transition remain. It is unclear if there is sufficient local labour to meet the demands of these projects, and it is unknown if the jobs created will go to the Cape Bretoners who need them most. There is evidence to suggest that the job creation will be gendered – going to men at a higher rate than women. There is also evidence that these projects will put strain on social systems in the region, and that there may not be the infrastructure – housing, healthcare, public utilities - needed to support them.

However, there is still hope. With targeted policies, based on the principles of a just transition, Cape Breton could see the success of green hydrogen in a future energy market. Cape Breton must target key groups with training programs and must respect the rights of Mi'kmaw communities. Policy makers need to assure that programs are in place to support and reinforce the local infrastructure that may be strained by the construction of these new projects. With an approach founded in justice and respect for communities, Cape Breton definitely has the ability to shift away from only building a new energy industry and instead create opportunities for community revitalization.

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Appendix:
Cross Tabs, Syntax and Correlation Tables for EDA Data from Labour Force Survey

```
CROSSTABS
  /TABLES=survyear BY lfsstat sex
  /FORMAT=AVALUE TABLES
  /CELLS=COUNT
  /COUNT ROUND CELL.
```

Crosstabs

Notes

Output Created		09-APR-2025 12:09:01
Comments		
Input	Data	/Users/rubyswartz/Desktop/NS Cor LFS SURVMTH1.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	915913
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each table are based on all the cases with valid data in the specified range(s) for all variables in each table.
Syntax		CROSSTABS /TABLES=survyear BY lfsstat sex /FORMAT=AVALUE TABLES /CELLS=COUNT /COUNT ROUND CELL.
Resources	Processor Time	00:00:01.75
	Elapsed Time	00:00:02.00
	Dimensions Requested	2
	Cells Available	524245

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Survey year * Labour force status (2017-present)	915913	100.0%	0	0.0%	915913	100.0%
Survey year * Sex of respondent	915913	100.0%	0	0.0%	915913	100.0%

Survey year * Labour force status (2017-present) Crosstabulation

Count

		Labour force status (2017-present)				
		Employed, at work	Employed, absent from work	Unemployed	Not in labour force	Total
Survey year	2017	55473	4694	5004	37575	102746
	2018	55480	4695	4513	37821	102509
	2019	54902	4528	4139	37030	100599
	2020	53565	4795	4035	36780	99175
	2021	41400	4296	4633	33458	83787
	2022	49474	5793	4068	38564	97899
	2023	58055	5026	3660	41323	108064
	2024	58494	4960	4200	41624	109278
	2025	59445	5056	4709	42646	111856

Total	486288	43843	38961	346821	915913

Survey year * Sex of respondent Crosstabulation

Count

		Sex of respondent		
		Male	Female	Total
Survey year	2017	50133	52613	102746
	2018	49974	52535	102509
	2019	49132	51467	100599
	2020	48398	50777	99175
	2021	40662	43125	83787
	2022	47433	50466	97899
	2023	52498	55566	108064
	2024	53350	55928	109278
	2025	54527	57329	111856
Total		446107	469806	915913

```
CROSSTABS
  /TABLES=survyear lfsstat BY sex
  /FORMAT=AVALUE TABLES
  /STATISTICS=CHISQ PHI
  /CELLS=COUNT
  /COUNT ROUND CELL.
```

Crosstabs

Notes

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	Split File	<none>
	N of Rows in Working Data File	915913
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each table are based on all the cases with valid data in the specified range(s) for all variables in each table.
Syntax		CROSSTABS /TABLES=survyear lfsstat BY sex /FORMAT=AVALUE TABLES /STATISTICS=CHISQ PHI /CELLS=COUNT /COUNT ROUND CELL.
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	Elapsed Time	00:00:02.00
	Dimensions Requested	2
	Cells Available	524245

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Survey year * Sex of respondent	915913	100.0%	0	0.0%	915913	100.0%

Labour force status (2017-present) * Sex of respondent	915913	100.0%	0	0.0%	915913	100.0%

Survey year * Sex of respondent

Crosstab

Count

		Sex of respondent		
		Male	Female	Total
Survey year	2017	50133	52613	102746
	2018	49974	52535	102509
	2019	49132	51467	100599
	2020	48398	50777	99175
	2021	40662	43125	83787
	2022	47433	50466	97899
	2023	52498	55566	108064
	2024	53350	55928	109278
	2025	54527	57329	111856
Total		446107	469806	915913

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.384[a]	8	.604
Likelihood Ratio	6.384	8	.604
Linear-by-Linear Association	.421	1	.516
N of Valid Cases	915913		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 40809.52.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.003	.604
	Cramer's V	.003	.604
N of Valid Cases		915913	

Labour force status (2017-present) * Sex of respondent

Crosstab

Count

		Sex of respondent		
		Male	Female	Total
Labour force status (2017-present)	Employed, at work	252971	233317	486288
	Employed, absent from work	19369	24474	43843
	Unemployed	22892	16069	38961
	Not in labour force	150875	195946	346821
Total		446107	469806	915913

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7832.855[a]	3	<.001
Likelihood Ratio	7851.892	3	<.001
Linear-by-Linear Association	5057.563	1	<.001
N of Valid Cases	915913		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 18976.45.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.092	<.001
	Cramer's V	.092	<.001
N of Valid Cases		915913	

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Crosstabs

Notes

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Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Survey year * Class of worker, main job * Sex of respondent	604904	66.0%	311009	34.0%	915913	100.0%

Survey year * Class of worker, main job * Sex of respondent Crosstabulation

Count

			Class of worker, main job				
Sex of respondent			Public sector employees	Private sector employees	Self-employed incorporated, with paid help	Self-employed incorporated, no paid help	Self-employed unincorporated, with paid help
Male	Survey year	2017	5367	24604	1542	1405	473
		2018	5366	24523	1614	1450	454
		2019	5315	24121	1513	1461	431

		2020	5291	23534	1551	1381	463
		2021	4607	18737	1205	1049	302
		2022	5288	22005	1364	1310	344
		2023	5880	25005	1594	1423	355
		2024	5960	25599	1471	1528	309
		2025	5983	25887	1487	1608	315
	Total		49057	214015	13341	12615	3446
Female	Survey year	2017	9740	20053	555	536	240
		2018	9800	19557	606	573	214
		2019	9704	19235	563	596	220
		2020	9488	18968	574	534	199
		2021	8161	15090	417	426	142
		2022	9549	17766	519	522	153
		2023	10434	20088	515	682	172
		2024	10705	20379	480	619	182
		2025	10926	20556	530	674	162
	Total		88507	171692	4759	5162	1684
Total	Survey year	2017	15107	44657	2097	1941	713
		2018	15166	44080	2220	2023	668
		2019	15019	43356	2076	2057	651
		2020	14779	42502	2125	1915	662
		2021	12768	33827	1622	1475	444
		2022	14837	39771	1883	1832	497
		2023	16314	45093	2109	2105	527
		2024	16665	45978	1951	2147	491
		2025	16909	46443	2017	2282	477
	Total		137564	385707	18100	17777	5130

Survey year * Class of worker, main job * Sex of respondent Crosstabulation

Count

Sex of respondent			Class of worker, main job: Self-employed unincorporated, no paid help	Unpaid family worker	Total
Male	Survey year	2017	2674	30	36095
		2018	2500	56	35963
		2019	2523	63	35427
		2020	2420	41	34681
		2021	1930	28	27858
		2022	2148	24	32483
		2023	2359	14	36630
		2024	2185	22	37074
		2025	2243	15	37538
	Total		20982	293	313749
Female	Survey year	2017	2157	77	33358
		2018	2229	77	33056
		2019	2154	49	32521
		2020	2162	56	31981
		2021	1852	41	26129
		2022	1983	40	30532
		2023	2144	37	34072
		2024	2037	43	34445
		2025	2179	34	35061
	Total		18897	454	291155
Total	Survey year	2017	4831	107	69453
		2018	4729	133	69019
		2019	4677	112	67948
		2020	4582	97	66662

	2021	3782	69	53987
	2022	4131	64	63015
	2023	4503	51	70702
	2024	4222	65	71519
	2025	4422	49	72599
Total		39879	747	604904

Chi-Square Tests

Sex of respondent		Value	df	Asymptotic Significance (2-sided)
Male	Pearson Chi-Square	413.062[b]	48	<.001
	Likelihood Ratio	415.468	48	<.001
	Linear-by-Linear Association	196.975	1	<.001
	N of Valid Cases	313749		
Female	Pearson Chi-Square	261.930[c]	48	<.001
	Likelihood Ratio	260.740	48	<.001
	Linear-by-Linear Association	66.162	1	<.001
	N of Valid Cases	291155		
Total	Pearson Chi-Square	579.499[a]	48	<.001
	Likelihood Ratio	584.908	48	<.001
	Linear-by-Linear Association	251.099	1	<.001
	N of Valid Cases	604904		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 66.67.
b. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 26.02.
c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 40.74.

Symmetric Measures

Sex of respondent			Value	Approximate Significance
Male	Nominal by Nominal	Phi	.036	<.001
		Cramer's V	.015	<.001
	N of Valid Cases		313749	
Female	Nominal by Nominal	Phi	.030	<.001
		Cramer's V	.012	<.001
	N of Valid Cases		291155	
Total	Nominal by Nominal	Phi	.031	<.001
		Cramer's V	.013	<.001
	N of Valid Cases		604904	

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Crosstabs

Notes

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Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Survey year * Flows into unemployment * Sex of respondent	38961	4.3%	876952	95.7%	915913	100.0%

Survey year * Flows into unemployment * Sex of respondent Crosstabulation

Count

			Flows into unemployment					
Sex of respondent			Job losers, temporary layoff	Job losers, permanent layoff	Job leavers	Job leavers/losers (status unknown), worked more than 1 year ago	New entrants	Re-entrants, worked 1 year ago or less
Male	Survey year	2017	302	1212	215	315	205	493
		2018	285	1092	175	242	166	415
		2019	223	1037	209	205	153	364
		2020	276	951	185	179	153	382
		2021	420	922	112	196	183	392
		2022	299	754	109	257	160	308
		2023	172	701	143	165	214	401
		2024	184	905	196	159	238	425
		2025	162	965	157	225	353	440
	Total		2323	8539	1501	1943	1825	3620
Female	Survey year	2017	81	536	173	135	168	410
		2018	76	513	163	121	150	348
		2019	63	431	128	125	138	399
		2020	69	398	141	106	182	335
		2021	459	547	103	121	156	387
		2022	254	409	115	182	151	307
		2023	52	323	105	95	172	353
		2024	70	405	137	89	246	369
		2025	39	466	128	143	323	374
	Total		1163	4028	1193	1117	1686	3282
Total	Survey year	2017	383	1748	388	450	373	903
		2018	361	1605	338	363	316	763
		2019	286	1468	337	330	291	763
		2020	345	1349	326	285	335	717
		2021	879	1469	215	317	339	779

		2022	553	1163	224	439	311	615
		2023	224	1024	248	260	386	754
		2024	254	1310	333	248	484	794
		2025	201	1431	285	368	676	814
	Total		3486	12567	2694	3060	3511	6902

Survey year * Flows into unemployment * Sex of respondent Crosstabulation

Count

			Flows into unemployment		
Sex of respondent			Re-entrants, worked more than 1 year ago	Future starts	Total
Male	Survey year	2017	269	79	3090
		2018	265	80	2720
		2019	253	60	2504
		2020	233	90	2449
		2021	233	69	2527
		2022	260	96	2243
		2023	280	81	2157
		2024	287	64	2458
		2025	364	78	2744
	Total		2444	697	22892
Female	Survey year	2017	333	78	1914
		2018	362	60	1793
		2019	297	54	1635
		2020	286	69	1586
		2021	251	82	2106
		2022	294	113	1825
		2023	334	69	1503
		2024	369	57	1742
		2025	431	61	1965
	Total		2957	643	16069
Total	Survey year	2017	602	157	5004
		2018	627	140	4513
		2019	550	114	4139
		2020	519	159	4035
		2021	484	151	4633
		2022	554	209	4068
		2023	614	150	3660
		2024	656	121	4200
		2025	795	139	4709
	Total		5401	1340	38961

Chi-Square Tests

Sex of respondent		Value	df	Asymptotic Significance (2-sided)
Male	Pearson Chi-Square	615.035[b]	56	<.001
	Likelihood Ratio	594.369	56	<.001
	Linear-by-Linear Association	117.200	1	<.001
	N of Valid Cases	22892		
Female	Pearson Chi-Square	1367.404[c]	56	<.001
	Likelihood Ratio	1179.259	56	<.001
	Linear-by-Linear Association	30.938	1	<.001
	N of Valid Cases	16069		
Total	Pearson Chi-Square	1576.035[a]	56	<.001
	Likelihood Ratio	1452.123	56	<.001
	Linear-by-Linear Association	156.429	1	<.001
	N of Valid Cases	38961		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 125.88.

b. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 65.67.

c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 60.14.

Symmetric Measures

Sex of respondent			Value	Approximate Significance
Male	Nominal by Nominal	Phi	.164	<.001
		Cramer's V	.062	<.001
	N of Valid Cases		22892	
Female	Nominal by Nominal	Phi	.292	<.001
		Cramer's V	.110	<.001
	N of Valid Cases		16069	
Total	Nominal by Nominal	Phi	.201	<.001
		Cramer's V	.076	<.001
	N of Valid Cases		38961	

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Crosstabs

Notes

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Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Survey year * Occupation at main job - 2016 NOC * Sex of respondent	604904	66.0%	311009	34.0%	915913	100.0%

Survey year * Occupation at main job - 2016 NOC * Sex of respondent Crosstabulation

Count

Sex of respondent			Management occupations	Business, finance and administration occupations	Natural and applied sciences and related occupations	Health occupations	Occupations in education, law and social, community and government services
Male	Survey year	2017	3733	2517	3083	970	2369
		2018	3840	2622	3194	942	2203
		2019	3646	2570	3156	994	2272
		2020	3600	2643	3103	999	2209
		2021	2786	2071	2716	815	2005
		2022	3509	2728	3478	991	2178
		2023	4148	3092	3870	1143	2505
		2024	4343	3093	4112	1079	2646
		2025	4301	3130	4175	1179	2619
	Total		33906	24466	30887	9112	21006
Female	Survey year	2017	2111	7156	960	4170	5441
		2018	1984	7001	993	4176	5543
		2019	1976	6845	1013	4157	5449
		2020	1936	6813	1008	4090	5500
		2021	1642	5808	911	3503	4546
		2022	1930	6991	1129	4159	5289
		2023	2292	7640	1308	4790	5878
		2024	2590	7729	1364	4660	6118
		2025	2541	7804	1376	4894	6385
	Total		19002	63787	10062	38599	50149
Total	Survey year	2017	5844	9673	4043	5140	7810
		2018	5824	9623	4187	5118	7746
		2019	5622	9415	4169	5151	7721
		2020	5536	9456	4111	5089	7709
		2021	4428	7879	3627	4318	6551
		2022	5439	9719	4607	5150	7467
		2023	6440	10732	5178	5933	8383
		2024	6933	10822	5476	5739	8764
		2025	6842	10934	5551	6073	9004
	Total		52908	88253	40949	47711	71155

Survey year * Occupation at main job - 2016 NOC * Sex of respondent Crosstabulation

Count

Sex of respondent			Occupations in art, culture, recreation and sport	Sales and service occupations	Trades, transport and equipment operators and related occupations	Natural resources, agriculture and related production occupations	Occupations in manufacturing and utilities	Total
Male	Survey year	2017	864	7132	10928	1984	2515	36095
		2018	825	7089	10822	1956	2470	35963
		2019	758	6979	10665	2068	2319	35427
		2020	702	6933	10311	1948	2233	34681
		2021	592	5298	8295	1451	1829	27858
		2022	686	6145	9216	1525	2027	32483
		2023	930	6847	10314	1608	2173	36630
		2024	934	6954	10373	1528	2012	37074
		2025	909	6867	10639	1591	2128	37538
	Total		7200	60244	91563	15659	19706	313749

Female	Survey year	2017	1022	10252	908	396	942	33358
		2018	1045	10107	888	418	901	33056
		2019	1052	9783	911	462	873	32521
		2020	989	9459	875	465	846	31981
		2021	772	7152	735	366	694	26129
		2022	909	8075	881	370	799	30532
		2023	1079	8856	964	397	868	34072
		2024	1118	8736	908	374	848	34445
		2025	1302	8680	936	330	813	35061
	Total		9288	81100	8006	3578	7584	291155
Total	Survey year	2017	1886	17384	11836	2380	3457	69453
		2018	1870	17196	11710	2374	3371	69019
		2019	1810	16762	11576	2530	3192	67948
		2020	1691	16392	11186	2413	3079	66662
		2021	1364	12450	9030	1817	2523	53987
		2022	1595	14220	10097	1895	2826	63015
		2023	2009	15703	11278	2005	3041	70702
		2024	2052	15690	11281	1902	2860	71519
		2025	2211	15547	11575	1921	2941	72599
	Total		16488	141344	99569	19237	27290	604904

Chi-Square Tests

Sex of respondent		Value	df	Asymptotic Significance (2-sided)
Male	Pearson Chi-Square	1186.597[b]	72	<.001
	Likelihood Ratio	1190.872	72	<.001
	Linear-by-Linear Association	739.338	1	<.001
	N of Valid Cases	313749		
Female	Pearson Chi-Square	1111.075[c]	72	<.001
	Likelihood Ratio	1109.568	72	<.001
	Linear-by-Linear Association	532.482	1	<.001
	N of Valid Cases	291155		
Total	Pearson Chi-Square	2064.975[a]	72	<.001
	Likelihood Ratio	2067.485	72	<.001
	Linear-by-Linear Association	1240.093	1	<.001
	N of Valid Cases	604904		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 1471.54.
b. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 639.29.
c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 321.10.

Symmetric Measures

Sex of respondent			Value	Approximate Significance
Male	Nominal by Nominal	Phi	.061	<.001
		Cramer's V	.022	<.001
	N of Valid Cases		313749	
Female	Nominal by Nominal	Phi	.062	<.001
		Cramer's V	.022	<.001
	N of Valid Cases		291155	
Total	Nominal by Nominal	Phi	.058	<.001
		Cramer's V	.021	<.001
	N of Valid Cases		604904	

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Crosstabs

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Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Survey year * Industry of main job - 2012 NAICS * Sex of respondent	604904	66.0%	311009	34.0%	915913	100.0%

Survey year * Industry of main job - 2012 NAICS * Sex of respondent Crosstabulation

Count

			Industry of main job - 2012 NAICS					
Sex of respondent			Agriculture	Forestry and logging and support activities for forestry	Fishing, hunting and trapping	Mining, quarrying, and oil and gas extraction	Utilities	Construction
Male	Survey year	2017	1178	309	194	1350	430	5123
		2018	1177	325	243	1279	394	5121
		2019	1219	331	238	1336	426	5020
		2020	1220	289	240	1213	378	4830
		2021	889	244	210	937	332	3635
		2022	864	242	172	934	368	4347
		2023	902	169	195	1075	437	4859
		2024	760	208	186	1031	414	4926
		2025	851	179	224	1029	432	5111
	Total		9060	2296	1902	10184	3611	42972
Female	Survey year	2017	476	44	42	288	140	673
		2018	499	60	41	250	137	680
		2019	519	58	56	239	112	628
		2020	527	40	65	223	109	645
		2021	386	54	55	182	116	541

		2022	384	41	36	200	123	643
		2023	407	41	49	238	122	677
		2024	331	41	54	210	161	707
		2025	404	36	38	214	149	771
	Total		3933	415	436	2044	1169	5965
Total	Survey year	2017	1654	353	236	1638	570	5796
		2018	1676	385	284	1529	531	5801
		2019	1738	389	294	1575	538	5648
		2020	1747	329	305	1436	487	5475
		2021	1275	298	265	1119	448	4176
		2022	1248	283	208	1134	491	4990
		2023	1309	210	244	1313	559	5536
		2024	1091	249	240	1241	575	5633
		2025	1255	215	262	1243	581	5882
	Total		12993	2711	2338	12228	4780	48937

Survey year * Industry of main job - 2012 NAICS * Sex of respondent Crosstabulation

Count

			Industry of main job - 2012 NAICS					
Sex of respondent			Manufacturing - durable goods	Manufacturing - non-durable goods	Wholesale trade	Retail trade	Transportation and warehousing	Finance and insurance
Male	Survey year	2017	2636	1864	1602	3680	2701	886
		2018	2660	1810	1565	3674	2704	947
		2019	2561	1764	1450	3668	2668	880
		2020	2485	1697	1322	3608	2662	872
		2021	1974	1444	1123	2892	2166	736
		2022	2185	1798	1367	3401	2464	1011
		2023	2530	1816	1456	3822	2629	1237
		2024	2354	1782	1535	3881	2930	1315
		2025	2389	1861	1482	3841	2943	1307
	Total		21774	15836	12902	32467	23867	9191
Female	Survey year	2017	600	1100	652	4576	779	1548
		2018	604	1026	632	4377	815	1455
		2019	597	990	573	4338	813	1390
		2020	648	967	533	4195	756	1397
		2021	456	892	498	3446	657	1189
		2022	605	1032	585	3912	785	1425
		2023	664	1059	634	4229	812	1758
		2024	648	1097	656	4076	790	1803
		2025	677	1026	660	4236	858	1749
	Total		5499	9189	5423	37385	7065	13714
Total	Survey year	2017	3236	2964	2254	8256	3480	2434
		2018	3264	2836	2197	8051	3519	2402
		2019	3158	2754	2023	8006	3481	2270
		2020	3133	2664	1855	7803	3418	2269
		2021	2430	2336	1621	6338	2823	1925
		2022	2790	2830	1952	7313	3249	2436
		2023	3194	2875	2090	8051	3441	2995
		2024	3002	2879	2191	7957	3720	3118
		2025	3066	2887	2142	8077	3801	3056
	Total		27273	25025	18325	69852	30932	22905

Survey year * Industry of main job - 2012 NAICS * Sex of respondent Crosstabulation

Count

			Industry of main job - 2012 NAICS				
Sex of respondent			Real estate and rental and leasing	Professional, scientific and technical services	Business, building and other support services	Educational services	Health care and social assistance

Male	Survey year	2017	588	2084	1496	1596	1528
		2018	593	2114	1519	1577	1559
		2019	606	2257	1398	1581	1609
		2020	613	2164	1380	1536	1614
		2021	465	1887	1116	1339	1399
		2022	583	2424	1326	1515	1649
		2023	667	2953	1416	1714	1854
		2024	668	3171	1395	1801	1896
		2025	694	3151	1443	1794	1982
	Total		5477	22205	12489	14453	15090
Female	Survey year	2017	461	1799	1166	3552	7554
		2018	518	1738	1090	3749	7425
		2019	461	1817	1140	3644	7526
		2020	474	1830	1078	3688	7345
		2021	381	1564	867	3128	6191
		2022	445	2009	936	3517	7232
		2023	547	2342	1022	3867	8122
		2024	540	2456	1103	4054	8215
		2025	587	2403	1023	4216	8422
	Total		4414	17958	9425	33415	68032
Total	Survey year	2017	1049	3883	2662	5148	9082
		2018	1111	3852	2609	5326	8984
		2019	1067	4074	2538	5225	9135
		2020	1087	3994	2458	5224	8959
		2021	846	3451	1983	4467	7590
		2022	1028	4433	2262	5032	8881
		2023	1214	5295	2438	5581	9976
		2024	1208	5627	2498	5855	10111
		2025	1281	5554	2466	6010	10404
	Total		9891	40163	21914	47868	83122

Survey year * Industry of main job - 2012 NAICS * Sex of respondent Crosstabulation

Count

Sex of respondent			Industry of main job - 2012 NAICS: Information, culture and recreation	Accommodation and food services	Other services (except public administration)	Public administration	Total
Male	Survey year	2017	1524	1923	1493	1910	36095
		2018	1510	1922	1398	1872	35963
		2019	1399	1845	1299	1872	35427
		2020	1430	1852	1364	1912	34681
		2021	1039	1228	1142	1661	27858
		2022	1273	1469	1180	1911	32483
		2023	1597	1811	1352	2139	36630
		2024	1595	1763	1366	2097	37074
		2025	1578	1754	1369	2124	37538
	Total		12945	15567	11963	17498	313749
Female	Survey year	2017	1355	2982	1523	2048	33358
		2018	1353	2988	1655	1964	33056
		2019	1356	2828	1486	1950	32521
		2020	1278	2753	1512	1918	31981
		2021	904	1764	1166	1692	26129
		2022	1151	2047	1302	2122	30532
		2023	1341	2351	1503	2287	34072
		2024	1395	2343	1422	2343	34445
		2025	1469	2356	1408	2359	35061
	Total		11602	22412	12977	18683	291155
Total	Survey year	2017	2879	4905	3016	3958	69453

	2018	2863	4910	3053	3836	69019
	2019	2755	4673	2785	3822	67948
	2020	2708	4605	2876	3830	66662
	2021	1943	2992	2308	3353	53987
	2022	2424	3516	2482	4033	63015
	2023	2938	4162	2855	4426	70702
	2024	2990	4106	2788	4440	71519
	2025	3047	4110	2777	4483	72599
Total		24547	37979	24940	36181	604904

Chi-Square Tests

Sex of respondent		Value	df	Asymptotic Significance (2-sided)
Male	Pearson Chi-Square	1806.413[b]	160	<.001
	Likelihood Ratio	1820.921	160	<.001
	Linear-by-Linear Association	324.969	1	<.001
	N of Valid Cases	313749		
Female	Pearson Chi-Square	1298.044[c]	160	<.001
	Likelihood Ratio	1297.491	160	<.001
	Linear-by-Linear Association	9.462	1	.002
	N of Valid Cases	291155		
Total	Pearson Chi-Square	2755.976[a]	160	<.001
	Likelihood Ratio	2770.262	160	<.001
	Linear-by-Linear Association	253.482	1	<.001
	N of Valid Cases	604904		

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c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 37.24.

Symmetric Measures

Sex of respondent			Value	Approximate Significance
Male	Nominal by Nominal	Phi	.076	<.001
		Cramer's V	.027	<.001
	N of Valid Cases		313749	
Female	Nominal by Nominal	Phi	.067	<.001
		Cramer's V	.024	<.001
	N of Valid Cases		291155	
Total	Nominal by Nominal	Phi	.067	<.001
		Cramer's V	.024	<.001
	N of Valid Cases		604904	

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Crosstabs

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Case Processing Summary

	Cases					
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	N	Percent	N	Percent	N	Percent
Survey year * Highest educational attainment * Sex of respondent	915913	100.0%	0	0.0%	915913	100.0%

Survey year * Highest educational attainment * Sex of respondent Crosstabulation

Count

Sex of respondent			Highest educational attainment: 0 to 8 years	Some high school	High school graduate	Some postsecondary	Postsecondary certificate or diploma	Bachelor's degree
Male	Survey year	2017	2814	7173	10616	3268	16714	6202
		2018	2680	6943	10507	3533	16622	6367
		2019	2620	6556	10243	3200	16758	6317
		2020	2430	6341	9993	3019	16634	6505
		2021	1836	5142	8381	2497	13979	5760
		2022	1954	5833	9884	2546	16221	7217
		2023	2071	6287	10747	2958	17754	8199
		2024	2042	6291	10658	2926	17836	8777
		2025	1975	6326	10782	3275	18239	8951
	Total		20422	56892	91811	27222	150757	64295
Female	Survey year	2017	2794	6402	10823	3411	17573	8225
		2018	2654	6379	10698	3520	17477	8372
		2019	2556	5932	10515	3264	17107	8535
		2020	2411	5610	10013	3188	17145	8661
		2021	1919	4547	8586	2630	14521	7669
		2022	2122	5173	9963	2557	17123	9376
		2023	2199	5635	10698	2893	18673	10539
		2024	2078	5384	10481	2781	18707	11178
		2025	1981	5544	10549	3027	18877	11654
	Total		20714	50606	92326	27271	157203	84209
Total	Survey year	2017	5608	13575	21439	6679	34287	14427
		2018	5334	13322	21205	7053	34099	14739
		2019	5176	12488	20758	6464	33865	14852
		2020	4841	11951	20006	6207	33779	15166
		2021	3755	9689	16967	5127	28500	13429
		2022	4076	11006	19847	5103	33344	16593
		2023	4270	11922	21445	5851	36427	18738
		2024	4120	11675	21139	5707	36543	19955

	2025	3956	11870	21331	6302	37116	20605
	Total	41136	107498	184137	54493	307960	148504

Survey year * Highest educational attainment * Sex of respondent Crosstabulation

Count

Sex of respondent			Highest educational attainment Above bachelor's degree	Total
Male	Survey year	2017	3346	50133
		2018	3322	49974
		2019	3438	49132
		2020	3476	48398
		2021	3067	40662
		2022	3778	47433
		2023	4482	52498
		2024	4820	53350
		2025	4979	54527
	Total		34708	446107
Female	Survey year	2017	3385	52613
		2018	3435	52535
		2019	3558	51467
		2020	3749	50777
		2021	3253	43125
		2022	4152	50466
		2023	4929	55566
		2024	5319	55928
		2025	5697	57329
	Total		37477	469806
Total	Survey year	2017	6731	102746
		2018	6757	102509
		2019	6996	100599
		2020	7225	99175
		2021	6320	83787
		2022	7930	97899
		2023	9411	108064
		2024	10139	109278
		2025	10676	111856
	Total		72185	915913

Chi-Square Tests

Sex of respondent		Value	df	Asymptotic Significance (2-sided)
Male	Pearson Chi-Square	2309.289[b]	48	<.001
	Likelihood Ratio	2303.814	48	<.001
	Linear-by-Linear Association	1720.720	1	<.001
	N of Valid Cases	446107		
Female	Pearson Chi-Square	2878.464[c]	48	<.001
	Likelihood Ratio	2874.435	48	<.001
	Linear-by-Linear Association	2267.242	1	<.001
	N of Valid Cases	469806		
Total	Pearson Chi-Square	5087.109[a]	48	<.001
	Likelihood Ratio	5077.809	48	<.001
	Linear-by-Linear Association	3971.162	1	<.001
	N of Valid Cases	915913		

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c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 1901.40.

Symmetric Measures

Sex of respondent			Value	Approximate Significance
Male	Nominal by Nominal	Phi	.072	<.001
		Cramer's V	.029	<.001
	N of Valid Cases		446107	
Female	Nominal by Nominal	Phi	.078	<.001
		Cramer's V	.032	<.001
	N of Valid Cases		469806	
Total	Nominal by Nominal	Phi	.075	<.001
		Cramer's V	.030	<.001
	N of Valid Cases		915913	

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Crosstabs

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Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Survey year * Class of worker, main job * Sex of respondent	604904	66.0%	311009	34.0%	915913	100.0%

Survey year * Class of worker, main job * Sex of respondent Crosstabulation

Count

Sex of respondent			Class of worker, main job: Public sector employees	Private sector employees	Self-employed incorporated, with paid help	Self-employed incorporated, no paid help	Self-employed unincorporated, with paid help
Male	Survey year	2017	5367	24604	1542	1405	473
		2018	5366	24523	1614	1450	454
		2019	5315	24121	1513	1461	431
		2020	5291	23534	1551	1381	463
		2021	4607	18737	1205	1049	302
		2022	5288	22005	1364	1310	344
		2023	5880	25005	1594	1423	355
		2024	5960	25599	1471	1528	309
		2025	5983	25887	1487	1608	315
	Total		49057	214015	13341	12615	3446
Female	Survey year	2017	9740	20053	555	536	240
		2018	9800	19557	606	573	214
		2019	9704	19235	563	596	220
		2020	9488	18968	574	534	199
		2021	8161	15090	417	426	142
		2022	9549	17766	519	522	153
		2023	10434	20088	515	682	172
		2024	10705	20379	480	619	182
		2025	10926	20556	530	674	162
	Total		88507	171692	4759	5162	1684
Total	Survey year	2017	15107	44657	2097	1941	713
		2018	15166	44080	2220	2023	668
		2019	15019	43356	2076	2057	651
		2020	14779	42502	2125	1915	662
		2021	12768	33827	1622	1475	444
		2022	14837	39771	1883	1832	497
		2023	16314	45093	2109	2105	527
		2024	16665	45978	1951	2147	491
		2025	16909	46443	2017	2282	477
	Total		137564	385707	18100	17777	5130

Survey year * Class of worker, main job * Sex of respondent Crosstabulation

Count

Sex of respondent			Class of worker, main job: Self-employed unincorporated, no paid help	Unpaid family worker	Total
Male	Survey year	2017	2674	30	36095
		2018	2500	56	35963
		2019	2523	63	35427
		2020	2420	41	34681
		2021	1930	28	27858
		2022	2148	24	32483
		2023	2359	14	36630
		2024	2185	22	37074
		2025	2243	15	37538
	Total		20982	293	313749
Female	Survey year	2017	2157	77	33358
		2018	2229	77	33056
		2019	2154	49	32521
		2020	2162	56	31981
		2021	1852	41	26129
		2022	1983	40	30532
		2023	2144	37	34072

		2024	2037	43	34445
		2025	2179	34	35061
	Total		18897	454	291155
Total	Survey year	2017	4831	107	69453
		2018	4729	133	69019
		2019	4677	112	67948
		2020	4582	97	66662
		2021	3782	69	53987
		2022	4131	64	63015
		2023	4503	51	70702
		2024	4222	65	71519
		2025	4422	49	72599
	Total		39879	747	604904

Chi-Square Tests

Sex of respondent		Value	df	Asymptotic Significance (2-sided)
Male	Pearson Chi-Square	413.062[b]	48	<.001
	Likelihood Ratio	415.468	48	<.001
	Linear-by-Linear Association	196.975	1	<.001
	N of Valid Cases	313749		
Female	Pearson Chi-Square	261.930[c]	48	<.001
	Likelihood Ratio	260.740	48	<.001
	Linear-by-Linear Association	66.162	1	<.001
	N of Valid Cases	291155		
Total	Pearson Chi-Square	579.499[a]	48	<.001
	Likelihood Ratio	584.908	48	<.001
	Linear-by-Linear Association	251.099	1	<.001
	N of Valid Cases	604904		

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Symmetric Measures

Sex of respondent			Value	Approximate Significance
Male	Nominal by Nominal	Phi	.036	<.001
		Cramer's V	.015	<.001
	N of Valid Cases		313749	
Female	Nominal by Nominal	Phi	.030	<.001
		Cramer's V	.012	<.001
	N of Valid Cases		291155	
Total	Nominal by Nominal	Phi	.031	<.001
		Cramer's V	.013	<.001
	N of Valid Cases		604904	

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Crosstabs

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Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Survey year * Labour force status (2017-present) * Sex of respondent	915913	100.0%	0	0.0%	915913	100.0%

Survey year * Labour force status (2017-present) * Sex of respondent Crosstabulation

Count

			Labour force status (2017-present)				
Sex of respondent			Employed, at work	Employed, absent from work	Unemployed	Not in labour force	Total
Male	Survey year	2017	28702	2107	3090	16234	50133
		2018	28925	2096	2720	16233	49974
		2019	28689	2005	2504	15934	49132
		2020	27795	2136	2449	16018	48398
		2021	21703	1840	2527	14592	40662
		2022	25740	2578	2243	16872	47433
		2023	30178	2225	2157	17938	52498
		2024	30387	2180	2458	18325	53350
		2025	30852	2202	2744	18729	54527
	Total		252971	19369	22892	150875	446107
Female	Survey year	2017	26771	2587	1914	21341	52613
		2018	26555	2599	1793	21588	52535
		2019	26213	2523	1635	21096	51467
		2020	25770	2659	1586	20762	50777
		2021	19697	2456	2106	18866	43125
		2022	23734	3215	1825	21692	50466
		2023	27877	2801	1503	23385	55566
		2024	28107	2780	1742	23299	55928
		2025	28593	2854	1965	23917	57329
	Total		233317	24474	16069	195946	469806
Total	Survey year	2017	55473	4694	5004	37575	102746

	2018	55480	4695	4513	37821	102509
	2019	54902	4528	4139	37030	100599
	2020	53565	4795	4035	36780	99175
	2021	41400	4296	4633	33458	83787
	2022	49474	5793	4068	38564	97899
	2023	58055	5026	3660	41323	108064
	2024	58494	4960	4200	41624	109278
	2025	59445	5056	4709	42646	111856
Total		486288	43843	38961	346821	915913

Chi-Square Tests

Sex of respondent		Value	df	Asymptotic Significance (2-sided)
Male	Pearson Chi-Square	903.613[b]	24	<.001
	Likelihood Ratio	892.788	24	<.001
	Linear-by-Linear Association	65.440	1	<.001
	N of Valid Cases	446107		
Female	Pearson Chi-Square	962.750[c]	24	<.001
	Likelihood Ratio	933.618	24	<.001
	Linear-by-Linear Association	33.256	1	<.001
	N of Valid Cases	469806		
Total	Pearson Chi-Square	1739.327[a]	24	<.001
	Likelihood Ratio	1710.669	24	<.001
	Linear-by-Linear Association	95.483	1	<.001
	N of Valid Cases	915913		

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Symmetric Measures

Sex of respondent			Value	Approximate Significance
Male	Nominal by Nominal	Phi	.045	<.001
		Cramer's V	.026	<.001
	N of Valid Cases		446107	
Female	Nominal by Nominal	Phi	.045	<.001
		Cramer's V	.026	<.001
	N of Valid Cases		469806	
Total	Nominal by Nominal	Phi	.044	<.001
		Cramer's V	.025	<.001
	N of Valid Cases		915913	