ONTARIO'S SHIFT TOWARDS THE GREEN ECONOMY: THE

INSTITUTIONAL PERSPECTIVE

Author: Karen N. Botchway

Institution: Western University

Supervisors: Jesse Sutton, Godwin Arku

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Introduction

Climate change increases the chance of sickness, death, and the likelihood of contracting diseases, such as tuberculosis, yellow fever, and Lyme disease, in humans. This increased threat to human health makes climate change a worldwide issue (Wells, 2024; Biello, 2008). Since climate change is caused by greenhouse gas emissions from human activities, reducing greenhouse gas emissions is the best way to mitigate climate change and a goal many nations are striving towards. To achieve this goal, advancing the green economy is critical since it allows for continuing crucial economic human activities without greenhouse gas emissions (UN Environmental Programme, 2024).

How formal institutions, such as upper-level governments, are directing regions' shifts toward the green economy, a crucial element in reducing greenhouse gas emissions, has not been widely examined in the literature. To address this gap in the literature, this study will examine institutional efforts supporting the move toward the green economy in Ontario. Specifically, it aims to answer the following question: what are some federal and provincial policies and programs that facilitate green industrial activities in Ontario?

To answer the question, we reviewed policies and programs implemented by the Canadian and Ontario governments by examining sources, such as federal websites, news posts, and private and public institutional websites. This review process took two months and required multiple reviews of the same sources, subsequent searches of related sources, constant documentation of sources visited, and summaries of the information obtained.

Ontario was chosen for this research because it has been one of the biggest net importers of gas in the world with releases and transfers of more than 347 million kilograms of pollutants (Qudrat-Ullah, 2014; Winfield, 2012). It is also undergoing shifts towards the green economy, so

focusing on the government actions taken by such a key contributor to greenhouse gas emissions is crucial to understanding the necessary steps for advancing the green economy and any effects of this change. It will also provide an informative policy review that can support the shift towards the green economy for other countries globally (Eaton, 2021).

This paper contributes to the literature on economic geography and regional studies in many ways. It provides an in-depth summary of the policies and programs implemented to achieve a green economy in Ontario. Next, research on the green economy in Ontario is limited, so this study provides a novel insight into the topic to help future researchers understand the institutional landscape of Ontario better. Lastly, there has also been limited research that connects the Geographical Political Economy perspective to the green economy, and in doing so, the institutional lens allows this study to provide additional insight.

The paper starts by examining the literature on the green economy in Canada, and Ontario. It then provides background on the Geographic Political Economy (GPE) and Evolutionary Economic Geography (EEG) to provide the context to understand how institutions influence economic actors' behaviors and actions. Subsequently, the paper reviews the method employed. Next, the paper provides an overview of the results. Then, a discussion of the results is given. Finally, the paper concludes and presents some recommendations for policy implementation.

Literature review

Between 1970 and 2004, greenhouse gas emissions increased by 70% with an 80% increase in carbon dioxide (D'Amato et al., 2010). The rise in greenhouse gas emissions has led to multiple

harmful effects like climate change and the depletion of the ozone layer, and approximately 55,600 predicted climate change-related annual deaths by 2030 (Silva et al., 2017).

These damaging effects led countries to promote a green economy in an attempt to reduce emissions (Georgeson et al., 2017). The green economy encourages green growth, which is a term to describe a path of economic growth that sustainably utilizes natural resources. Green growth promotes using renewable resources in production and the mitigation of carbon dioxide from the production process (Bagheri et al., 2018).

Most countries have attempted to shift towards the green economy albeit in different ways. For instance, countries like China create and utilize wind, solar, biological, and hydropower plants for lower-emission electricity generation. Brazil, China, India, Mexico, Russia, and South Africa are directing their national budget towards renewable energy projects (Babonea & Joia, 2012). Also, countries like the UK, France, and China are implementing growth-focused policies that are environmentally sustainable, like building green products, and countries like Rwanda, Morocco, Ethiopia, Senegal, and South Africa are implementing ecologically sustainable policies that aim to reduce pollution (Georgeson et al., 2017).

The stride for mitigating the harmful effects of climate change through the green economy encouraged the use of policies that increase economic growth and promote sustainable development, which encourages more eco-friendly consumption and production by different governments, firms, and individuals (Söderholm, 2020). Promoting the green economy shifts the focus from strict economic goals, such as competitiveness, productivity, and GDP growth, to broader societal goals, such as climate stability and quality job creation (Tagliapietra & Veugelers, 2020). This change in policies and goals highlights the fundamental characteristics of the green economy, which are environmental sustainability and emission reduction, thereby

causing countries to focus on mitigating the unfavorable effects of production (Georgeson et al., 2017).

Each country uniquely contributes to greenhouse gas emissions regardless of their percentage of the global population. Take Canada: the country has 0.5% of the world's population yet contributes 2% of global greenhouse gas emissions. Its greenhouse gas emissions have decreased by a smaller percentage than other countries. Most of Canada's greenhouse gas emissions come from the energy sector, industrial processes, and the current Canadian driving culture with greenhouse gas-emitting vehicles. Different governments have failed to get greenhouse gas emissions levels to their targets (Nikzad & Sedigh, 2017). Canada is also among the world's top energy consumers due to its heavy reliance on energy-intensive industries, harsh climate, vast geography, low population density, and high standard of living. It is also one of the world's most reliable energy producers since it owns numerous renewable and non-renewable resources such as oil, gas, coal, solar, and wind (Bagheri et al., 2018; Schwartz, 2007).

Canada's government consists of the federal, provincial, and municipal governments. Each section functions differently, with each function aimed at achieving that government's interests (Young & Leuprecht, 2006; Cairns, 2009). The provincial government works to meet the needs of the politically-created provincial society and economy, and the federal government works to meet the needs of the country-wide society and economy (Cairns, 2009). Due to the difference in capabilities, the provincial government is generally more restricted than the federal, by its territorial boundaries, and tends to respond to federal initiatives instead of creating its own initiatives (Young & Leuprecht, 2006; Cairns, 2009). Municipal governments are the most restricted since they are "creatures of the state", and typically have no power (Sutton & Arku, 2024). Consequently, most policies and programs tend to be initiated by the federal government

with only a few being started by the provincial and municipal governments (Young &
Leuprecht, 2006).

Regardless, the federal and provincial governments both aim to promote the green economy in
Canada by employing various techniques, including market-based instruments like taxation and
non-market-based instruments like command-and-control regulation (Nikzad & Sedigh, 2017).
Market-based instruments are tools and practices that utilize financial incentives like price to
limit undesired environmental impacts. They encourage certain behaviors to ensure that
individuals' and firms' actions benefit the economy and environment.

Some market-based instruments used in Canada are the Cap and Trade Mechanisms,
Environmental Offsets, and Green Infrastructure Incentive Programs (MacEachern, 2013). Green
infrastructure incentive programs are efficient ways to promote the green economy and can be
implemented through expenditure and taxation. Expenditure programs, such as The Investing in
Canada Infrastructure Program, allocate large amounts of federal funding to green infrastructure
for the reduction of greenhouse gas emissions, and enablement of climate change resilience and
adaptation. For instance, The Investing in Canada Infrastructure Program helped fund green
infrastructure in different provinces to facilitate greenhouse gas emission reduction, climate
change resilience, and the mitigation of its harmful effects (Anderson & Gough, 2022).

A popular taxation system in Canada and other countries is the feed-in-tariff (FIT) program.
Feed-in tariffs allow electricity vendors to sell to the electricity grid at a high price. These prices
differ depending on the type of renewable energy project. The government offers higher prices
for less competitive complex technologies, such as solar photovoltaics, and lower prices for more
competitive technologies, such as onshore wind generation plants. FIT also encourages local
generation with the use of the local content requirements, which provide subsidies based on

whether the electricity was generated in Canada and using Canadian equipment (Charnovitz &
Fischer, 2015). Taxation systems also fund green product production expenditures, such as the
Canadian Renewable and Conservation Expenses (CRCE) and Wind Power Production
Incentive. CRCE was introduced in the 1996 federal budget to promote energy efficiency and
small to medium-scale renewable energy projects through the income tax system. The WPPI
funded the creation of wind farms in Canada, such as the wind farms at McBride Lake, Alberta,
Exhibition Place in Toronto; Summerview at Pincher Creek, Alberta; and Renard at
Rivière-aux-Renards, Québec (Whitmore & Bramley, 2003). This type of expenditure leads to
the creation of goods that would produce crucial resources for Canada, such as electricity, in an
environmentally sustainable way.

   Another means to the green economy utilized by Canada is the use of subsidies. These include
subsidizing green technology, renewable energy projects, and green technology research. In
terms of subsidizing research, there are already major Canadian organizations that provide
funding for renewable projects, such as the Office of Energy Research and Development for
Research and Development (R&D) and the Renewable and Electrical Energy Division of Natural
Resources Canada for Market Development. These organizations and the Government of Canada
have donated billions of Canadian dollars to invest in new technologies to reduce gas emissions
(Islam et al., 2004). Research for green technologies is generally underinvested because of its
uncertainty. Green technologies are still relatively new and more complex than non-green
technology, so investing in them poses higher levels of risk and uncertainty since the knowledge
found may not be usable soon. These issues repel firms from green technology and towards
non-green technology. Therefore, attracting them to non-green technology like fossil fuel-based
production is profitable due to fossil-fuel subsidies and the lack of sufficient emission penalties

(Tagliapietra & Veugelers, 2020). Thus, subsidizing research would reduce its cost to firms, which could encourage more firms to engage in such research. Although subsidies are efficient ways of advancing environmental sustainability, they work best when combined with taxation on pollution since this combination encourages renewable production while discouraging non-renewable production (Barbier, 2016).

These techniques are crucial for many high-polluting provinces in Canada, and Ontario is one of them. In 2003, Ontario was one of the biggest net importers of gas from the US, and between 1997 and 2012, Ontario was among the top six sources of releases and transfers of pollutants in Canada and the United States of America. Ontario also held the second position, after British Columbia, between 2003 and 2006, with releases and transfers of more than 347 million kilograms of pollutants (Qudrat-Ullah, 2014; Winfield, 2012).

Reducing these pollutants can be done by finding cleaner ways to generate Ontario's needed resources, such as generating electricity from renewable sources, like wind and solar power. Take wind power. It is one of the cleanest sources of electrical energy since it does not produce greenhouse gases or nuclear waste. By 2006, 3,006 megawatts per hour of wind power was under construction with a total estimated wind power potential of 406 megawatts per hour. However, an issue with wind-based electricity is that after a particular capacity is reached, it becomes unstable. In Ontario, this threshold is believed to be 5,000 megawatts (Schwartz, 2007). Despite Canada's sizable wind energy potential, there have not been any intensive wind energy programs in Canada (Islam et al., 2004).

Solar power is considered an alternative to the conventional non-renewable energy source. This coupled with the rising cost of fuel-based electricity has increased the attention towards solar-powered electricity. Solar power, like wind power, does not pollute the environment and

cannot be used in the absence of solar energy. Thus, firms and consumers must have alternative forms of electricity along with solar power. SunEdison LLC of Baltimore and SkyPower Corp. of Toronto are two major companies that produce solar energy. They build and operate solar photovoltaic farms in Toronto (Schwartz, 2007). These sources encourage the production of green power. Green power is electricity produced from renewable sources with minimal unfavorable effects on the environment, human health, and communities. Green power is crucial for a greener Ontario since fossil fuel-based electricity production, such as coal electricity production, is an essential cause of climate change and was responsible for 19% of Canada's greenhouse gas emissions in 2001. Green power, however, emits little to no greenhouse gas emissions and uses renewable sources like wind, hydro, and solar power. Thus, to reduce greenhouse gas emissions, producing green power must be considered (Whitmore & Bramley, 2003).

Another way to promote the green economy in Ontario is through implementing regulations, such as the Ontario Building Code, Kyoto Protocol, Climate Change Plan, and Green Economy Act, to encourage greener production (Anderson & Gough, 2022; Sinclair, 2013). The Green Energy Act invested millions into renewable energy projects and encouraged economic practices that reduced greenhouse gas emissions. This act encouraged activities involving the production and use of renewable energy in Ontario and, ultimately, eradicating non-renewable energy production methods like coal-powered electricity production (Sinclair, 2013). The government's first step in regulating greenhouse gas concentrations was the Kyoto Protocol, which was established in 1997. This protocol led to the agreement of legally binding the greenhouse gas emission target to 6% below the 1990 level between 2008 and 2012. The Climate Change Plan

for Canada, established in November 2002, increased the focus on renewable electricity, including green power (Whitmore & Bramley, 2003).

   A greener Ontario can also be achieved by incorporating zero-emission vehicles (ZEV) into the province. ZEV reduce greenhouse gas emissions by limiting the number of greenhouse gas-emitting vehicles used. The term ZEV describes battery electric vehicles (BEVs) powered by electricity alone, plug-in hybrid electric vehicles (PHEVs) powered by electricity and petroleum or biofuel, and hydrogen fuel cell vehicles (HFCVs) powered by hydrogen. To encourage the adoption of ZEV, demand and supply-focused policies must be considered, with demand-focused policies like purchase and fuel subsidies and supply policies like research and development subsidies and direct requirements for automakers to sell zero-emission vehicles being utilized. ZEV mandates are strong supply-side policies since they make producers responsible for the production of ZEV and task them to make these goods appealing to consumers. The exact policies needed to encourage ZEV production are unknown to researchers, but through a Monte Carlo simulation, it is estimated that a high amount of zero-emission vehicle policies would be needed to reach the nation's 2030 goals (Sykes & Axsen, 2017). ZEV, therefore, serve as a reasonable way to reduce greenhouse gas emissions.

Institutional Review

Various researchers have introduced approaches, such as the Global Production Network (GPN) approach, which combines the evolutionary and institutional approach, more specifically the Geographical Political Economy (GPE) approach, to explain the changing organizational dynamics of globalization and their implications for regional development (MacKinnon et al.,

2019). This combination allows for the exploration of the economy and its composing institutions at the firm and territorial levels, which provides a better idea of the organizational routines of firms and institutions at the territorial level (Boschma & Frenken, 2006).

The GPE approach attributes institutions to the expression of authority, social and legal laws, and national regulations. Therefore, institutions develop from and co-evolve by solving specific problems and stabilizing mutual expectations and correlated interaction. Inheritance concepts related to the GPE approach are the family and community inheritance for teaching institutions. Family inheritance refers to the joint capabilities of firms within a region, and it views firms as individual learners. The community inheritance refers to the joint nature of all firms in a region with each firm acting as both a teacher and learner (Bathelt & Glückler, 2013). Thus, any paths created are related to the group requirements of all institutions within a space (MacKinnon et al., 2009).

Additionally, within the GPE framework, actors within the institution have their actions constrained by those institutions (MacKinnon et al., 2009; MacKinnon et al., 2019; Sutton & Arku, 2024). Therefore, actors are bound and rely heavily on the institutions in which they find themselves. These institutions guide their decisions and actions and also dictate the types of paths, laws, rules, and ways of doing things created (Boschma & Frenken, 2006; MacKinnon et al., 2019). The function of institutions is based on their positions in the world since it defines how they perform and the types of resources they have access to. This function and creativity inform territorial divisions of labor, path dependence, and path type (MacKinnon et al., 2009).

The Evolutionary Geographic Perspective explains the change in policies as a change in different factors within its governing institutions, such as the changes of the primary actors within the government and firms, and not as a change in the industry itself (Rafiqui, 2008;

Boschma & Frenken, 2006). The different institutional environments depict the varying

institutions of the economy, such as the government and economic institutions, as systems of

informal norms, social routines, and formal rules and regulations that affect the types of

decisions they make (Rafiqui, 2008; Bathelt & Glückler, 2013). This coupled with the concept of

trial and error influencing the policies implemented (Boschma & Frenken, 2006), explains the

difference in green industrial policies over the years.

   The evolutionary economic geography perspective also helps us narrow our research down to

the principal institutions, the government, and financial institutions. Other institutions, such as

legal and educational institutions, are influenced by notable institutions like the government

(Boschma & Frenken, 2006; Bathelt & Glückler, 2013). Different actors within these institutions

explain the drastic change of policies with green policies implemented in specific years and

non-green policies, such as the encouragement of fossil fuel-based electricity production,

implemented in other years. These actors act due to external influence, such as pressure or

expectations from the public, world organizations, and other local institutions (Bathelt &

Glückler, 2013).

   This influence results in an institutional change from promoting an unsustainable economy to a

green economy by encouraging action based on the interests of different actors (MacKinnon et

al., 2019; Bathelt & Glückler, 2013). This change has led to the creation of a path that promotes

the emergence and growth of green industries and economic activities in the world and Canada

(MacKinnon et al., 2019). It resulted in the continuous emergence of green policies and activities

since all actors within a set industry act in line with the previously established laws of those

industries (Boschma & Frenken, 2006). It also leads to the development of new technology and

social rules that correspond with the established green economy path to further promote its cause (MacKinnon et al., 2019).

The evolutionary economic geography principle helps to explain the recent emergence of green economy promotion. As time passes, organizations inherit different characteristics based on external factors, like location and events, which shape their norms, customs, and actions. These characteristics are usually impeded into society and irreversible since they result from irreversible events, such as the harmful effects of pollution (MacKinnon et al., 2019; MacKinnon et al., 2009). Subsequently, these characteristics cause a change in an actor's interests, which creates a path that corresponds with the influential actors' interests, thus leading to a change in the type of policies prioritized and promoted by institutions those actors belong to (Boschma *&* Frenken, 2006). This change in prioritized policies leads to the emergence of policies and programs that address the varying organizational characteristics.

Methodology

Research Area

Ontario was chosen for this research because it has been one of the biggest net importers of gas in the world with releases and transfers of more than 347 million kilograms of pollutants (Qudrat-Ullah, 2014; Winfield, 2012). Also, Ontario being the leading manufacturing province in Canada makes the province's efforts to promote the green economy worth looking into since any efforts taken to provide a less greenhouse emitting way to produce could lead to significant reductions in the country's greenhouse gas emission levels (Horn et al., 2024). Ontario is also currently undergoing shifts towards the green economy through the implementation of various

environmental, green industrial, and green infrastructure policies, such as the Green
Infrastructure Smart Grid Program, Smart Renewables and Electrification Pathways Program,
and the Green Energy Act (Natural Resources Canada, 2024b; Natural Resources Canada,
2024d; *Green Energy and Green Economy Act* 2009). Therefore, focusing on the government
actions taken by such a key contributor to greenhouse gas emissions is crucial to understanding
what it takes to shift to a green economy and the effects of the shift. It will also provide countries
or territories looking to move towards a green economy with an idea of how to do so (Eaton,
2021).

Search Strategy

The goal of my project was to uncover green industrial policies and programs, i.e., policies or
programs that produce green products, in Ontario at the federal and provincial levels that make
Ontario's economy greener. My research was conducted between May 7th, 2024, and June 20th,
2024, so any sources used were found within these dates. To conduct my research, I used online
resources and databases like Google Scholar, ScienceDirect, federal websites like Canada.ca, and
Ontario Newsroom, Google Chrome, and Western Libraries. I also conducted a comprehensive
search by consulting the public federal sites, news sites, and the websites of private
organizations. The key search terms I used were green products, green policies, and green
industrial policies and programs in Canada and Ontario. This search resulted in the discovery of
various green policies in Ontario and Canada and the production of comprehensive reviews of
these policies. To ensure that information was properly captured, I read many of these articles
numerous times and conducted subsequent searches to examine the accuracy and significance of
these policies.

The criteria I used to examine whether these policies would be featured in my research output was whether these policies or programs produced green products in Ontario (i.e., products that protect or enhance the environment during production, use, or disposal by conserving resources and minimizing the use of toxic agents, pollution, and waste (Bhardwaj et al., 2020). Subsequently, the exclusion criteria resulted in the exclusion of numerous environmental, green infrastructure policies and programs in Canada and policies or programs that do not produce green products in Ontario or are implemented by the municipal government, such as the Green Infrastructure Smart Grid Program, The Canadian Critical Minerals Strategy, Electric Vehicle Infrastructure Demonstration (EVID) Program. However, it led to the inclusion of many green industrial policies and programs in Canada, such as the Three-stream strategy for SMR deployment program, ecoENERGY for Renewable Power program, and Zero Emission Transit Fund program. The included policies and programs provide a good overview of the policy environment in Ontario regarding the green economy.

Results

As illustrated in Table 1, seven different green industrial policies and programs at the federal and provincial levels in Ontario were identified. Most of the policies found were within the 2000s and the federal level and signify that Ontario is currently taking steps to advance the green economy. Additionally, most of the plan-specific programs and policies were started because of the 2030 Emissions Reduction Plan. More information on the policies and program can be found below:

TABLE 1: ALL POLICIES AND PROGRAMS FOUND

Name	Program or Policy	Year	Type of government	Plan	How it enhances the green economy
The Canadian Critical Minerals Strategy	Program	2022	Federal	Canadian Minerals and Metals Plan	Creates more environmentally friendly ways to extract critical materials like lithium, and cobalt which are used in many green technologies.
ecoENERGY for Renewable Power program	Program	2007	Federal	N/A	Funding projects, such as the construction of wind turbines at Invenergy's Raleigh Wind Energy Centre.
Zero Emission Transit Fund	Program	2021	Federal	N/A	Funding the production of zero emission public transit vehicles like buses from conventional fuel vehicles.
Three-stream strategy for SMR deployment	Program	2019	Federal and Provincial	N/A	Constructing three small modular reactors and microreactors in different cities in Ontario.

Name	Program or Policy	Year	Type of government		How it enhances the green economy
Federal Bill C-69: The Clean Technology Manufacturing ITC section	Policy	2024	Federal	2030 Emissions Reduction Plan	Tax credit on the manufacturing of conversion equipment, such as solar and wind equipment, and zero-emission vehicles.
The Canadian Net-Zero Emissions Accountability Act	Policy	2021	Federal	2030 Emissions Reduction Plan	Funding the construction of carbon and carbon dioxide removal technology from point sources, such as power generation plants.
Strategic Innovation Fun-Net Zero Accelerator (SIF-NZA)	Program	2020	Federal	2030 Emissions Reduction Plan	Funded projects such as the construction of a commercial electric vehicle manufacturing plant in Ontario.

The first is the Canadian Critical Minerals Strategy. The Canadian Critical Minerals Strategy is a five-year initiative established by the federal government in 2022 as part of the Canadian Minerals and Metals Plan (Ontario.ca, 2022; Government of Canada, 2023a). The aim of this program, according to the Minister of Northern Development, Greg Rickford, is to allow Ontario

to meet the world demand for critical materials in the surge of promoting the green economy through increased investment and employment in the mining sector. The mining sector produces essential materials needed to manufacture green products, such as solar cells and green manufacturing technology built today (Ontario.ca, 2022).

With regards to green product production specifically, this program encourages more environmentally friendly mining of material compared to the traditional methods of mining, which result in high levels of pollution and water consumption (Ukpanah, 2024). This is accomplished through environmental and feasibility studies at the start of the exploration phase in mining and the leaning towards lower-impact mining (Ontario.ca, 2022). The program encourages research in mining, which would lead to the discovery of more environmentally sustainable mining methods, such as Direct Lithium Extraction (DLE), which extracts significantly more lithium with less pollution (Ukpanah, 2024).

Secondly, the ecoENERGY for Renewable Power program is a federal program established in 2007 to encourage electricity generation from renewable energy sources, such as biomass, wind, hydro, photovoltaic, and geothermal energy. It funded 104 renewable energy projects and successfully generated 4500 megawatts of renewable power capacity by the time it ended in March 2021 (Natural Resources Canada, 2020).

To promote green industrial activity, the ecoENERGY for Renewable Power program funded many renewable-source-based electricity generation projects, such as Invenergy's Raleigh Wind Energy Centre project, which led to the manufacture of 52 GE 1.5xle turbines. This would result in a total power of 78MW and allow Ontario to power approximately 20000 homes solely with these turbines (Duchesne, 2011; GrahamBuilds, 2022). The project took fifteen months to complete and ended in January 2011 (GrahamBuilds, 2022).

Another program found is the Zero Emission Transit Fund, a federal program established in August 2021. The program aims to electrify public and school buses in Ontario. The program also funds the purchase of zero-emission buses to reduce greenhouse gas emissions from the transportation sector (Government of Canada, 2024a). This electrification and purchase of zero-emission vehicles would significantly reduce the greenhouse gas emission levels in transportation since the production and use of zero-emission vehicles results in less greenhouse gas emissions when compared to their regular emission car counterparts (Carey, 2023).

Currently, the transportation sector accounts for 25% of Canada's greenhouse gas emissions, so switching from gas-emitting to zero-emission vehicles would help reduce this percentage (Government of Canada, 2024a). For this project, the Canadian government has partnered with the Canadian Urban Transit Research & Innovation Consortium to decarbonize transit fleets through the purchase and construction of zero-emission transit vehicles (Kuyl, 2024). The program has completed about 50 decarbonization projects. It allows provinces and territories, municipal or regional governments, transit agencies, public bodies, private-sector school bus operators, and private accessible transit transportation providers to apply for funds to electrify or plan the electrification of their transit vehicles (Kuyl, 2024; Government of Canada, 2024a).

The next program is the three-stream strategy for SMR deployment program, established in 2019 which is a federal and provincial program that involves the construction of three small modular reactors and microreactors in different cities in Ontario. The program comprises three streams, with the first being the production of a small modular reactor at the Darlington nuclear site in Ontario (Science.gc.ca, 2024). The second stream involves the production of two 'fourth-generation' advanced small modular reactors in New Brunswick, and the third stream entails the construction of microreactors, a class of small modular reactors, in Chalk River,

Ontario by 2026 (Ministry of Energy and Electrification, 2022). Electricity generated from small modular generators results in a less pollutive way to meet energy demands (Fedchenko, 2024). These modular reactors, even when implemented on a small scale, would have the ability to power over 300,000 homes (Science.gc.ca, 2024).

This relates to the green industrial activity by producing energy to meet the province's growing need for electricity in a more environmentally friendly way. In 2022, Canada accounted for 20% of the world's gas emission percentage from electricity production (Environment and Climate Change Canada, 2023). Through the use of small modular reactors to generate electricity, this percentage would decrease by 48%, which allows electricity to be produced in a more environmentally friendly way (Gao et al., 2022).

The *Federal Bill C-69*: The Clean Technology Manufacturing ITC section is a federal program established in May 2024 is an investment tax credit program that covers 30% of the cost of investing in the manufacturing of clean technologies and extraction of critical resources (Bell et al., 2024; Natural Resources Canada, 2024d). The program was created to achieve the goals of the 2030 Emissions Reduction Plan (Natural Resources Canada, 2024d). The program will end in December 2034 and faces decreasing tax credit percentage as we approach the date: With a 30% rate from December 31, 2023, to December 30, 2031, a 20% rate from December 31, 2031, to December 30, 2032, a 10% rate from December 31, 2032, to December 30, 2033, and nothing from December 31, 2033, to December 30, 2034 (EYCanada, 2024).

Concerning advancing green industrial activity, this program provides tax credits to produce clean technologies, such as zero-emission vehicles, and conversion equipment, such as solar and wind equipment (EYCanada, 2024). The increased supply and implementation of zero-emission vehicles and energy conversion equipment would significantly reduce greenhouse emissions,

essential for promoting the green economy (National Academy of Engineering et al., 2010; Carey, 2023).

The Canadian Net-Zero Emissions Accountability Act is a federal policy established in 2021 to prove Canada's commitment to achieving net-zero greenhouse gas emissions by 2050 (Natural Resources Canada, 2023). The act serves as a legal bind to achieve different greenhouse-emission goals, with the most recent one being a greenhouse gas emission level of 40-45% below the 2005 greenhouse gas emission level by 2030 and was created as a means to achieve the goals of the 2030 Emissions Reduction Plan (Environment and natural resources, 2022; Natural Resources Canada, 2023). The greenhouse emission level goals for 2035, 2040, and 2045 will be set ten years in advance (Natural Resources Canada, 2023). This would translate to a reduction of about 470 megatonnes of carbon dioxide equivalent by 2030 (Office of the Auditor General of Canada, 2023).

In promoting green industrial activity, the act contains different strategies to achieve this greenhouse gas emission, one of which is the carbon strategy, released in September 2023, which funds the construction of carbon dioxide removal technologies and technology that remove carbon from point sources, such as power generation or industrial plants (Natural Resources Canada, 2023). These carbon capture technologies include direct air capture, carbon capture at power plants, and carbon capture and cryogenic carbon capture technology (Veloso, 2023).

The final program I found is the Strategic Innovation Fun-Net Zero Accelerator (SIF-NZA), which is a federal program established in 2020 that builds on Canada's target to reduce greenhouse gas emissions by 40-45% by 2030 and forms part of the 2030 Emissions Reduction Plan (Office of the Auditor General of Canada, 2024; Government of Canada, 2023b). The

program is a subsection of the Strategic Innovation Fund, which sponsors innovative projects in Canada to accelerate the growth of the Canadian economy (Government of Canada, 2024b).

   Concerning green industrial activity, this program led to the funding of many projects, such as the creation of General Motors's electric vehicle production facility in Oshawa, Ontario. The program was announced on April 4, 2022, by the Minister of Innovation, Science and Industry and would lead to electric vehicle manufacturing in Ontario (Government of Canada, 2023b). These electric vehicles would significantly reduce greenhouse emissions since electric vehicles are considered zero-emission vehicles (Natural Resources Canada, 2024b; Carey, 2023). This process is a green industrial activity since it creates vehicles that produce significantly less harm, in the form of toxic emissions, to the environment during their use.

Discussion

The results show that most of these policies or programs were established in the 2000s by the federal government. This is supported by the articles by Young & Leuprecht and Cairns, which state that the majority of policies and programs are initiated by the federal government, and the provincial government only implements these policies (Young & Leuprecht, 2006; Cairns, 2009). These policies and programs affect the institutional landscape of government policies by establishing important pathways to implement green industrial policies in Ontario, which makes it easier and more likely for governments to implement more green policies in the future. This idea is supported by Boschma & Frenken's (2006) concept of path creation leading to the emergence of similar types of policies, which is green policies in this case. The creation of these institutional pathways limits the policies implemented to those supported by the path since

implementing those types of policies is easier and more cost-efficient because economic actors are familiar with them, so they know the best way to employ them.

This combined with the information from Cairns (2009), which notes that the provincial government is financially restrained explained why most of the policies and programs found were federal or as a result of a federal plan or initiative (Cairns, 2009). Although the other levels of government (provincial and municipal) can influence policies, the federal government has the greatest influence and power which gives it control over what policies are implemented and the provincial and municipal government control over how these policies are implemented (Cairns, 2009). This relates to the GPE approach since institutional actors create norms and rules that address their interests. The findings of policies or programs implemented in the 2000s are supported by the current environment with significantly high levels of worldwide greenhouse emissions since these emissions negatively affect us and our environment (D'Amato et al., 2010; Silva et al., 2017). Therefore countries and different organizations work towards mitigating them through implementing environmental laws and policies (Babonea & Joia, 2012; Georgeson et al., 2017). This also relates to the EEG and GPE approach, with how the environment or institutions actors find themselves in affects the types of laws and norms they create and how time causes organizations to inherit different irreversible characteristics based on external factors, like their location and events, which shape their norms, customs, and actions (MacKinnon et al., 2019; MacKinnon et al., 2009; Boschma & Frenken, 2006).

The results also show Ontario's current efforts to advance green industrial activity, proven by worldwide support for promoting the green economy, with countries using green production and legislative laws to advance and promote the green economy. Countries like China are creating and utilizing wind, solar, biological, and hydropower electricity generation plants for

lower-emission electricity generation, and others like Brazil, India, Mexico, Russia, and South Africa are directing their national budget toward renewable energy projects (Georgeson et al., 2017; Babonea & Joia, 2012). Additionally, regarding the Evolutionary Economic Geography (EEG) and the Geographic Political Economy (GPE), key actors within major institutions in countries set the laws based on their interests, which seem to be in line with ensuring the success of their organization amidst the current concern for greener production methods and environmental sustainability (Bathelt & Glückler, 2013; Tagliapietra & Veugelers, 2020; Georgeson et al., 2017). Actors are also bound to and influenced by their environment, which seems to deteriorate as time passes and causes them to create laws and norms targeted around environmental sustainability (Bathelt & Glückler, 2013; Söderholm, 2020). Ontario's current efforts to advance green industrial activities through promoting a greener economy are seen through the types of policies implemented since the results presented were mainly aimed at cleaner electricity and transportation production. It signifies Ontario's move towards a cleaner manufacturing industry, more specifically, a cleaner electricity, and transportation industry.

Finally, the results show that most plan-specific programs and policies were started because of the 2030 Emissions Reduction Plan. This is supported by the literature since it was agreed that to promote the green economy, Canada's goal, greenhouse gas emissions must be reduced (Anderson & Gough, 2022; Sinclair, 2013; Whitmore & Bramley, 2003). These emission reductions can happen in multiple sectors of the economy, like the transportation, manufacturing, and electricity sectors, which could lead to substantial decreases in the greenhouse gas level. For instance, switching from fossil-fuel-based electricity production to greener production methods would moderate a production method that accounts for 19% of greenhouse gas emissions (Whitmore & Bramley, 2003). Regarding the EEG and GPE approach, this finding reveals the

environment affecting institutions since, due to the high amount of greenhouse gas emissions in the environment, institutions must adapt their processes and customs to meet the current environmental landscape (Boschma & Frenken, 2006; MacKinnon et al., 2019). It also speaks on the emergence and growth of the green industry since the changing environment causes institutions to act differently and create new paths and ways of doing things. The new paths also lead to new technology and social rules corresponding to the established green economy path to promote its cause (MacKinnon et al., 2019). Thus, these paths lead to a rise in green production in Ontario due to the adoption of technology and government action towards producing goods in a more environmentally sustainable way.

Conclusion

This paper aims to examine green industrial federal and provincial policies and programs that have been implemented in Ontario between the 1990s and now. We originally posed the research question: what are some federal and provincial policies and programs that facilitate green industrial activities in Ontario? There were seven policies and programs. Specifically, The Canadian Critical Minerals Strategy program, ecoENERGY for Renewable Power program, Zero Emission Transit Fund program, Three-stream strategy for SMR deployment program, *Federal Bill C-69*: The Clean Technology program, The Canadian Net-Zero Emissions Accountability Act program, and the Strategic Innovation Fun-Net Zero Accelerator (SIF-NZA) programs which were implemented at the federal and provincial level in Ontario between the 1990s and now. The three main discoveries from the results are that the majority of the policies and programs found

were within the 2000s and the federal level, were initiated because of the 2030 Emissions Reduction Plan, and Ontario is currently making efforts to enhance the green economy.

A notable limitation of my research is the focus solely on Ontario regarding policies and programs advancing the green economy. This limitation, however, does not pose a threat since Ontario is an essential case study for advancing the green economy due to its large manufacturing and pollution capacity. Another limitation would be that although there is evidence that these policies and programs have positively impacted Ontario's shift towards the green economy, we are unsure of the effect each policy or program has on the green economy due to the confounding government actions. However, this effect is not crucial to our understanding of implementing the green economy since the research provides an idea of the combination of policies and programs needed to induce a significant change.

Based on my study, future research should focus on other provinces in Canada as well as countries in the world, focusing more on the conflicts between different institutional bodies in Canada, such as the conflict between the federal and provincial governments and the conflicts between various political parties within Canada and its provinces, and conduct a follow-up study to note any changes in the type of policies and programs implemented in Ontario in the future. Finally, some recommendations for the implementation of various policies and programs in Ontario based on the research is to ensure greater collaboration between several levels of government and the general public by establishing a clear goal for the country or province to ensure that future actions are in-line with the established goal and the public is in support and working actively towards those goals, greater dissemination of information on the policies and programs being implemented by the government since these policies and programs are currently hard to find, and greater collaboration between the government and industries in Canada to

ensure that implemented policies and feasible and beneficial to the environment and the

Canadian economy.

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