

Strait-Highlands Green Action

Milestone One Report September 2007



Strait-Highlands Green Action Milestone One Report

The Strait-Highlands Regional Development Agency has now moved beyond debating whether or not climate change is happening to looking at what we are going to do about it. Climate change is expected to accelerate in coming decades leading to threats to our health, our communities, farms, forests and coastal areas. While at the same time, escalating and volatile fossil fuel prices are stimulating the search for alternative forms of energy and new ways of thinking about how we use energy.

The attached Milestone One report is the first of a three milestone project that's underway in the Strait-Highlands Region to address the issue of climate change and enhance energy opportunities. This first milestone report presents the findings of a greenhouse gas emissions inventory and forecast conducted during the period June 2006 to July 2007 in Inverness and Richmond counties and the Town of Port Hawkesbury. The study looks at energy consumption and greenhouse gas emissions for residential, commercial, transportation and waste as well as municipal government's facilities and operations.

Considerable opportunities exist to trim our energy footprint in the region through conservation and the use of locally available renewable sources of energy. Energy conservation and renewables can create new jobs in services, installation, construction, assembly and manufacturing in addition to helping to mitigate climate change. By proactively seeking out opportunities associated with climate change and secure energy systems, our region can become more resilient and economically competitive.

I would like to express my personal appreciation to all those who contributed to the creation of this report and to the generous support of our funding partners. We are looking forward to your continuous input and support in Milestones Two and Three. We hope this report will serve as a starting point for, and give structure to efforts to prepare the Strait-Highlands Region for the impacts of climate change and a secure energy future.

Sincerely,

A handwritten signature in blue ink that reads 'Hugh MacDougall'.

Hugh MacDougall, Chair
Strait-Highlands Regional Development Agency

ACKNOWLEDGEMENTS

We would like to extend our sincere thanks to all the contributors to this report: the Strait-Highlands Green Action team for sustained efforts in gathering information on energy usage in the region; municipal Chief Administrative Officers and Public Works Engineers for guidance and comments throughout the process, the Steering Committee for constructive comments, CBCL Limited Consulting Engineers for assistance with gathering and analyzing the data and the Atlantic Institute for Sustainability for guiding the process. In addition, we would like to thank the many community stakeholders within the private, non-profit and institutional sectors that generously contributed information and ideas.

It goes without saying that none of this would have been possible without the generous support of our many funding partners. They include:

Federal

Federation of Canadian Municipalities
Enterprise Cape Breton Corporation
Natural Resources Canada
Service Canada

Provincial

Nova Scotia Department of Energy
Nova Scotia Office of Economic Development
Service Nova Scotia and Municipal Relations

Municipal

Municipality of the County of Inverness
Municipality of the County of Richmond
Town of Port Hawkesbury

Multi Government

Strait-Highlands Regional Development Agency

Private Sector

Statia Terminals, a Valero Company
Stora Enso Port Hawkesbury Ltd.

Table of Contents

Executive Summary	1
1 Introduction and Background	7
2 Greenhouse Gas Emissions Analysis.....	12
2.1 PCP Emissions Inventory and Forecast.....	12
2.2 Methodology.....	12
3 2005 Community Emissions Inventory	16
3.1 Overview.....	16
3.2 Residential.....	17
3.2.1 Residential Energy Consumption Analysis.....	20
3.2.2 Residential Emissions Analysis.....	26
3.3 Commercial and Small Industrial (C & I).....	30
3.3.1 Commercial & Small Industrial Sector: Energy Analysis.....	30
3.3.2 Commercial and Small Industrial GHG Emissions.....	34
3.4 Large Industrial (not Included in this report).....	35
3.5 Transportation.....	35
3.5.1 Fuel Consumption and GHG Emissions Analysis.....	36
3.6 Institutional.....	39
3.7 Waste.....	41
4 2005 Municipal Emissions Inventory.....	45
4.1 Municipal Energy Use.....	45
4.2 Municipal GHG Emissions Summary.....	49
5.0 1995 COMMUNITY Inventory Estimate.....	50
6.0 2015 Emissions Inventory Forecast.....	54

LIST OF TABLES

Table 1.	Strait Highlands Residence and Businesses Count, 2005.....	1
Table 2.	Strait Highlands Demographic Shift.....	17
Table 3.	Summary of Residential Count by Dwelling Type and Region	19
Table 4.	Proportion of Residences by Size and Age	19
Table 5.	Strait Highlands Residences by Age and Size	20
Table 6.	Per household Energy Consumption and GHG emissions by Energy Source.....	28
Table 7.	Strait-Highlands Region Total Business Count by Size	30
Table 8.	Inverness Commercial Energy Use by Size and Energy Type	30
Table 9.	Richmond Commercial Energy Consumption by Size and Energy Type	32
Table 10.	Port Hawkesbury Commercial Energy Consumption by Size and Energy Type	33
Table 11.	Strait Highlands Vehicle Registration by Region, 2005.....	35
Table 12.	Regional VKT Fuel Consumption and Emissions based on 2005 indicators	35
Table 13.	2005 Inverness GHG emissions from community waste.....	42
Table 14.	2005 Richmond GHG emissions from community waste	43
Table 15.	2005 Town of Port Hawkesbury GHG emissions from community waste	44
Table 16.	Observed trends in regional transportation sector	50
Table 17.	Captured trends in the Strait Highlands regional population.....	50
Table 18.	Captured trends in the number of occupied regional dwellings	51
Table 19.	Changes in regional commercial and small industrial businesses	51
Table 20.	Summary of annual % changes in the period between 1995 and 2005	51

LIST OF FIGURES

Figure 1.	Energy Consumption by Region and Sector (kWh).....	2
Figure 2.	GHG Emissions by Region and Sector (tonnes)	2
Figure 3.	Inverness County Energy Use by Sector (kWh).....	4
Figure 4.	Inverness GHG Emissions by Sector (tonnes)	4
Figure 5.	Richmond County Energy Use by Sector (kWh)	5
Figure 6.	Richmond County GHG Emissions by Sector (tonnes)	5
Figure 7.	Port Hawkesbury Energy Use by Sector (kWh).....	6
Figure 8.	Port Hawkesbury GHG Emissions by Sector (tonnes).....	6
Figure 9.	2005 Residential Count and Classification by Age and Region.....	18
Figure 10.	Residential Dwelling Classification by Age and Within-region Proportion	18
Figure 11.	Distribution Percentages by Principal Energy Sources for Residences	20
Figure 12.	Count of Occupied Dwellings by Primary Heating Source and Region	21
Figure 13.	Inverness Residential Energy Use by Source	22
Figure 14.	Inverness Residential Energy Use by Dwelling Type.....	23
Figure 15.	Richmond County Residential Energy Use by Source.....	24
Figure 16.	Richmond Residential Energy Use by Dwelling Type.....	24
Figure 17.	Town of Port Hawkesbury Energy Use by Energy Source	25
Figure 18.	Port Hawkesbury Residential Energy Use by Dwelling Type	25
Figure 19.	Inverness Residential GHG Emissions by Source (tonnes)	26
Figure 20.	Inverness Residential GHG Emissions by Dwelling Type.....	26
Figure 21.	Richmond GHG Emissions by Energy Source.....	27

Figure 22. Richmond GHG Emissions by Dwelling Type	27
Figure 23. Town of Port Hawkesbury Residential GHG Emissions by Energy Source.....	28
Figure 24. Port Hawkesbury Residential GHG Emissions by Dwelling Type	28
Figure 25. Inverness County Commercial Energy Use by Business Size	31
Figure 26. Inverness County Commercial Energy Use by Energy Source.....	31
Figure 27. Richmond County Commercial Energy Use by Business Size	32
Figure 28. Richmond Commercial Energy Use by Energy Source	32
Figure 29. Port Hawkesbury Commercial Energy Use by Business Size.....	33
Figure 30. Town of Port Hawkesbury Commercial Energy Use by Energy Source	33
Figure 31. Strait-Highlands Commercial and Small Industrial GHG Emissions (tonnes)	34
Figure 32. Inverness Transportation Fuel Usage by Vehicle Type	36
Figure 33. Inverness Transportation GHG Emissions by Vehicle Type (tonnes)	36
Figure 34. Richmond County Transportation Fuel Usage by Vehicle Type	37
Figure 35. Richmond Transportation Emissions by Vehicle Type (tonnes).....	37
Figure 36. Town of Port Hawkesbury Transportation Fuel Use by Vehicle Type	38
Figure 37. Town of Port Hawkesbury Transportation Emissions by Vehicle Type (tonnes).....	38
Figure 38. Inverness Institutional Energy Use by Source (kWh)	39
Figure 39. Inverness Institutional GHG Emissions by Source (tonnes)	39
Figure 40. Richmond Institutional Energy Use by Source (kWh).....	40
Figure 41. Richmond Institutional GHG Emissions by Source (kWh)	40
Figure 42. Town of Port Hawkesbury Institutional Energy Use by Source (kWh).....	40
Figure 43. Town of Port Hawkesbury Institutional GHG Emissions by Source (tonnes).....	41
Figure 44. Rate of GHG Emissions from the Closed Inverness Landfill	42
Figure 45. Rate of GHG Emissions from the Closed Richmond Landfill.....	43
Figure 46. Rate of GHG Emissions from Closed Landfill in Port Hawkesbury.....	44
Figure 47. Inverness Municipal Energy Use by Energy Source.....	46
Figure 48. Inverness Municipal Energy Use by Municipal Sector.....	46
Figure 49. Richmond County Municipal Energy Use by Source	47
Figure 50. Richmond Municipal Energy Use by Municipal Sector.....	47
Figure 51. Town of Port Hawkesbury Municipal Energy use by Energy Source.....	48
Figure 52. Town of Port Hawkesbury Municipal Energy Use by Sector	48
Figure 53. Municipal GHG Emissions by Sector and Energy Source (tonnes).....	49
Figure 54. Inverness County Comparison of 2005 and 1995 Emissions Estimates	52
Figure 55. Richmond County Comparison of 2005 and 1995 Emissions Estimates	52
Figure 56. Town of Port Hawkesbury Comparison of 2005 and 1995 Emissions Estimates	53
Figure 57. Variations of GHG Emissions Reduction for the Strait-Highlands Region	55
Figure 58. GHG Emissions Reduction Scenarios for Inverness County	55
Figure 59. GHG Emissions Reduction Scenarios for Richmond County	56
Figure 60. GHG Emissions Reduction Scenarios for Town of Port Hawkesbury.....	56

LIST OF ACRONYMS

BAU	Business as usual
C&I	Commercial and small industrial
CFL	Compact fluorescent light
GHG	greenhouse gas
ICLEI	Local Governments of Sustainability (formerly the International Council for Local Environmental Initiatives)
kWh	kilowatt hour
l	litre
VKT	vehicle kilometres travelled
LAP	Local Action Plan
PCP	Partners for Climate Protection
t	tonnes; typically the unit of measure in which emissions are calculated

EXECUTIVE SUMMARY

This report presents the findings of energy audits and other data gathering exercises conducted during the period June 2006 to July 2007 in the Strait-Highland's Region which encompasses Inverness County, Richmond County and the Town of Port Hawkesbury. This Emissions Inventory Report completes the objectives of Milestone One of the Partners for Climate Protection Program.

For the purposes of this analysis energy use and resultant emissions were categorized as follows:

- Residential;
- Commercial and Small Industrial (C & I);
- Large Industrial;
- Corporate (or Municipal);
- Institutional; and
- Transportation.

For the most part, energy records were generally available for the most recent year when our auditors conducted on site audits. Categorization audits classified more than 5,700 residences in Inverness County, over 3, 880 in Richmond County, and just over 1000 residences in the Town of Port Hawkesbury. The following table summarizes approximate count for Residences and Commercial & Small Industrial (C & I) sectors in the region:

Table 1. Strait Highlands Residence and Businesses Count, 2005

REGIONAL AREA	RESIDENCES	C & I
Inverness County	5,727	574
Richmond County	3,888	246
Port Hawkesbury	1,066	256

Source: Adjusted from Statistics Canada, Annual Demographic Statistics CAT. No. 91-213-XPB, 2005

Energy consumption data was available from more than 960 residences, thus allowing for a reasonable analysis of the region's residential energy consumption and the resultant greenhouse gas (GHG) emissions.

About twenty institutional and commercial & small industrial establishments were audited while energy records were received from eleven (11) businesses in Inverness County, 21 businesses in each of Richmond and Port Hawkesbury for a total of 53 for the entire region. These energy records will also help to establish an energy use database in these sectors for the region. More energy records and bills were still pending during the writing of this report, however the document will be updated as more information becomes available. When these pending records are received, they will be used to augment the database for subsequent milestones of this initiative as well. Thus the inventory can be thought of as a 'living' document that can be augmented as more accurate and representative information becomes available.

With all energy types and sources converted to an equivalent kilowatt hour (kWh) unit, total current energy consumption for each of the regions is shown in Figure 1 below:

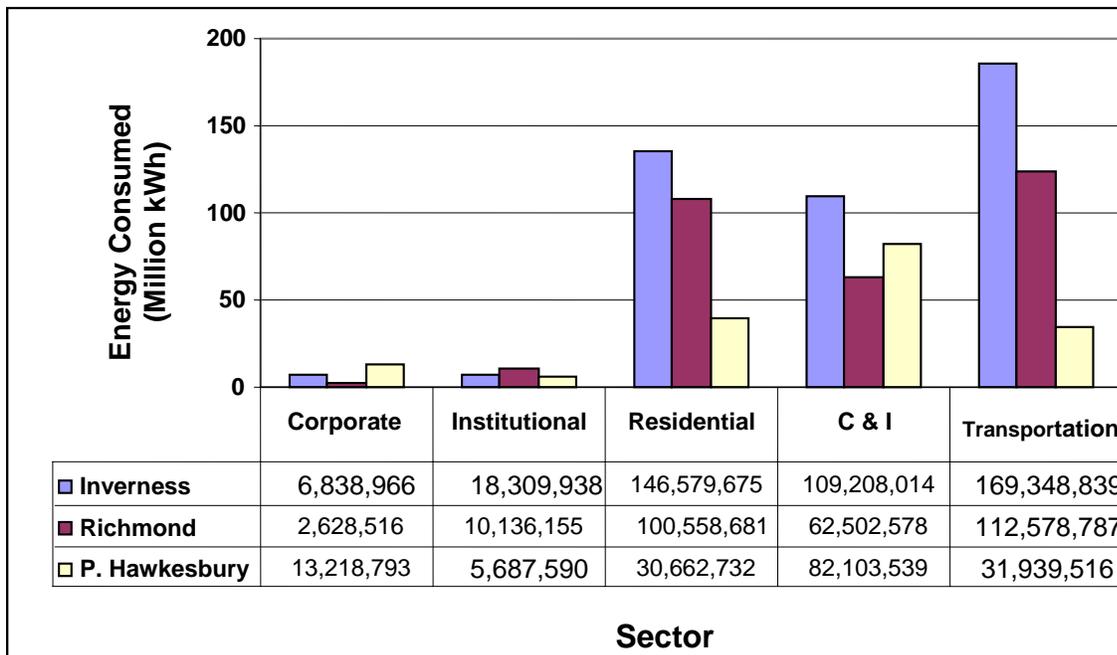


Figure 1. Energy Consumption by Region and Sector (kWh)

Similarly, corresponding GHG emissions were analysed by sector for each of the regions. The outcome of GHG emissions analysis is summarized in Figure 2 below:

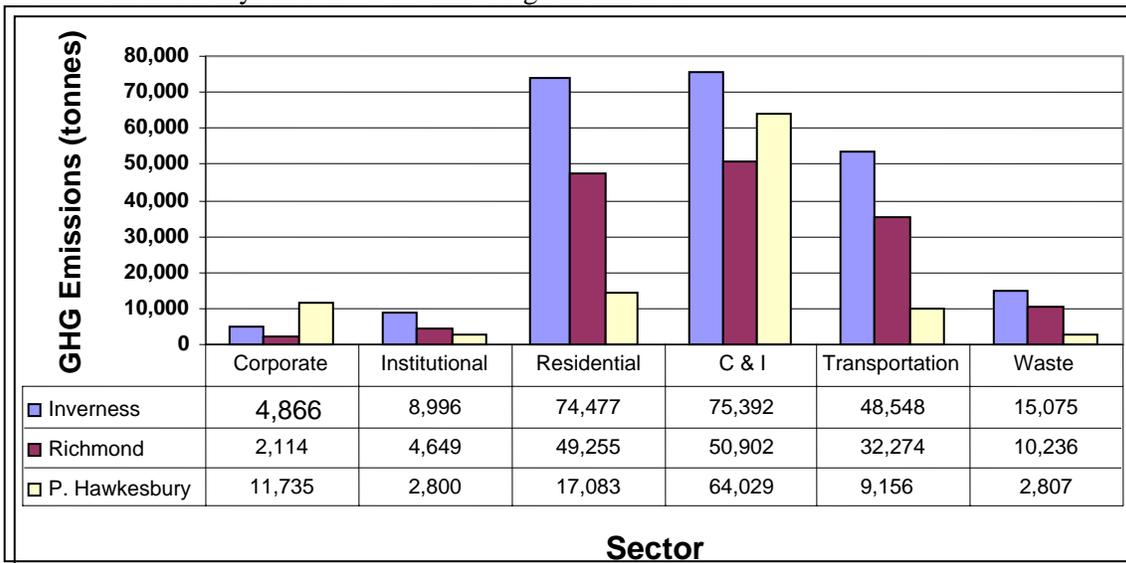


Figure 2. GHG Emissions by Region and Sector (tonnes)

As a result of a steady trend in the region where the population, the number of occupied dwellings and the number of vehicles registered in the region are declining, although at a slight rate, it is expected that the 2005 emissions levels as summarized above are in fact lower than those in 1995. Furthermore, the closure of the landfills in each of the three regions will result in reduced GHG emissions from the closed landfills.

It is crucial to note that even in an environment where GHG emissions are on a natural decline, reduction targets are necessary as this presents opportunities for improving energy utilization efficiencies while also contributing to efforts to mitigate adverse climate change. It is also worth noting that while the general demographic trends show declining indicators, the commercial sector seems to be quite the opposite through the entire region. As seen from Figure 2, emissions from the Commercial and Small Industrial sector are greater than any other sector. In addition, local observation from regional experts attest that regardless of actual positive net out migration from the region, the business sector has been experiencing continual growth both in numbers as well as in diversity of economic activity. This is particularly true of Port Hawkesbury where labour force participants are not only associated with heavy industrial operations at Point Tupper, but also in various industrial sectors including services such as technical support and information technology from call centres.

Inverness County: Energy and GHG Emissions Summary

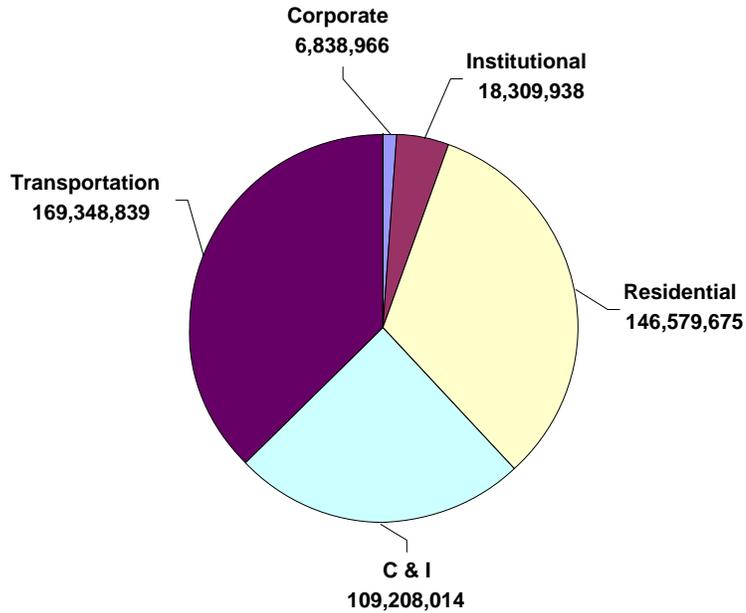


Figure 3. Inverness County Energy Use by Sector (kWh)

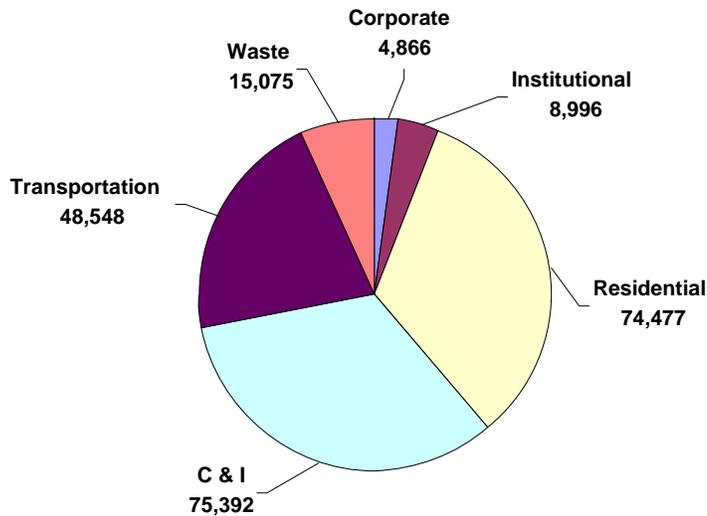


Figure 4. Inverness GHG Emissions by Sector (tonnes)

Richmond County Energy and GHG Emissions Summary

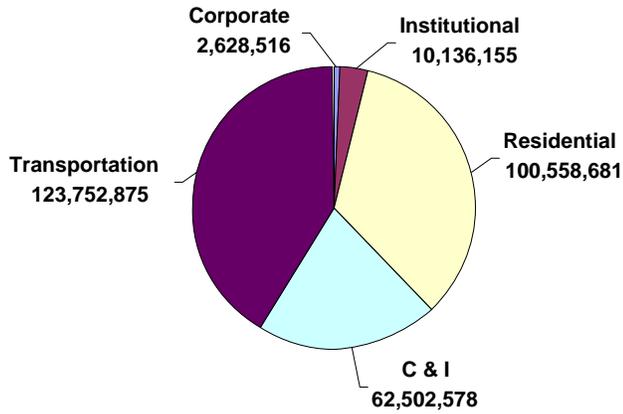


Figure 5. Richmond County Energy Use by Sector (kWh)

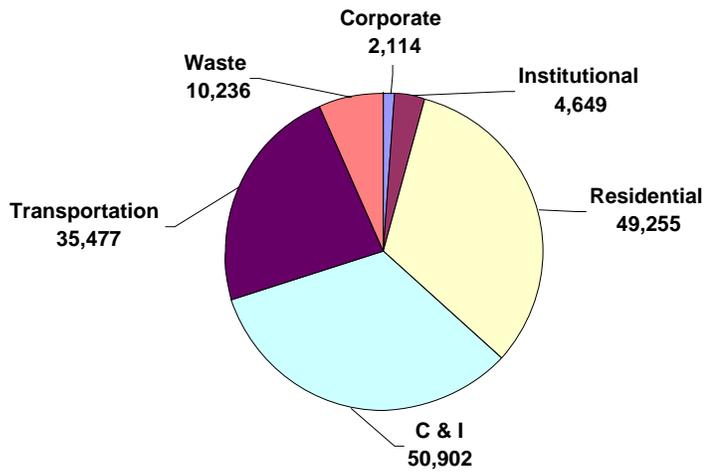


Figure 6. Richmond County GHG Emissions by Sector (tonnes)

Town of Port Hawkesbury: Energy and GHG Emissions Summary

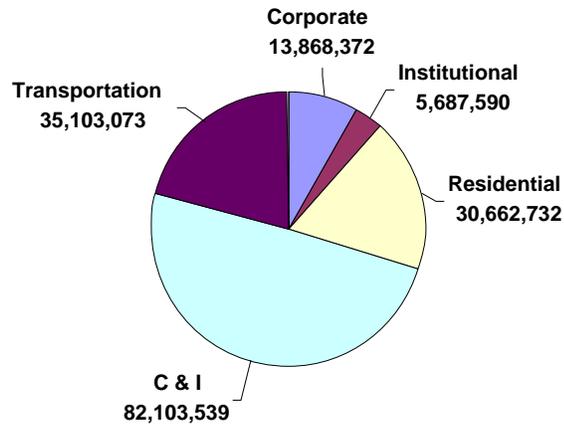


Figure 7. Port Hawkesbury Energy Use by Sector (kWh)

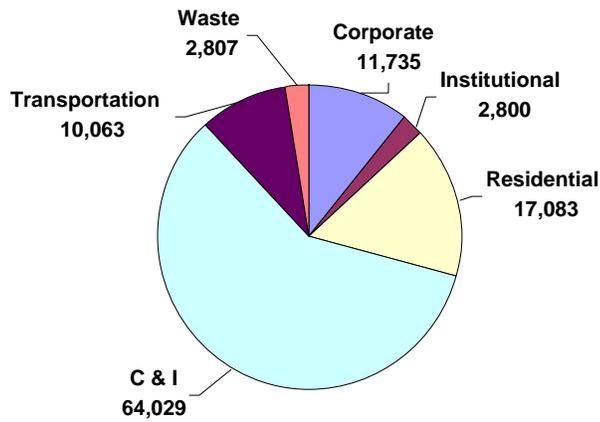


Figure 8. Port Hawkesbury GHG Emissions by Sector (tonnes)

1.0 INTRODUCTION AND BACKGROUND

The genesis of the Strait-Highlands Green Action (S-HGA) project was a workshop in Port Hawkesbury on sustainable community energy systems in October 2002, followed by an Innovation Town Hall on climate change and energy needs for the Strait-Highlands Region in March 2004. The workshops were organized by the Atlantic Institute for Sustainability (AIS) and Feigin Engineering & Associates (FEA) in collaboration with the Strait-Highlands Regional Development Agency (S-HRDA). The S-HRDA also commissioned AIS to conduct a study on ways to move the region toward long-term sustainability and to guide the process of joining the Partners for Climate Protection (PCP) Program. AIS and FEA partnered with David C. Stewart and Associates to develop a successful \$350,000 application to the Federation of Canadian Municipalities (FCM) for developing an action plan for the PCP Program and to make presentations to stakeholders to partner with the S-HRDA in raising matching funds.

Partners for Climate Protection is a network of over 150 Canadian communities committed to reducing greenhouse gas (GHG) emissions and to taking action on climate change. PCP is the Canadian component of ICLEI's Cities for Climate Protection network which is comprised of over 800 communities worldwide dedicated to taking action on climate change. The PCP is a five milestone plan that creates a greenhouse gas emissions inventory and forecast; sets an emissions reduction target; develops a sustainability plan; implements the plan; and monitors progress and reports results.

In February 2006, the Strait-Highlands Regional Development Agency (S-HRDA) entered into a Grant Agreement with the Federation of Canadian Municipalities, which provided funds to undertake the first three milestones. The S-HRDA submitted a successful application to Service Canada and used the funds to hire a coordinator and two researchers to work exclusively on the project. They assembled an advisory committee and developed a logo and branded the project as Strait-Highlands Green Action (S-HGA). The S-HGA is a partnership encompassing Inverness County, Richmond County and the Town of Port Hawkesbury with the S-HRDA assuming a lead role in managing the initiative.

In June 2006, the S-HRDA retained the Atlantic Institute for Sustainability to assist with the completion of Milestone One. The project uses a sustainability framework based on systems thinking that integrates social, ecological and economic dimensions of energy. The project uses guiding principles for a sustainability framework recognizing a sustainable society as one that:

- Does not use renewable resources faster than they can regenerate
- Does not use non-renewable resources faster than renewable substitutes are developed for them
- Does not release pollutants faster than natural systems can break them down
- Protects the rights of future generations and other species.

Education and skills building are necessary to move sustainability forward in the region. A capacity strengthening approach is being used which involves:

- human resource development through equipping individuals with understanding, skills and access to information, knowledge and training that enables them to perform effectively;
- organizational development including management structures, processes and procedures within organizations as well as management of relationships between public, private and community sectors; and
- institutional and legal framework development to enable organizations, institutions and agencies at all levels and in all sectors to enhance their capacities. In order to be effective, S-HGA seeks to have broad involvement of all stakeholders in the region.

This report is the culmination of Milestone One, a greenhouse gas emissions inventory which involves bringing together data on community and municipal energy use and solid waste generation in order to estimate greenhouse gas emissions in a given year.

1.1 STUDY AREA

The study area is comprised of two counties, Inverness and Richmond Counties and the Town of Port Hawkesbury, a relative large area covering roughly half of Cape Breton Island.



1.1.1 INVERNESS COUNTY COMMUNITY PROFILE



Inverness County covers the western section of Cape Breton Island from the northern tip of Meat Cove to the southern section of Port Hastings, and east to the Bras'dor Lakes, an area of 1,513 square miles. Inverness County is home to just under 20,000 residents.

Inverness County has two hospitals, fifteen volunteer fire departments, four RCMP detachments, two senior's facilities, six schools, fourteen churches, and one Buddhist Monastery.

There are Federal, Provincial and Municipal government offices located in the Municipality of Inverness. The municipality is divided into six districts, each represented politically by an elected councilor. The Municipal Council operates its daily business from an office in Port Hood using the Chief Administrative Officer (CAO) form of management. The Chief Administrative Office is responsible to Council for the proper administration of the affairs of the municipality in accordance with the Municipal Government Act of the Province of Nova Scotia, its own enacted by-laws and policies as adopted by Council.

Tupper.

A major employer is Stora Enso Port Hawkesbury Ltd. in Point

Inverness County consists of eight main identifying sections; Margaree; Judique; Port Hastings; Inverness; Port Hood; Mabou; Cheticamp; and Whycomomagh; each with subsequent communities surrounding.

Margaree has been carved by the many branches of the Margaree River that runs through it. Basic commercial and service centres include stores, service stations, restaurants, hair salons, small repair establishments, building supply outlets, tourism accommodations and gift shops. Other consumer needs are fulfilled at Cheticamp, Inverness, Port Hawkesbury, or Sydney.

Judique is found along Route 19. It is largely a residential area. Three wharf facilities serve the present-day fishery. Port Hawkesbury and Port Hood are the nearest service centres for Judique and area residents.

Port Hastings along Route 19 is mostly residential with a section of commercial and retail business where Port Hastings meets the Town of Port Hawkesbury.

Inverness This area consists of the Village of Inverness and a series of communities surrounding the village along the coast and inland to Lake Ainslie. The area is of mixed cultural heritage. The town constitutes the main commercial centre with a variety of shops and services, including a hospital. The fishery continues to be the main source of income for the area.

Port Hood is a full service village on the west coast of Cape Breton Island's Ceilidh Trail. The community overlooks two islands; Port Hood and Henry Islands. Fishing has always played an important role in the local economy and there are two fishing ports still active in the area; Murphy's Pond and Little Judique Harbour. Port Hood today is still the seat of municipal government and the capital of Inverness County.

Mabou is located at the head of an inlet off the Gulf of St. Lawrence named Mabou Harbour about 70 km from the Canso Causeway on Route 19. It is surrounded by low mountains which are part of the Creignish Hills. Most health services are available in Inverness, 10 minutes away. Mabou area residents may go to Inverness or Port Hood for shopping. Sport and recreation interest is strong in the Mabou area. The main areas of employment for all areas are primarily the forest, fishing and tourism industries.

Cheticamp, an Acadian village, was originally settled by expelled Acadians in late 1780's. Cheticamp's economy is based primarily on the fishery. Residents also work in forestry, construction, commerce, in service and professional jobs, and there is limited farming. Cheticamp is possibly unique in Nova Scotia for its comprehensive health services in a relatively small community.

Whycocomagh district extends from the Victoria County boundary at Bucklaw, past the south end of Lake Ainslie to Skye Glen, south and west of Lake Ainslie across to Soapstone and Sky Mountain and to Whycocomagh Bay. Whycocomagh is home to the Waycobah First Nations community established in 1833 comprising of 828.5 hectares of land. Whycocomagh and surrounding communities are rural. Workers travel daily to jobs outside their communities. Basic services and amenities can be found in Whycocomagh proper.

1.1.2 RICHMOND COUNTY COMMUNITY PROFILE

The Municipality of the County of Richmond is the smallest of Nova Scotia's fourteen counties. The region is bordered on the south by the Atlantic Ocean and on the north by the Bras d'Or Lakes. Largely rural, this county boasts 230,000 acres of forested land and miles of pristine coastline. About one-third of Richmond's residents speak both French and English, since the county is home to several vibrant French-Acadian communities. Scottish and Mi'kmaq cultures also contribute to the area's rich history.



Richmond County runs along the Southeast side of Cape Breton Island and includes Isle Madame joined to the mainland by a causeway. The mainstay of Isle Madame is primarily the fishing industry and its spin-off businesses. The Isle is home to twenty-three communities and offers most essential and non-essential services.

The mainland of Richmond County is home to seventy-two communities with the Village of St. Peter's and Louisdale being

full service communities. Richmond County's only First Nations community, Chapel Island, also known as Potlotek, is located along Route 4, approximately 70 km. from the Canso Causeway.

Point Tupper Industrial Park is also located in Richmond County. It has twenty-one heavy industries, the largest concentration of heavy industry in Nova Scotia. A major employer is Stora Enso Port Hawkesbury Ltd. in Point Tupper.

Richmond County has five schools, thirteen churches, ten volunteer fire departments, two RCMP detachments, and one hospital.

There are Provincial and Municipal government offices located in Richmond County. The municipality is divided into ten districts, each represented politically by an elected councilor. In addition, the County is served by a Warden, Deputy Warden, and thirteen administrative personnel. The Municipal Council operates its daily business from an office in Arichat using the Chief Administrative Officer (CAO) form of management. The Chief Administrative Office is responsible to Council for the proper administration of the affairs of the municipality in accordance with the Municipal Government Act of the Province of Nova Scotia, its own enacted by-laws and policies as adopted by Council.

1.1.3 TOWN OF PORT HAWKESBURY COMMUNITY PROFILE



The Town of Port Hawkesbury runs adjacent to the Strait of Canso between the borders of Port Hastings to the west and Point Tupper to the east.

Port Hawkesbury is the largest commercial and retail centre between Town of Antigonish and the City of Sydney. There is a variety of shopping venues, and services, accommodations, entertainment, and a Light Industrial Park. The town and its businesses are the largest employer in the region. There are Federal, Provincial and Municipal government offices located in Port Hawkesbury. The Town Council operates its daily business using the Chief Administrative Officer (C.A.O.) form of management. The Chief Administrative Office is responsible to the Council for the proper administration of the affairs of the municipality in accordance with the Municipal Government Act of the Province of Nova Scotia, the by-laws of the municipality and the policies adopted by the Council. Currently, there are four service divisions within the Town. They include Community Services (Police, Fire and Public Works); Parks and Recreation; Financial Services; and, Civic Centre operations. Directors, or managers, are appointed for each of the service divisions.

Two schools, seven churches, an airport, one RCMP detachment, and one volunteer fire department can be found in the Town.

2.0 GREENHOUSE GAS EMISSIONS ANALYSIS

2.1 PCP EMISSIONS INVENTORY AND FORECAST

A greenhouse gas (GHG) emissions inventory and forecast is a compilation of community and municipal energy use and waste generation. A calculation then estimates the quantity of GHGs emitted in a baseline year and projects future emissions.

An emissions inventory and forecast consists of two parts:

1. A community inventory and forecast of greenhouse gas emissions throughout the municipal government's jurisdiction. Data was gathered for five sectors including residential, commercial, industrial, transportation and waste. In our study, we also gathered information for the institutional sector because of the importance of a strong institutional sector to the wellbeing of rural communities.
2. A corporate inventory and forecast of the municipal government's own facilities and operations. Data was gathered for buildings, street lighting, water and wastewater pumping and treatment, and fleet vehicles.

The GHG emissions inventory described in this report was completed in part to fulfil the Strait-Highlands Region's commitment to the Partners for Climate Protection (PCP). PCP members follow a five milestone process:

1. **Milestone 1: Create a GHG Emission Inventory and Forecast.** The best available data should be used to create the base year with looking back estimates to 1990 and forecasts to 2012 or beyond. The inventory should look at both municipal and community emissions.
2. **Milestone 2: Set a Reduction Target.** Upon completion of the inventory, the municipality can set a reduction target. Typical reduction targets in municipalities with low growth rates are 20% reduction in emissions from municipal operations and six to ten percent in overall emissions from 1990 levels within six to ten years of joining the PCP.
3. **Milestone 3: Develop a Local Action Plan (LAP).** Development of a realistic plan with broad community support to reduce energy use and emissions production is the next step once the target has been established.
4. **Milestone 4: Implement the Local Action Plan.** Creating a strong partnership between the municipality and the broader community will be key in carrying through on commitments from the local action plan.
5. **Milestone 5: Measure Progress and Report Results.** Maintain support for the LAP in the community by monitoring, verifying, and reporting the emission reductions.

2.2 METHODOLOGY

One of our first tasks in completion of Milestone One was to choose an inventory year based on the availability of energy consumption data from which to calculate GHG emissions. We chose the year 2005 for the baseline data collection. Detailed energy consumption information was used when available, to estimate consumption where necessary. PCP software was used for the GHG inventory.

Because a capacity strengthening approach was employed, education and awareness building were cross cutting themes in all activities. Cross sectoral links were established and groups involved in sustainability initiatives were approached to discuss opportunities for collaboration and to make best use of available resources. Methods of communication included in-person contact, telephone, e-mail, questionnaires and surveys.

Strait-Highlands Green Action staff received extensive training on various dimensions of energy. They were introduced to a holistic perspective on energy looking at social, economic, ecological and cultural dimensions by the Atlantic Institute for Sustainability. Targeted training and information sessions include NS Energy R&D Forum; Eco-Industrial Roundtable; Sustainable Agricultural Conference; Coastal Communities Network Learning Circle and “Spot the Energy Savings” hosted by NRCan. The team also received a two day classroom and field audit training exercise with energy engineers from CBCL.

The S-HGA team utilized a variety of contacts to obtain a wide spectrum of energy use data for the Strait-Highlands Region. This extensive data was necessary to determine the scope for the inventory. Working relationships were established within the Corporate sector (Chief Administrative Officers, Municipal Engineers, Accountants, and the Regional Planning Department) and was considered a vital step in the successful evaluation of this GHG emission inventory as it provided a detailed overview of the total energy use and related costs for respective municipalities. Involving municipal staff in compiling corporate data also served capacity strengthening objectives. Other government departments and agencies that contributed to the data pool include: Natural Resources Canada, Statistics Canada, Transport Canada, Resource Recovery Fund Board (RRFB), as well as fisheries, forestry and energy departments. A number of these initiatives will bear fruit throughout the life of the project. Extensive web searches were conducted to gather subsequent energy data for the inventory.

In evaluating the Institutional Sector, the team contacted the Strait-Regional School Board for energy use information on school infrastructure including buildings and vehicles. In addition to essential data, information about school’s environmental and sustainable initiatives and education programs was recorded for future reference. Hospital administrators were consulted for their input, and discussions were held with members of local fire departments, churches, community groups (hall owners) for energy usage data on their vehicles and buildings. These groups have also been instrumental in dissemination of energy conservation information on behalf of the S-HGA team.

In assessing the Commercial sector, the team requested energy usage information from individual businesses via survey forms filled out by business owners and managers. A control sample set of approximately 20 of these businesses was achieved through on-site audits. Completing on-site assessments of condition of buildings and recycling practices helped the project to get a perspective on the average condition of building envelopes and effectiveness of recycling programs.

The team scheduled and conducted representative residential audit samples across the region for analysis of energy demand and emissions. Individual homeowners were contacted personally, to request permission to assess the condition of their houses and record the amounts from at least one year’s worth of utility bills. Pre-formatted and printed forms were used prompting specific residential inspection protocol questions of the residence owners. The S-HGA staff conducted a residential windshield survey for Inverness County, Richmond County and the Town of Port Hawkesbury. They also collected residential energy data from 960 residences in exchange for compact fluorescent light (CFL) bulbs in a project funded by Conserve Nova Scotia. As part of the CFL project, residential audits were conducted in exchange for CFL bulbs. Some of the same bulbs were distributed in collaboration with Fire Halls, churches, and food banks to community members throughout the region, particularly those with more limited means to purchase CFL bulbs.

CBCL engineers conducted on-site energy audits of commercial and small industrial facilities in each of the regions.

The objective of the survey of residences and businesses was to establish the total energy demand and usage for all residences and businesses in each of the three municipalities. While it is obviously impossible to survey all the residences and businesses in the region, the approach taken was to survey a representative sample and then extrapolate the results. The following information was collected for each building where available:

Size: small, medium and large or commercial business; and mini, small, and large for residential dwellings.

Age: Pre 1970, 1970 – 1985, and Post 1985 (1985 to present)

In addition, for businesses where building size was not available, the number of employees was recorded for use in classifying businesses as small, medium or large. The cut-off numbers for these sizes are usually a moving target that depends mostly on the average size of businesses in the study area. For the Strait-Highlands Region, it was decided that on the basis of employee count per business the classification would be as follows:

- Small: Up to 20 employees
- Medium: 21 to 100 employees
- Large: Over 100 employees

Tables were prepared showing the number of buildings in each of the categories.

For residential dwellings, size classification was based on the following:

- Mini: Up to 1,000 ft²
- Small: Between 1,000 and 1,800 ft²
- Large: Over 1,800 ft²
-

Approximately 80 residences and 20 businesses had on-site energy audits conducted. For each, information was obtained on age, construction, energy use/demand, heating fuel and method, insulation levels and energy costs. Detailed interviews were conducted with individuals, lasting up to one hour in the residential audits, to a couple of hours in the commercial business audits. The information gathered included number, age and condition of major appliances and light fixtures; type, age and condition of doors and windows; insulation type and levels of effective insulation. A visual inspection of the attic and basement and the condition of weather stripping was also conducted for each inspection. Unusual features and/or problems were also noted for analysis and utilization in Milestone Three in the future.

The information was recorded on pre-printed forms that were provided to the audit team following the audit training. Auditors generally reported that there was an overwhelming level of cooperation from those owners and business operators who volunteered or agreed when asked to participate in the process. The residences/businesses selected for further interviews were selected at random, often based on the fact that the audit staff knew the owners or occupants of the chosen residences. Trying to schedule time when owners/occupants were able to accommodate the walk through audit appeared to be the most challenging part for the audit staff. However, once owners had consented to being audited, progress went smoothly and information was shared openly. This phase of the survey was substantially completed towards the end of July.

Data used in the analysis was derived locally to the extent possible. Where local data was not available, provincial and federal data were used, and the municipality of Clare, which underwent the process a year ago, was also used as a source of residential data because of the similarity of the housing stock and the recent nature of data from there. Vehicle fuel economy is difficult to derive and approximations for vehicle fleets were used.

Emissions sources that are small, unimportant or difficult to track are not included in the analysis, for example, lawn care equipment, methane from wastewater and sewage sludge, and non-combustion industrial emission sources. Emissions from very large energy intensive industrial facilities in the Point Tupper Industrial Park were excluded from the study. The Canadian Manufacturers and Exporters are taking a lead role in conducting an industrial energy audit in Nova Scotia and several large industries in the Point Tupper Park are included in their study. The Eco-Efficiency Centre is involved in another initiative in the Park that is tracking industrial inputs and waste products in order to determine the feasibility of creating an eco-industrial park. GHG emissions from local power generating stations are not accounted for in the inventory to avoid double counting as these are captured in the analysis for electrical energy use.

The information collected by the S-HGA staff was provided to CBCL for analysis and interpretation, the outcome of this analysis forms a greater part of this Milestone One Report. Bearing in mind that the findings from this initial milestone will form a 'living' document, it is anticipated that as more accurate and representative information becomes available, the document will be appended to give a better picture of the region's energy demand and offer guided progress for ensuing milestones of this Work.

3.0 2005 COMMUNITY INVENTORY ESTIMATE

3.1 OVERVIEW

The inventory breakdown was done generally based upon primary building use. Non-building related emission sources include the transportation sector, industrial process loads, streetlights and landfills. This section will summarize the community emissions inventory collected. This inventory is based upon the most recent energy use data available and is generally for the period from 2005 up to the present, although in a few occasions some owners had complete records of the five most recent years dating back to 2003.

Since no previous inventory exists for this region, we estimated the change in emissions from ten years earlier than the baseline for establishing trends. This year will be 1995, and the ten-year trends between 1995 and 2005 will be used in forecasting future emissions and inventories. Population, building count, labour force characteristics data, as well as information on levels of economic activity become critical indicators for back casting to establish an approximate emissions inventory in the past.

Between 1996 and 2006 the population in the Strait-Highlands Region declined steadily by approximately 1% annually, while the total number of occupied dwellings experienced a decline at a lesser aggregate rate of about 0.93%. The regional demographic patterns suggest that the per capita energy consumption in these type of communities is not falling in direct proportion to population or workforce due to the fewer occupants per household and the increase in seasonal occupation. It is not clear yet whether the decline in workforce has resulted in a decline in the number of businesses in the region in Inverness and Richmond County. However, it has been observed that in Port Hawkesbury business establishments have not suffered decline as a result of out-migration. The tendency in the Strait -Highlands Region appears to be that several businesses are registered as seasonal. Thus the total number of businesses in operation does not seem to have changed significantly despite declines in population and workforce but more may now be operating only as seasonal operations where they may have been year round operations in the past.

There are fewer seasonal business establishments in Port Hawkesbury (only 3 out of a total estimate of 256). It was noted that in the past, the Port Hawkesbury population size used to be fairly sensitive to economic activity at the Point Tupper and nearby larger industrial operations. As such, a significant number of commercial businesses in the area could change their staffing levels based on which of the larger industrial businesses in Point Tupper was increasing or decreasing its workforce. However, interest by investors to set up information technology centres in the town has brought greater stability in the local supporting business, as well as many dwellings remaining occupied more predictably. In Inverness and Richmond counties, the vast majority of businesses are small in scale and primarily in the fisheries, services and hospitality sector with the larger business operations being mostly in the fishing industry.

Demographic patterns and changes for select periods in the study area are summarized in Table 2, which is a selectively modified version of the Nova Scotia Statistical Review 2001 and 2006 publications for Region 21 in Cape Breton.

Table 2. Strait Highlands Demographic Shift

POPULATION	1996	2006	% CHANGE
Inverness County	17,514	15,812	-10.2
Richmond County	11,281	9,859	-13.4
Port Hawkesbury	3,905	3,678	-6.0
REGION LABOUR FORCE	1996	2005	% CHANGE
All Three Regions Combined	64,400	63,400	-1.6
OCCUPIED DWELLINGS	1996	2005	% CHANGE
Inverness County	6,461	5,727	-12.0
Richmond County	3,994	3,888	-2.7
Port Hawkesbury	1,203	1,066	-12.0

Sources: Population adjusted from Statistics Canada, 2001 Census, CAT. No. 95F031ZXCB01006

Others: Adjusted from Statistics Canada, Annual Demographic Statistics CAT. No. 91-213-XPB, 2005

3.2 RESIDENTIAL

As previously described in the Methodology, an extensive building counting exercise was conducted to categorize as much of the building stock as possible according to age, size, and energy forms in use. Of the three categorizations, we did not have reliable information on the square footage of residences. As such, residential size classification for the Strait-Highlands was augmented with observations from other Nova Scotia regions with similar size, social and demographic characteristics. Residential size categories were determined as follows:

- **Mini:** Up to 1,000 ft²
- **Small:** Between 1,000 and 1,800 ft²
- **Large:** Over 1,800 ft²

Figure 9 summarises the estimated count and age of the residential dwellings by county/town:

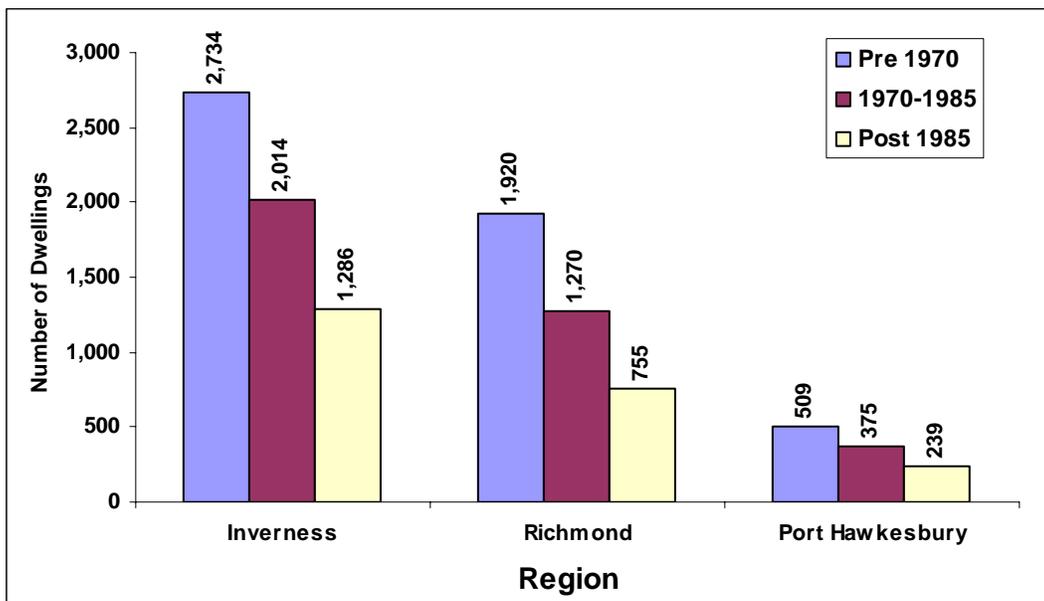


Figure 9. 2005 Residential Count and Classification by Age and Region

In Figure 10, the proportion of residential age within each of the three jurisdictions is depicted and shows that in the Strait-Highlands Region, the majority of residential houses fall in the Pre 1970 category. (Calculations are rounded up, so may not add to 100% in some cases).

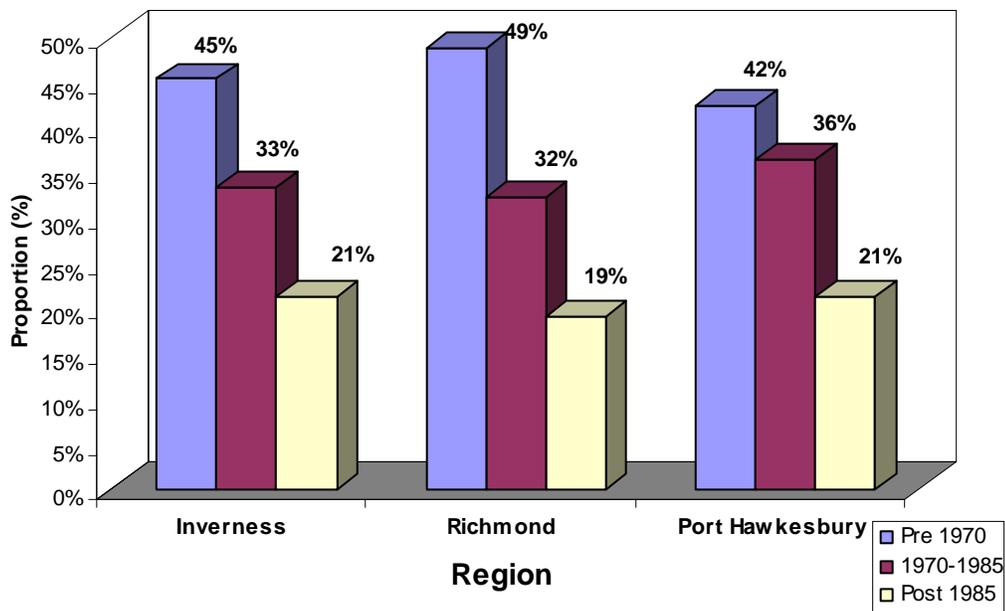


Figure 10. Residential Dwelling Classification by Age and Within-region Proportion

For each of the regions, dwellings were further classified into three types consisting of Single-Detached; Single-Attached & Other; and Apartments and Flats. The 'Single Attached & Other' category includes single attached, row houses, duplexes, mini and mobile homes. These counts are summarized in Table 3.

Table 3. Summary of Residential Count by Dwelling Type and Region

RESIDENTIAL TYPE	RESIDENTIAL COUNT		
	INVERNESS	RICHMOND	PORT HAWKESBURY
Single Detached	5,078	3,446	931
Single Attached & Other	641	435	119
Apartment & Flats	8	7	16
TOTAL	5,727	3,888	1,066

Modified from Statistics Canada, Annual Demographic Statistics CAT. No. 91-213-XPB, 2005

Although it was desirable to also explore residential count and classify dwellings into the three size categories (mini, small and large), the square footage detail for these residences was not readily available. The audit team was able to access and classify the residences by age as shown in Figure 9. However, as mentioned earlier, experience from other rural and semi-rural municipalities in Nova Scotia show that typically the ratios are approximately as shown in Table 4:

Table 4. Proportion of Residences by Size and Age

STRAIT HIGHLANDS	MINI	SMALL	LARGE
Pre 1970	0.07	0.38	0.54
1970 – 1985	0.10	0.67	0.23
Post 1985	0.04	0.63	0.33

(Criteria attributes adopted from analysis of residences in the Municipality of Clare, NS., 2006).

When using the residential count by age in Figure 9 in combination with the ratios in Table 4, a representative categorization of occupied dwellings in the Strait-Highlands Region by size can be approximated. The outcome of this analysis yields classification and count of residences by size as tabulated in Table 5.

Table 5. Strait Highlands Residences by Age and Size

RICHMOND COUNTY	MINI	SMALL	LARGE
Pre 1970	141	735	1,043
1970 – 1985	128	851	290
Post 1985	32	473	250
INVERNESS COUNTY	MINI	SMALL	LARGE
Pre 1970	201	1,047	1,486
1970 – 1985	204	1,350	461
Post 1985	55	805	425
PORT HAWKESBURY	MINI	SMALL	LARGE
Pre 1970	37	195	277
1970 – 1985	38	251	86
Post 1985	10	150	79

3.2.1 RESIDENTIAL ENERGY CONSUMPTION ANALYSIS

Energy use analysis was done across the residential sector to establish the relative use of available energy forms in the region. This information is then used to extract emissions quantities for the various forms of energy used.

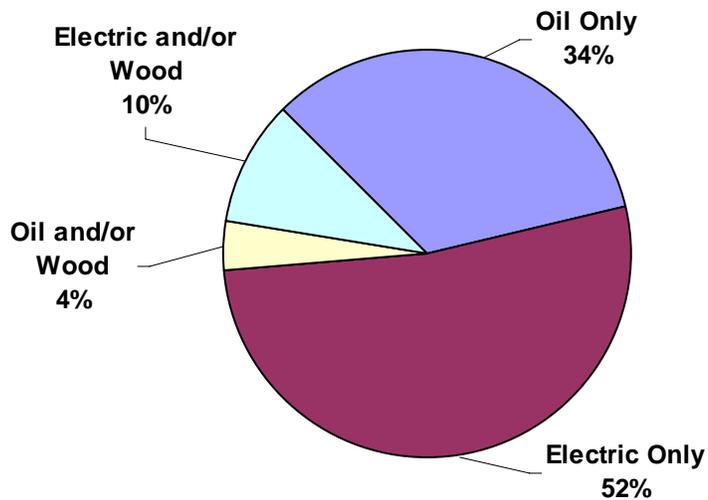


Figure 11. Distribution Percentages by Principal Energy Sources for Residences

The extent to which one form of energy predominates for heating in the residential sector could not be readily identified due to the fact that in most cases there was no record of how much fuel wood was used for heating. Further to that, on electric bills for residential buildings, energy consumed for heating, powering appliances and lights is combined. Thus one figure for electric bill does not assuredly reveal how much of it should be apportioned to heating so that comparison with other heating fuels can be established. The higher percentage of electricity compared to either fuel oil or wood should be explored and may be due to a number of factors including that many homes are seasonal occupancy only. Many seasonal home owners find electric heating for their homes makes it easier to tune up for occupation in the warm summer months and shut down for winter. Figure 12 depicts the estimated count of dwellings by energy form in the three communities:

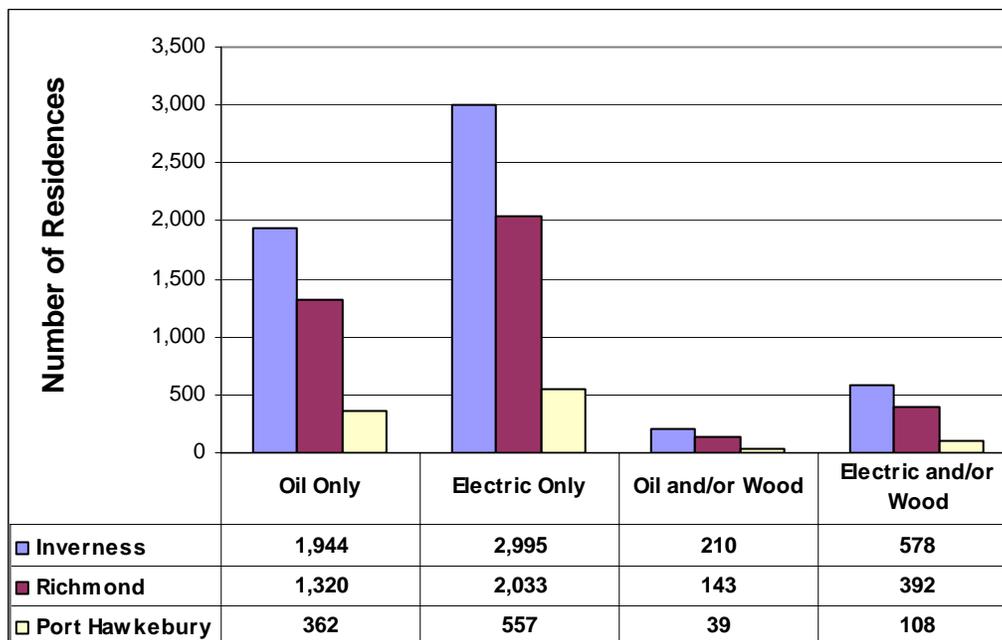


Figure 12. Count of Occupied Dwellings by Primary Heating Source and Region

The vast majority of residences in the Strait-Highlands Region are detached single family residences. Duplex, single attached and row houses have also been noted, but they represent a very small portion of the total residential count. Across the entire region, there were no more than 30 apartment buildings, 16 of which were identified to be in Port Hawkesbury. Ultimately, the apartment building count shown in the residential analysis includes flats, while nursing homes for this region were classified under commercial stock as all are privately owned.

Representative sample sizes of each category were determined and residences selected for onsite audits. Actual energy consumption figures were collected for each residence visited. Demand side management and efficiency improvement opportunities were also noted during each site visit. In their approach to obtain relevant information, the S-HGA staff contacted residence owners, fuel oil delivery companies, and fuel wood suppliers to obtain estimates of residential fuel sales within the municipalities. The site visits also provided data on the age and estimated efficiency of fuel fired appliances which assisted in the determination of overall fuel consumption figures for each residential building category.

Nova Scotia Power provided information on regional usage for electricity. Aggregate energy usage data was provided for each of the three municipalities for several categories: commercial demand, medium industrial, outdoor recreation lighting, residential service, seasonal service, small general, and small industrial.

The consumption figures were then used to calculate the equivalent CO₂ emissions from each category based upon available emission factors and energy intensity factors. The breakdown of residential energy consumption for each category is illustrated in the following figures for each of the three regional jurisdictions:

A. Inverness County

For Inverness County, energy utilization was determined by energy source and by dwelling type. Figure 13 and Figure 14 respectively summarize the findings:

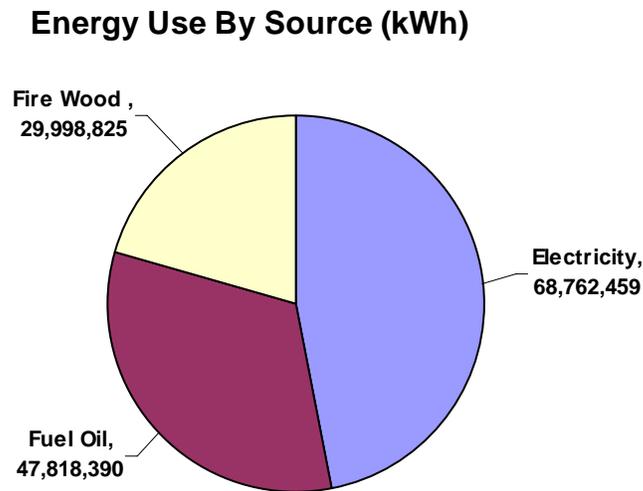


Figure 13. Inverness Residential Energy Use by Source

Energy Consumption By Dwelling Type (kWh)

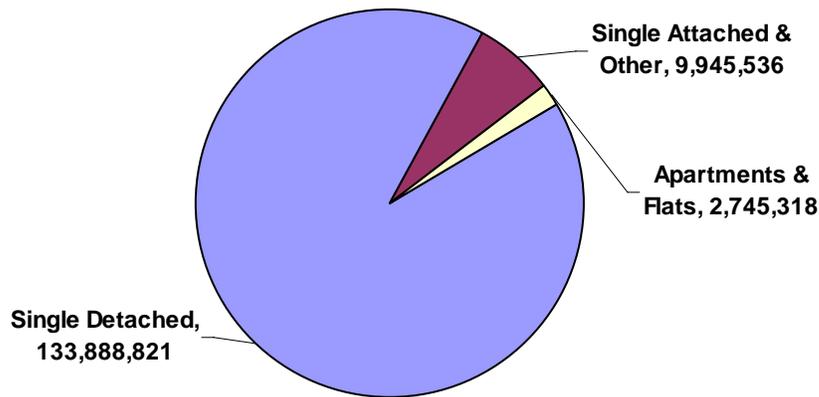


Figure 14. Inverness Residential Energy Use by Dwelling Type

It becomes clear that in Inverness County electricity and fuel oil are the most popular energy sources. It should be noted that electricity consumption in this context includes both heating as well as powering appliances and lights.

As stated above, Figure 14 highlights the fact that the bulk of energy use goes to single detached houses as this category forms the majority of the housing stock in the entire Strait-Highlands region. An estimate of over 4,000 cords of fuel wood was used as the annual consumption in the community

B. Richmond County

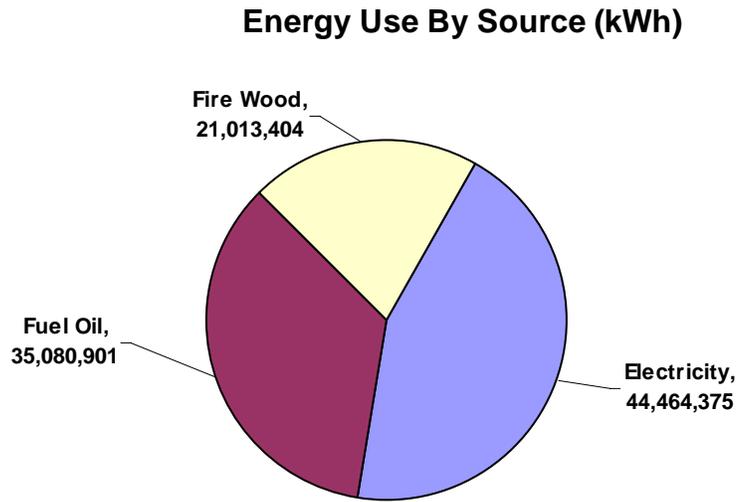


Figure 15. Richmond County Residential Energy Use by Source

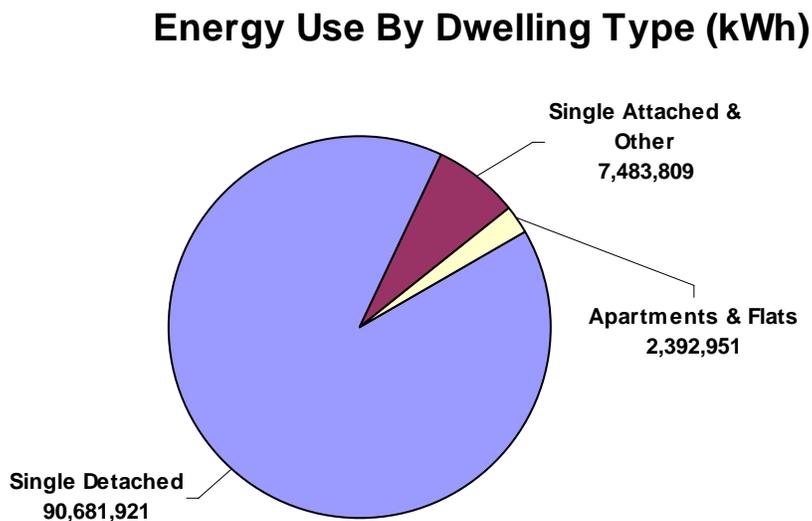


Figure 16. Richmond Residential Energy Use by Dwelling Type

In Richmond County approximately 2,800 cords of fuel wood were burned in 2005.

C. Town of Port Hawkesbury

Energy Usage By Source (kWh)

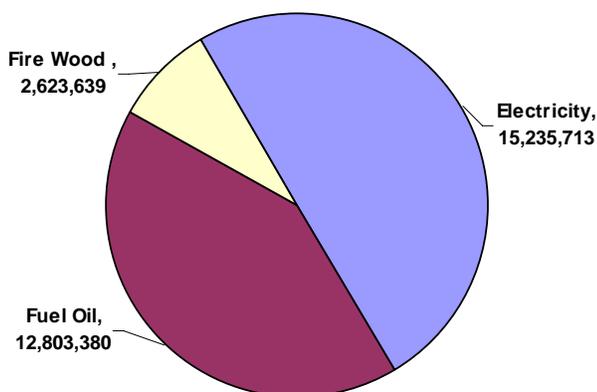


Figure 17. Town of Port Hawkesbury Energy Use by Energy Source

Energy Consumption By Dwelling Type (kWh)

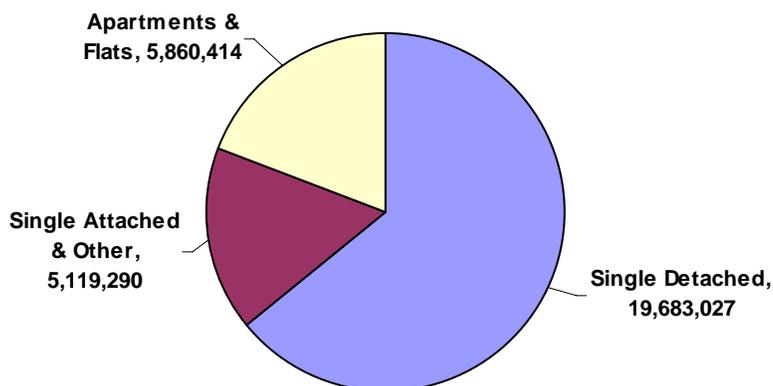


Figure 18. Port Hawkesbury Residential Energy Use by Dwelling Type

As far as energy source, Port Hawkesbury’s fuel split profile is slightly different from the two counties with almost half of total energy coming from fuel oil. On a per household basis, this translates to about 1,100 litres of oil per household compared to 775 litres and 840 litres per household for Inverness and Richmond respectively. Also, the per capita usage of fire wood is much smaller at about 1/3-cord per household compared to Inverness and Richmond with about 3/4-cord per household each on an annual basis.

3.2.2 RESIDENTIAL EMISSIONS ANALYSIS

The equivalent CO₂ emissions or greenhouse gases resulting from the residential sector energy consumption are presented as follows:

A. Inverness County

GHG Emissions by Energy Source (eCO2 tonnes)

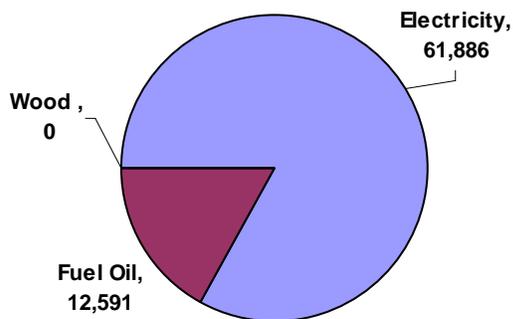


Figure 19. Inverness Residential GHG Emissions by Source (tonnes)

GHG Emissions By Dwelling Type (tonnes)

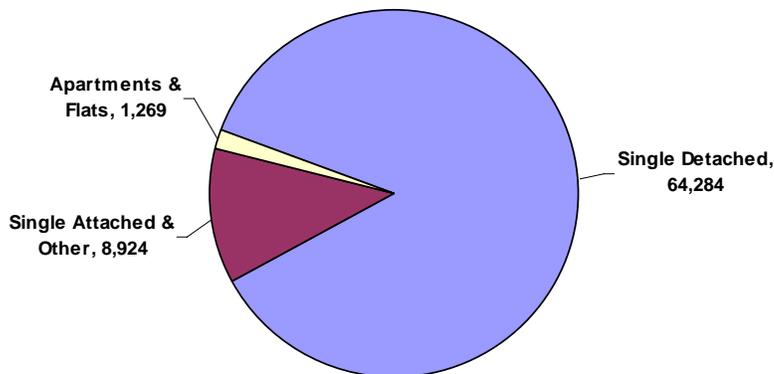


Figure 20. Inverness Residential GHG Emissions by Dwelling Type

B: Richmond County

GHG Emissions By Energy Source (tonnes)

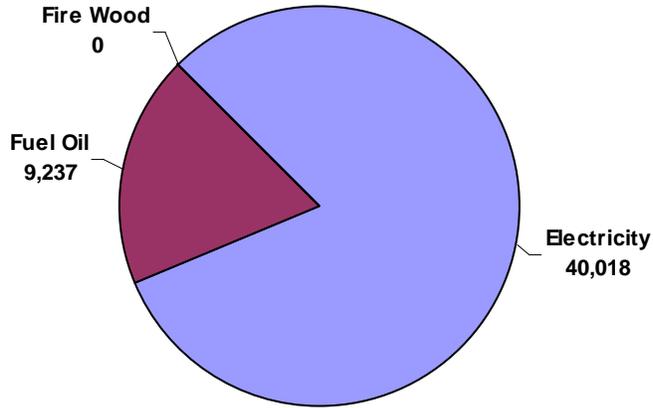


Figure 21. Richmond GHG Emissions by Energy Source

GHG Emissions By Dwelling Type (tonnes)

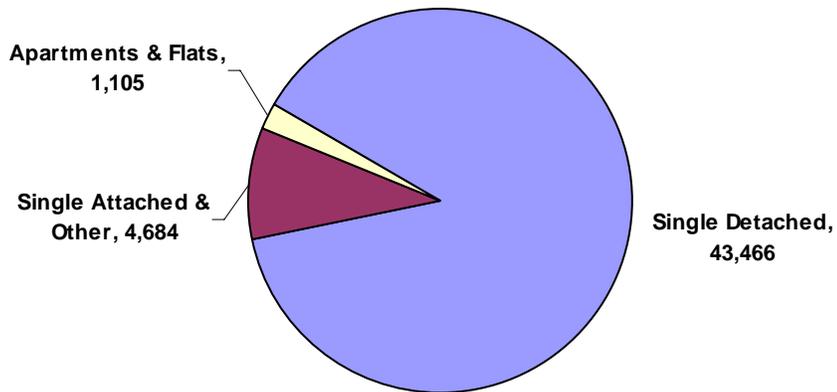


Figure 22. Richmond GHG Emissions by Dwelling Type

C: Town of Port Hawkesbury

GHG Emissions By Energy Source (tonnes)

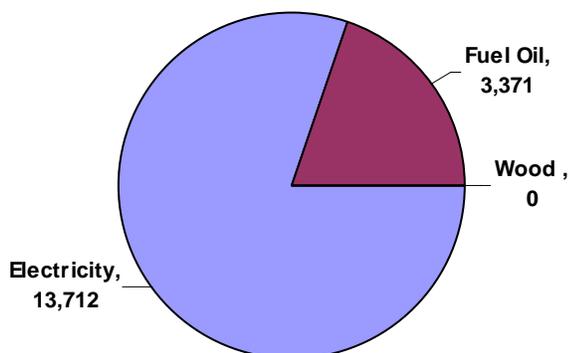


Figure 23. Town of Port Hawkesbury Residential GHG Emissions by Energy Source

GHG Emissions By Dwelling Type (tonnes)

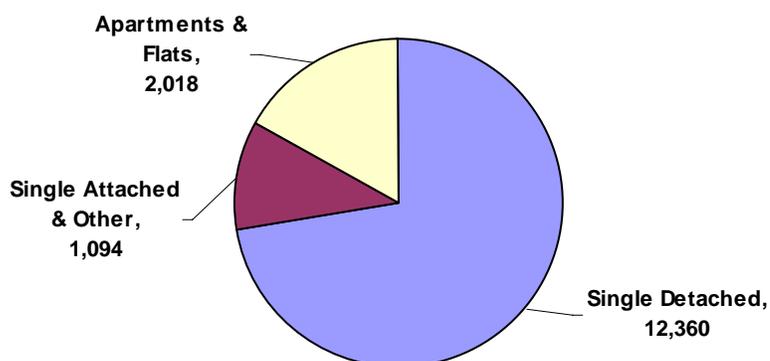


Figure 24. Port Hawkesbury Residential GHG Emissions by Dwelling Type

Observations from the emissions presentation in the figures above can be summarized on the per household basis as illustrated in Table 6 as follows:

Table 6. Per household Energy Consumption and GHG emissions by Energy Source

REGIONAL AREA	ENERGY (KWH/HOUSEHOLD)	GHG EMISSIONS (TONNES/HOUSEHOLD)
Inverness County	25,594	13.0
Richmond County	25,864	12.7
Port Hawkesbury	28,764	16.0

It can be surmised from the observations in the table above that even with the exclusion of large final emitters (LFE) in the analysis, Port Hawkesbury has a slightly higher per household GHG emissions than the other two communities. One main contributor to this occurrence is the apparent lower use of fuel wood compared to Inverness and Richmond in the residential sector. The difference in proportion between the categories in the energy and emissions graphs is due to the use of fuel wood for heating. Thus for residential communities with more intensive use of fire wood the resultant emissions are much lower. Fuel wood is an energy source that when harvested sustainably from regenerating woodland is considered to have a zero net CO₂ emission level. This is due to the assumption that the CO₂ emitted when combusting fuel wood is reabsorbed by trees growing on the regenerating woodland from which it was harvested.

Natural Resources Canada reports that the average equivalent annual CO₂ emission rate per individual dwelling unit in Canada is about six tonnes. These national residential emission rates are very low compared to Atlantic Canada, especially Nova Scotia. In the Strait Highlands, all three regions have exceeded this national average. Two other similar project studies of Nova Scotia communities that CBLC worked on, the rates were comparable to those derived for the Strait Highlands. Some possible reasons for this are:

1. Higher percentage of detached homes than national average.
2. Higher percentage of older homes than national average housing stock.
3. Greater reliance on fuel oil and electricity for heating than national average households.
4. Electricity in Nova Scotia has a higher emission intensity factor than the national average.

3.3 COMMERCIAL AND SMALL INDUSTRIAL (C & I)

This sector primarily comprises the retail, hospitality services, and small manufacturing and fabrication industries. Information on the number of businesses within the sector was obtained by S-HGA staff from each of the three municipalities, including a count of those businesses that are strictly seasonal. The businesses were categorized as Small, Medium and Large. In the absence of useful commercial space detail from owners, the team classified businesses on the basis of the number of employees. These size categories were classified as follows:

Small : Up to 20 employees

Medium: From 21 to 100 employees

Large : Over 100 employees

The total count of commercial and small industrial establishments, categorized by building size is summarized in Table 7:

Table 7. Strait-Highlands Region Total Business Count by Size

GEOGRAPHIC AREA	SEASONALITY	TOTAL NUMBER OF BUSINESSES	SMALL	MEDIUM	LARGE
Inverness County	All Year	574	455	8	0
	Seasonal	111	111	0	0
Port Hawkesbury	All Year	256	233	19	1
	Seasonal	3	3	0	0
Richmond County	All Year	246	211	6	1
	Seasonal	28	28	0	0

3.3.1 COMMERCIAL & SMALL INDUSTRIAL SECTOR: ENERGY ANALYSIS

The total energy consumption for this sector is broken down by region as depicted below:

A. Inverness County

Table 8. Inverness Commercial Energy Use by Size and Energy Type

BUSINESS SIZE	ELECTRIC (kWh)	OIL (kWh)	PROPANE (kWh)
Small	70,577,104	26,170,746	8,115,721
Medium	3,303,836	757,501	283,107
Large	0	0	0
Total	73,880,940	26,928,247	8,398,827

Energy Use By Business Size (kWh)

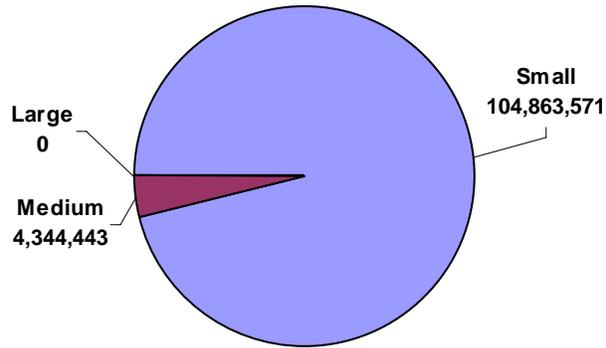


Figure 25. Inverness County Commercial Energy Use by Business Size

Commercial Energy Use by Source (kWh)

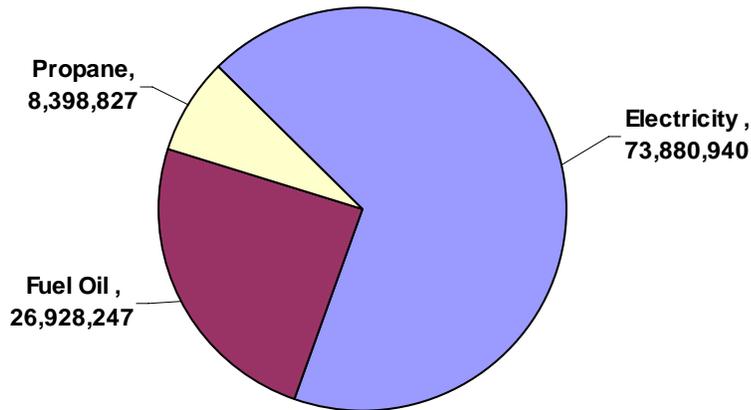


Figure 26. Inverness County Commercial Energy Use by Energy Source

B. Richmond County

Table 9. Richmond Commercial Energy Consumption by Size and Energy Type

SIZE CLASSIFICATION	ELECTRIC (KWH)	OIL (KWH)	PROPANE (KWH)
Small	50,383,498	5,903,255	1,718,775
Medium	2,477,877	374,626	84,530
Large	1,376,598	136,459	46,961
Total	54,237,974	6,414,339	1,850,266

C & I Energy Use by Energy Source (kWh)

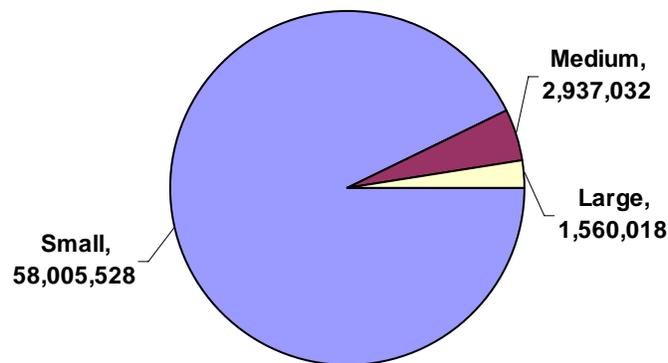


Figure 27. Richmond County Commercial Energy Use by Business Size

Richmond Commercial Energy Use By Source (kWh)

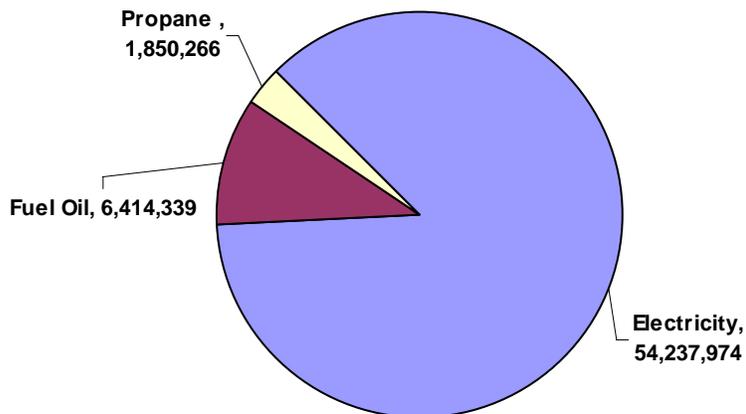


Figure 28. Richmond Commercial Energy Use by Energy Source

C. Town of Port Hawkesbury

Table 10. Port Hawkesbury Commercial Energy Consumption by Size and Energy Type

SIZE CLASSIFICATION	ELECTRIC (κWH)	OIL (κWH)	PROPANE (κWH)
Small	57,573,522	11,222,096	2,160,209
Medium	7,846,610	1,390,564	267,678
Large	1,376,598	219,300	46,961
Total	66,796,731	12,831,960	2,474,848

C&I Energy Use by Business Size (kWh)

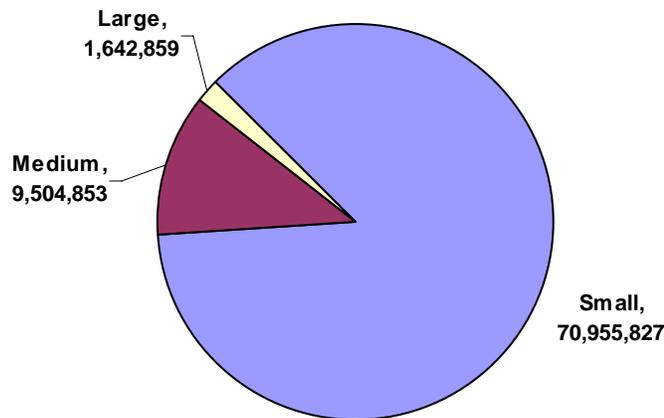


Figure 29. Port Hawkesbury Commercial Energy Use by Business Size

C&I Energy Usage By Source (kWh)

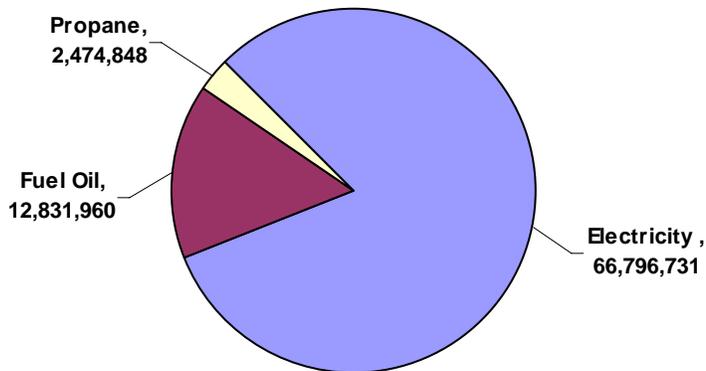


Figure 30. Town of Port Hawkesbury Commercial Energy Use by Energy Source

It appears that electricity is the predominate energy source of businesses in the region. Even though a good number of businesses use some fuel oil for heating, the majority of commercial businesses make use of electricity not so much for heating alone, but also for powering processes. An audit of the Clear Water Ltd. in Isle Madame showed that there were over 20 large compressors and pumps for the lobster harvesting and packaging. Similarly, the walk through audit of the SuperStore in Port Hawkesbury attested to the fact that lighting forms a large electrical load for many similar commercial businesses, second only to heating. However, heating for both the SuperStore and Clear Water Seafood Ltd. was electrical. The next largest electrical load for SuperStore was refrigeration and air conditioning. There was no record of any commercial business making use of fuel wood in this region, certainly none of those that were audited or that showed their utility and energy bills.

3.3.2 COMMERCIAL AND SMALL INDUSTRIAL GHG EMISSIONS

Wood heating is not used in this sector so the comparison between energy consumption and emissions is directly proportional.

Due to the large discrepancies in energy consumption for individual businesses as a result of varying operating hours, seasonal operation, equipment loads, and operating procedures, we did not attempt to break down the commercial and small industrial sector into a per business energy consumption or GHG emission figure. Figure 31 is a summary of GHG emissions across the Strait-Highlands Region by energy source. A combined total of about 190,000 tonnes per annum of equivalent CO₂ are emitted from the commercial and small industrial sector in the region. Of this, over 90% is directly related to electricity consumption. Nova Scotia has the highest emission intensity in the country for electricity generation. In 2000 when NSPI's intensity factor stood at 0.937/kg/kWh, our neighbours in New Brunswick and Newfoundland had 0.449 kg/kWh and 0.219 kg/kWh respectively. In this analysis for 2005, a value of 0.900 kg/kWh was used to account for GHG production in the use of electricity generated in the province. By comparison, a kWh of thermal energy produced by combusting fuel oil produces about 0.310 kg. of equivalent CO₂.

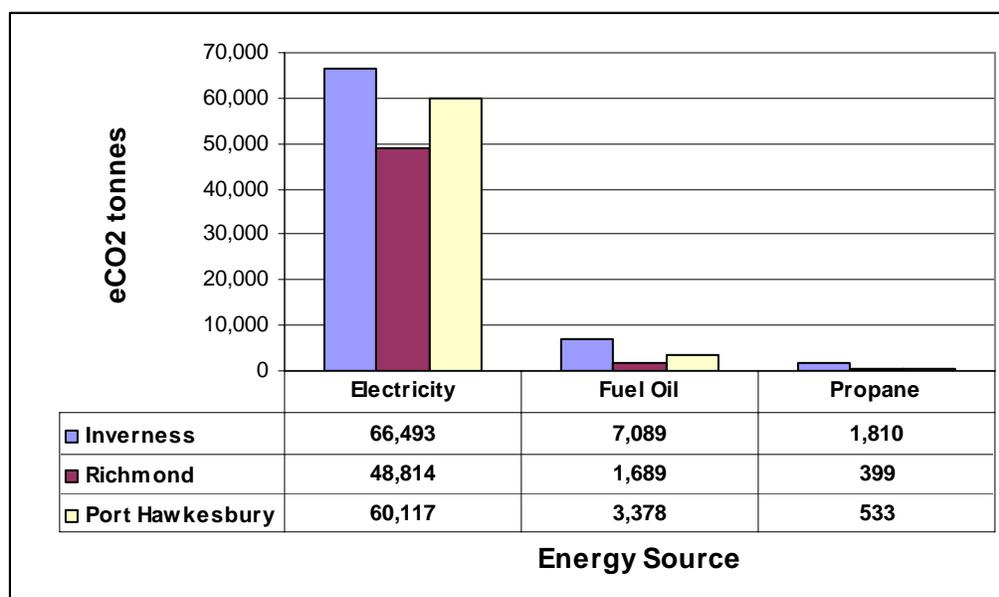


Figure 31. Strait-Highlands Commercial and Small Industrial GHG Emissions (tonnes)

3.4 LARGE INDUSTRIAL (NOT INCLUDED IN THIS REPORT)

Emissions from very large energy intensive industrial facilities in the region were excluded from the study. The Canadian Manufacturers and Exporters are taking a lead role in conducting an industrial energy audit in Nova Scotia and several large industries in the Point Tupper Park are included in their study. The Eco-Efficiency Centre is involved in another initiative in the Park that is tracking industrial inputs and waste products in order to determine the feasibility of creating an eco-industrial park. GHG emissions from local power generating stations are not accounted for in the inventory to avoid double counting as these are captured in the analysis for electrical energy use.

3.5 TRANSPORTATION

This sector comprises private and corporate land transportation.

Statistics Canada data from the 2001 census indicates approximately 1.4 registered motor vehicles per private dwelling in Nova Scotia. Large commercial highway vehicles are registered at a rate of 0.05 vehicles per private dwelling. Applying those features, and adjusting the latest census information for the Strait Highlands region yields the following vehicle totals.

Table 11. Strait Highlands Vehicle Registration by Region, 2005

VEHICLE TYPE BY REGION (2005)	NOVA SCOTIA	INVERNESS	RICHMOND	PORT HAWKESBURY
Total, Road Motor Vehicle Registrations	665,426	8,331	5,535	1,567
Vehicles weighing less than 4,500 kilograms	532,253	6,737	4,476	1,267
Vehicles weighing 4,500 kilograms to 14,999 kilograms	8,946	116	77	22
Vehicles weighing 15,000 kilograms or more	7,870	95	63	18
Buses	1,848	28	21	8
Motorcycles and Mopeds	10,407	106	70	20
Trailers	48,121	602	400	113
Off-Road, Construction, Farm Vehicles	55,980	652	433	123

Source: Service Nova Scotia and Municipal Relations, 2006

Annual transportation energy consumption and emissions were based on calculated total vehicle kilometres traveled (VKT) or each region separately, and by assuming the average per vehicle annual VKT of about 14,000 km.

Table 12. Regional VKT Fuel Consumption and Emissions based on 2005 indicators

REGION	ANNUAL VKT	TOTAL FUEL (KWH)	TOTAL FUEL COST	TOTAL ECO2 (TONNES)
Inverness	98,490,285	169,348,839	18,494,067	48,548
Richmond	65,473,828	112,578,787	12,294,384	32,274
Port Hawkesbury	18,575,457	31,939,516	3,488,017	9,156
Regional Total	182,539,569	313,867,143	34,276,468	89,978

Region specific transportation analysis is presented as follows:

3.5.1 FUEL CONSUMPTION AND GHG EMISSIONS ANALYSIS

A. Inverness County

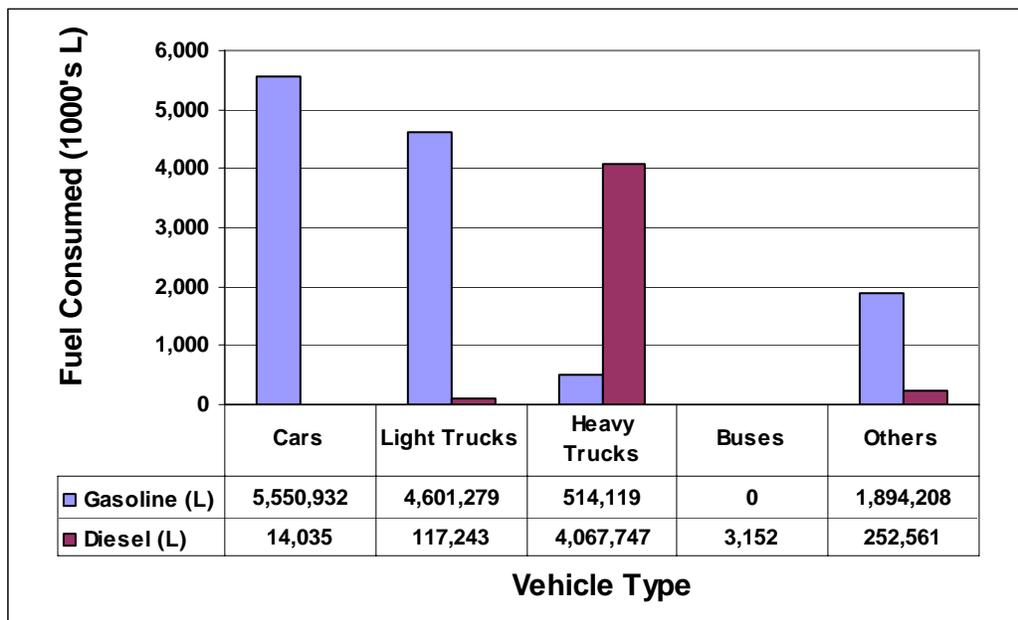


Figure 32. Inverness Transportation Fuel Usage by Vehicle Type

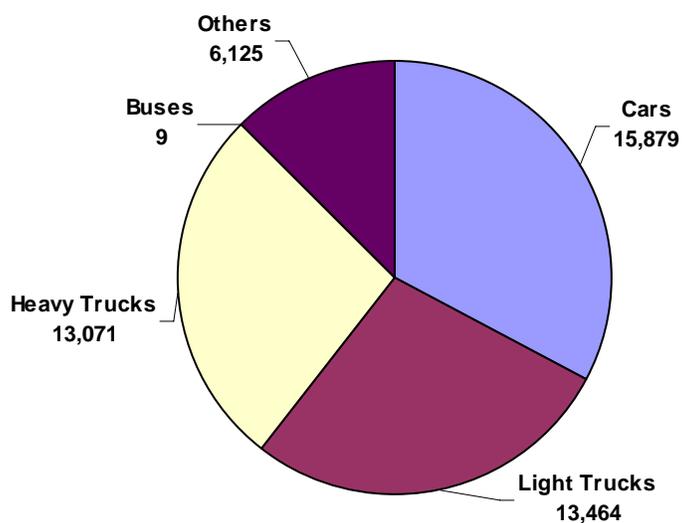


Figure 33. Inverness Transportation GHG Emissions by Vehicle Type (tonnes)

B. Richmond County

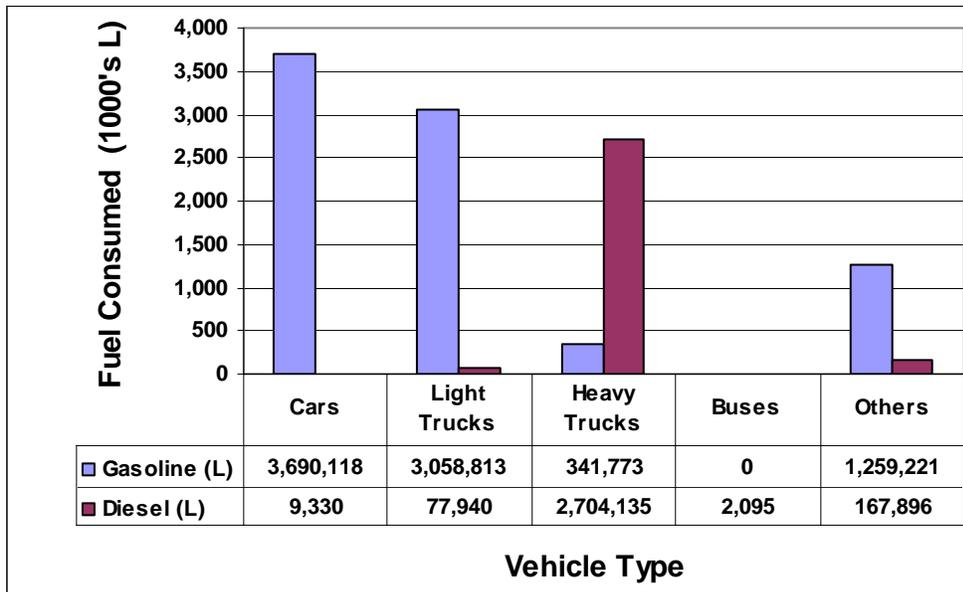


Figure 34. Richmond County Transportation Fuel Usage by Vehicle Type

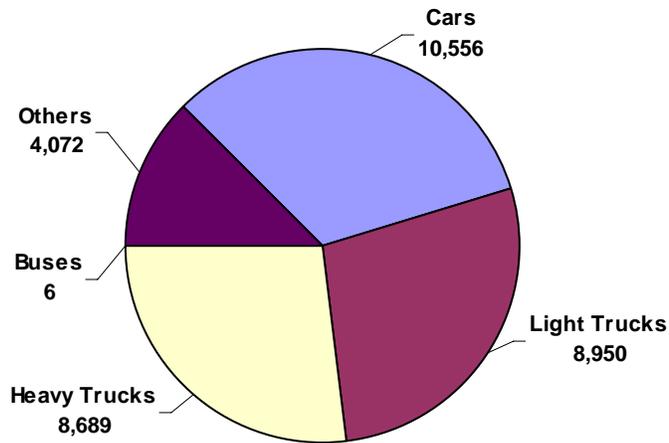


Figure 35. Richmond Transportation Emissions by Vehicle Type (tonnes)

C. Town of Port Hawkesbury

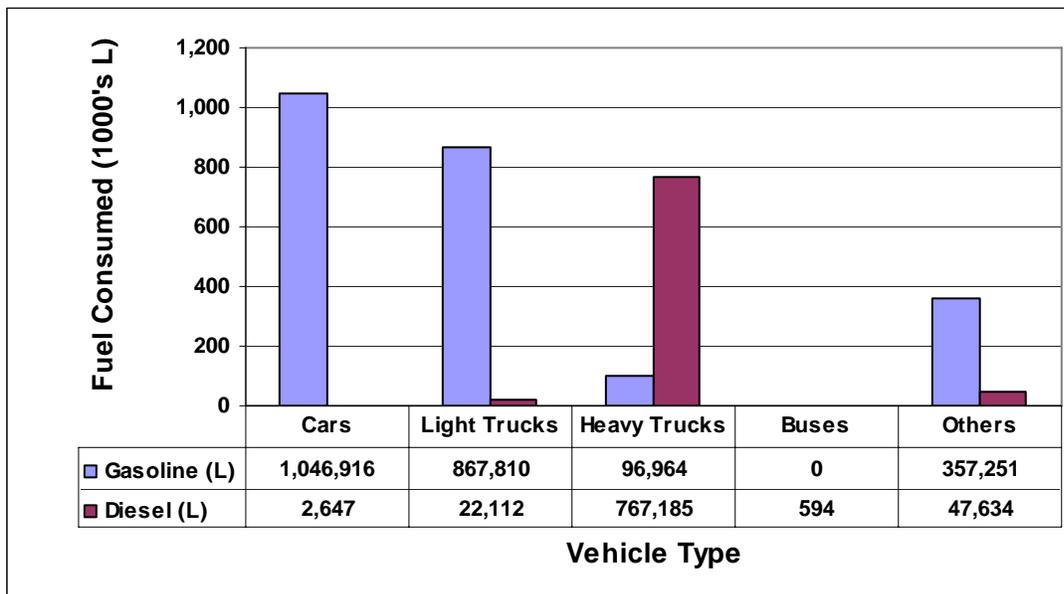


Figure 36. Town of Port Hawkesbury Transportation Fuel Use by Vehicle Type

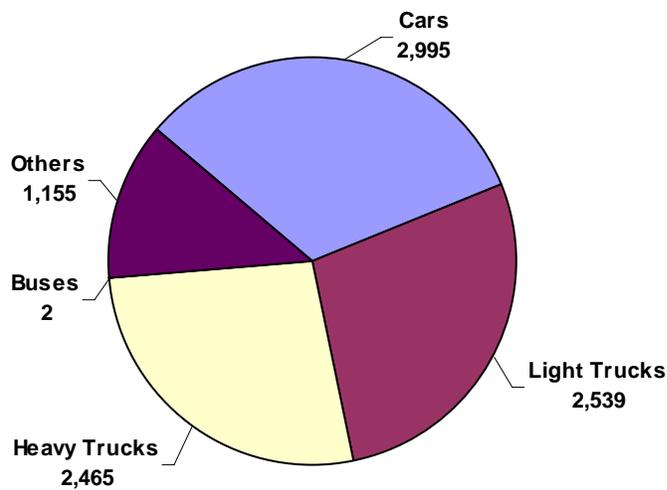


Figure 37. Town of Port Hawkesbury Transportation Emissions by Vehicle Type (tonnes)

3.6 INSTITUTIONAL

This sector includes public institutions and service facilities such as schools, colleges, hospitals, nursing homes, churches, fire halls, arenas, curling clubs, and other public facilities not run by municipalities. The energy consumption is almost exclusively related to buildings except for some external lighting. Energy consumption for most of the buildings follows a similar pattern to commercial and small industrial buildings in terms of scale and utilization index. However, unlike the commercial sector, institutional facilities tend to use more fuel oil than electricity. Energy consumption and emissions for this sector are discussed by geographic regions as follows:

A. Inverness County

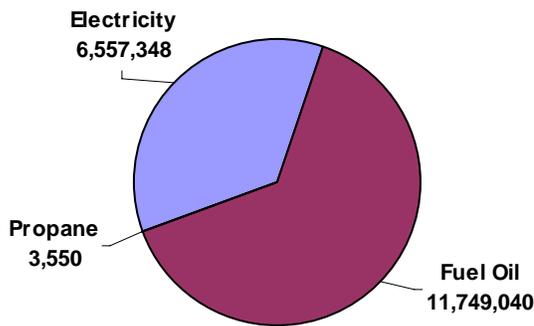


Figure 38. Inverness Institutional Energy Use by Source (kWh)

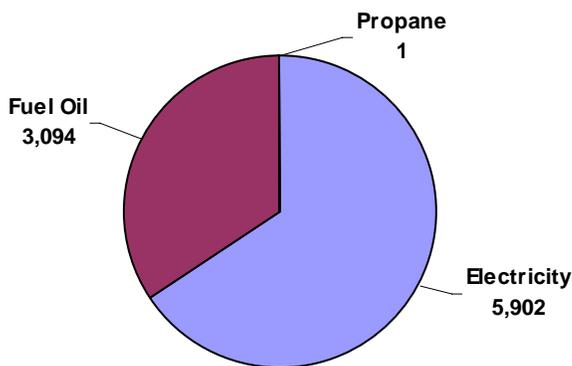


Figure 39. Inverness Institutional GHG Emissions by Source (tonnes)

B. Richmond County

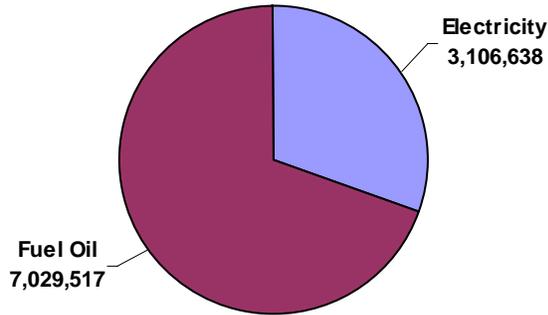


Figure 40. Richmond Institutional Energy Use by Source (kWh)

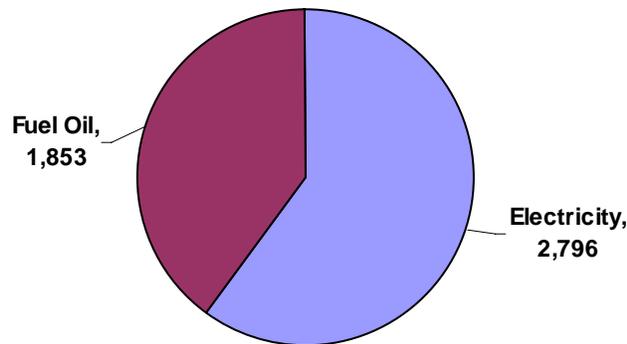


Figure 41. Richmond Institutional GHG Emissions by Source (kWh)

C. Town of Port Hawkesbury

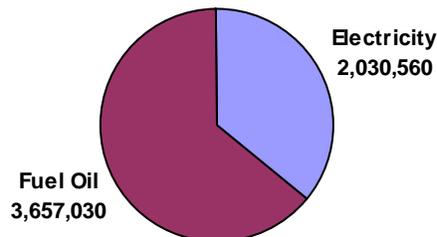


Figure 42. Town of Port Hawkesbury Institutional Energy Use by Source (kWh)

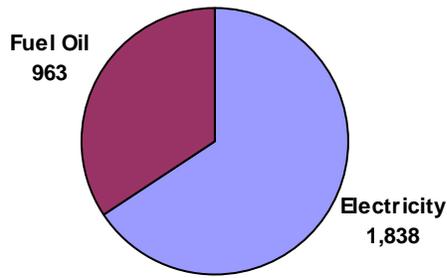


Figure 43. Town of Port Hawkesbury Institutional GHG Emissions by Source (tonnes)

3.7 WASTE

This sector is actually the fuel consumed by municipal trucks from collection areas to landfills, and therefore related fuel consumption and emissions are analysed under municipal vehicle fleet. However, where municipalities outsource these services to private waste management contractors, fuel energy use analysis and emissions are included under community transportation. Therefore, this section focuses only on the levels of GHG emissions per municipality.

All landfills in the Strait-Highlands Region are reported to be closed, and what now exists are transfer stations from whence waste is collected for disposal in Guysborough County. The closed landfills were modelled using a CBCL in-house program called LandGEM to determine emissions released primarily from the anaerobic decomposition of organic material which continues to take place long after discontinuation of garbage dumping. For the Strait-Highlands Region, it was reported that the old generation landfills were in operation from about 1985 until their closure at the end of 2005. The analysis, therefore, takes this into account. Furthermore, due to the imprecise nature of itemizing what used to go into those landfills, we have used typical North American per household garbage collection rates from our waste management team's two previous studies. The premise of these studies from 2003 and 2005 is that approximately 1.5 tonnes of organic waste is collected from each household annually. Estimates of GHG emissions are presented by geographic region as follows:

A. Inverness County

Table 13. 2005 Inverness GHG emissions from community waste

POLLUTANT TYPE	GAS (TONNES)
Carbon Dioxide (CO2)	1,742
Methane (CH4)	635
Total eCO2	15,075

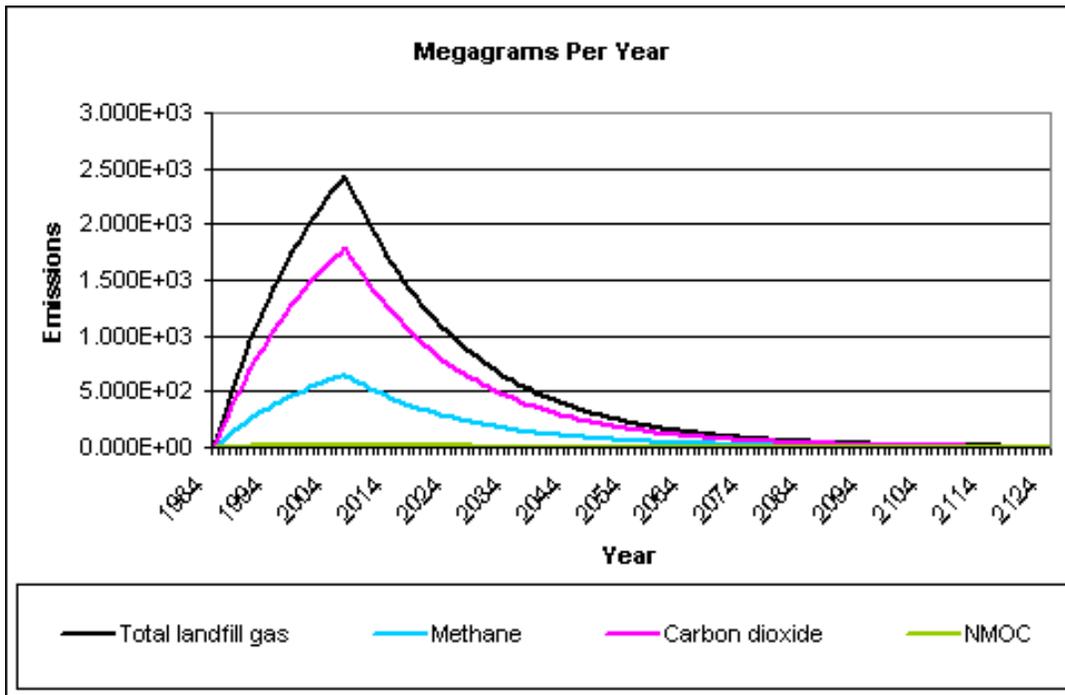


Figure 44. Rate of GHG Emissions from the Closed Inverness Landfill

B. Richmond County

Table 14. 2005 Richmond GHG emissions from community waste

POLLUTANT TYPE	GAS (TONNES)
Carbon Dioxide (CO2)	1,183
Methane (CH4)	431
Total eCO2	10,236

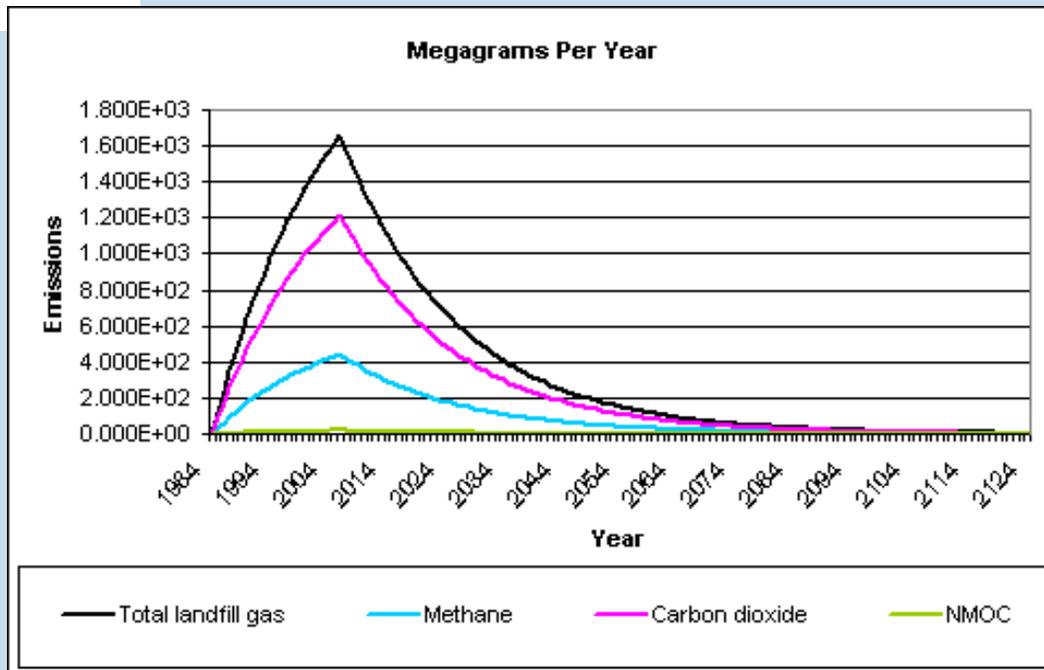


Figure 45. Rate of GHG Emissions from the Closed Richmond Landfill

C. Town of Port Hawkesbury

Table 15. 2005 Town of Port Hawkesbury GHG emissions from community waste

POLLUTANT TYPE	GAS (TONNES)
Carbon Dioxide (CO2)	324
Methane (CH4)	118
Total eCO2	2,807

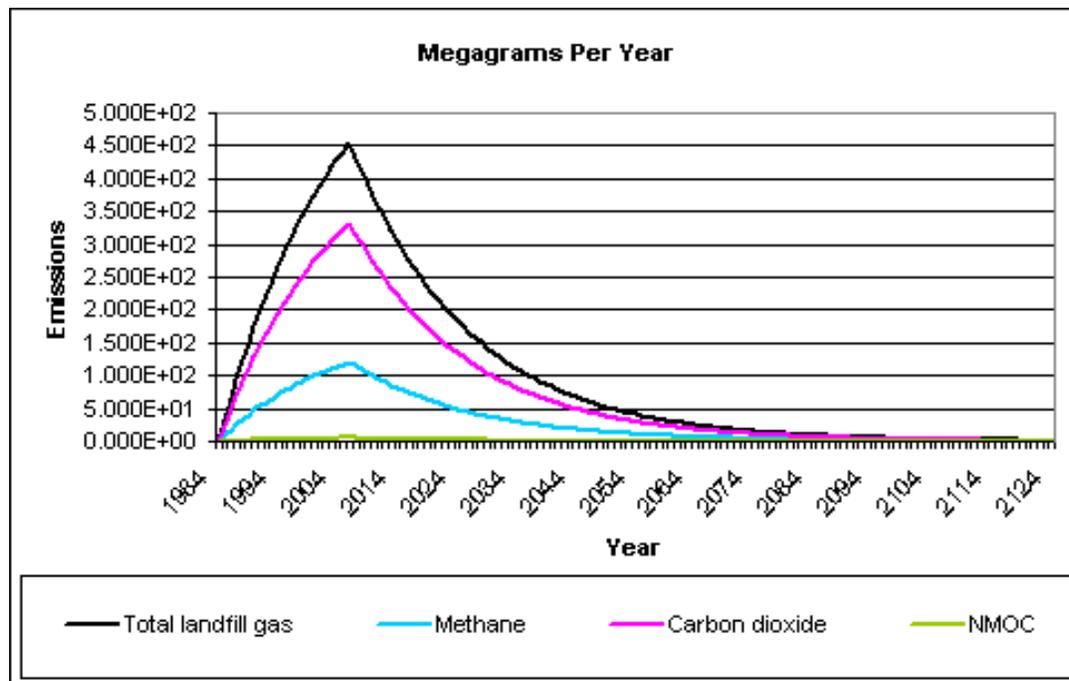


Figure 46. Rate of GHG Emissions from Closed Landfill in Port Hawkesbury

4.0 2005 MUNICIPAL EMISSIONS INVENTORY

Strait-Highlands Region

For the purposes of this inventory, municipal or corporate data includes all energy consumed from municipally owned or operated facilities and infrastructure including streetlights, transfer stations, landfills, water and sewage treatment plants as well as administration buildings. Municipal inventory is categorized into four sectors namely:

- Buildings
- Vehicle Fleet
- Streetlights
- Water and Sewage

None of these assets are large consumers of energy, nor are they large emitters of CO₂ with the exception of the landfill. Estimates of energy consumption related to municipal services were obtained by S-HGA staff from municipal staff and verified for completeness by the staff after compilation.

This section presents municipal energy use by energy source and by municipal sector. This is then followed by analysis of related emissions for the three municipalities:

4.1 MUNICIPAL ENERGY USE

A. Inverness

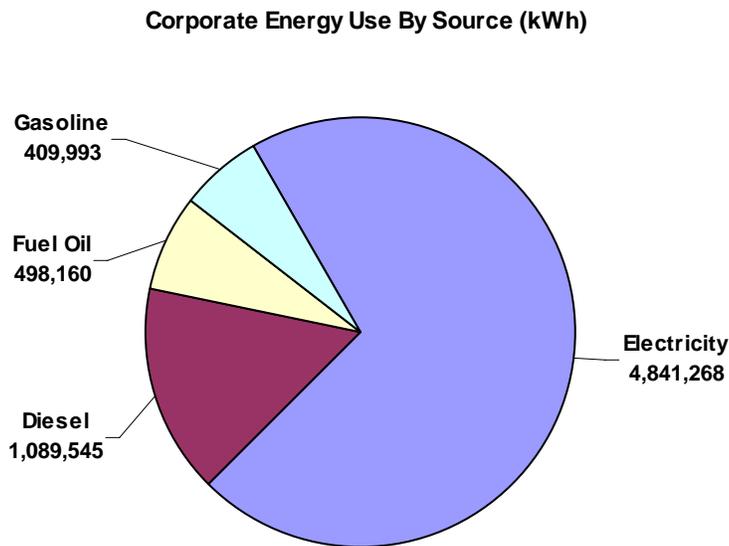


Figure 47. Inverness Municipal Energy Use by Energy Source

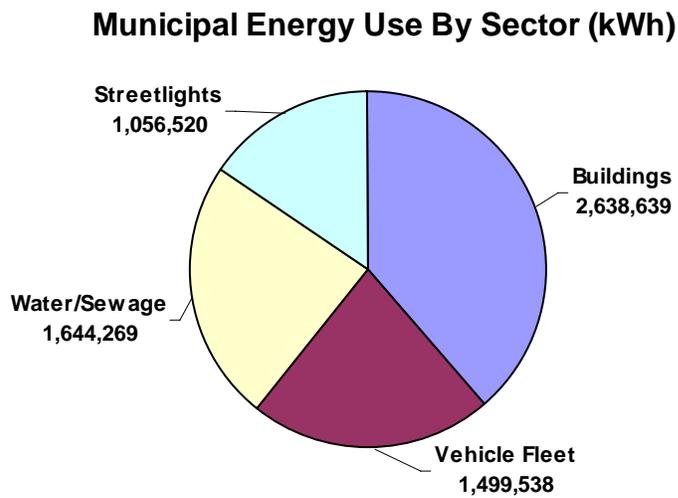


Figure 48. Inverness Municipal Energy Use by Municipal Sector

B. Richmond County

Municipal Energy Use By Source (kWh)

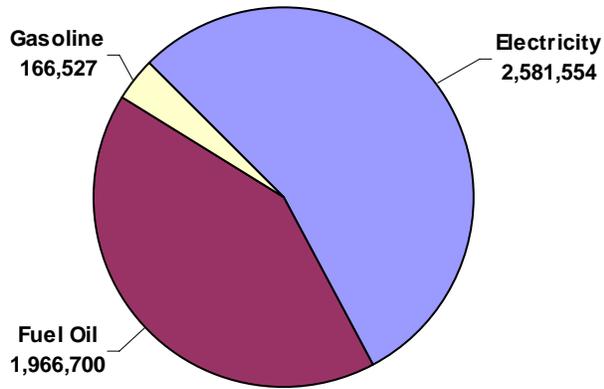


Figure 49. Richmond County Municipal Energy Use by Source

Municipal Energy Use By Sector (kWh)

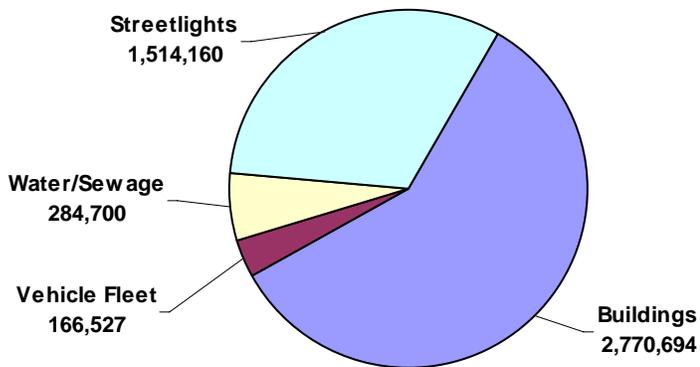


Figure 50. Richmond Municipal Energy Use by Municipal Sector

C. Municipality of Town of Port Hawkesbury

Municipal Energy Use By Source (kWh)

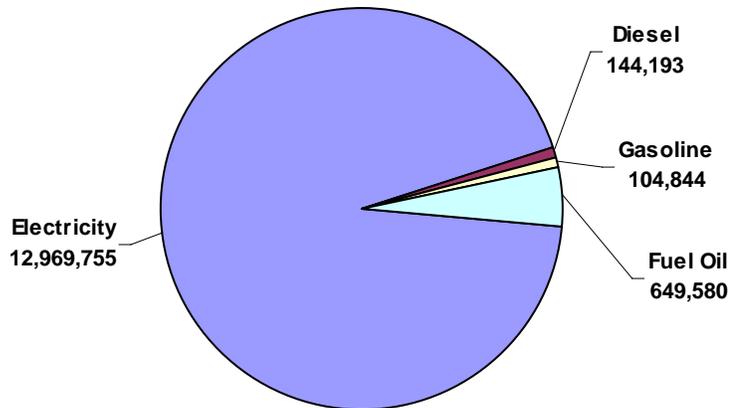


Figure 51. Town of Port Hawkesbury Municipal Energy use by Energy Source

Municipal Energy Use By Sector (kWh)

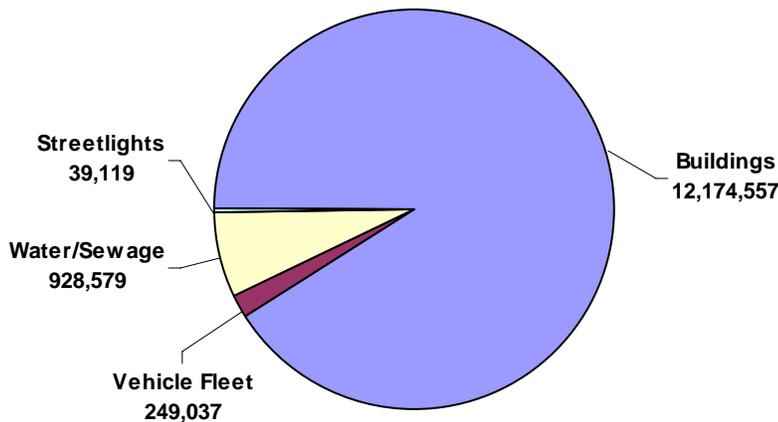


Figure 52. Town of Port Hawkesbury Municipal Energy Use by Sector

In all three municipalities, consumption profiles are quite similar with municipal buildings consuming the largest portion of total energy, while electricity is the largest energy source by a large margin over other energy sources. In rural municipalities, street lighting tends to utilize a larger portion of overall energy consumption than in towns and cities, due to the large areas requiring servicing. Rural municipalities don't usually have many large concentrations of population requiring centralized services such as water and sewer so energy consumption for those services tends to be lower than in towns and cities. With small populations and tax bases and large areas to service, many rural municipalities also outsource many services such as snowploughing, road maintenance, and garbage collection to private contractors, thus reducing the corporate energy consumption footprint at the expense of an increase in the community footprint while also keeping the municipal vehicle fleet small. For most small municipalities, the largest corporate assets and greatest energy consumers are the buildings owned and controlled by the municipality. Many of these buildings are of modern construction and use more electricity per unit of

floor area than similar sized residential properties. The greatest opportunities for corporate energy reductions are usually found in the buildings.

4.2 MUNICIPAL GHG EMISSIONS SUMMARY

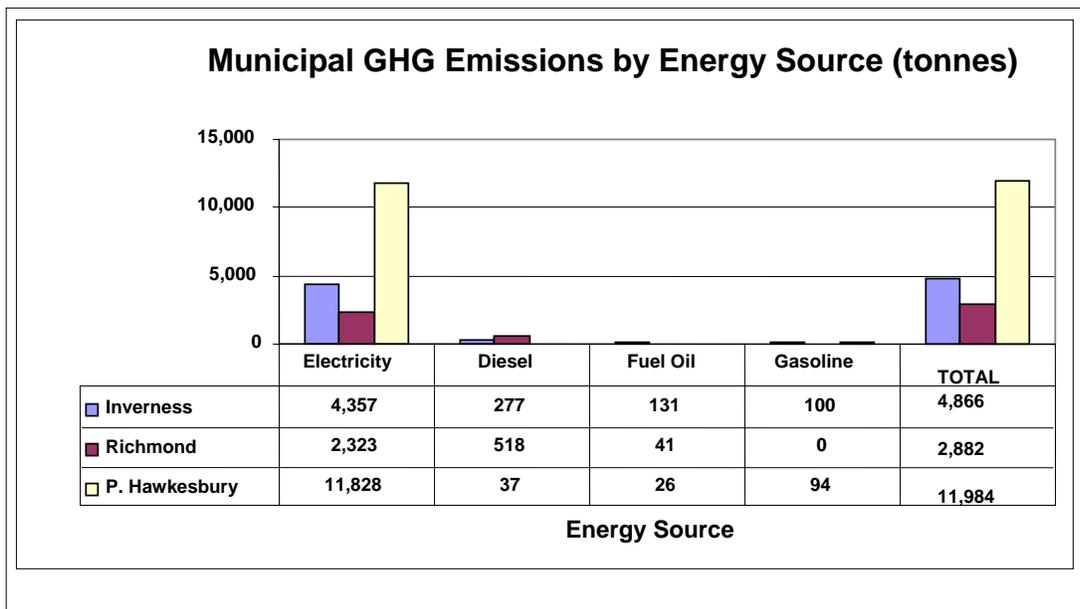
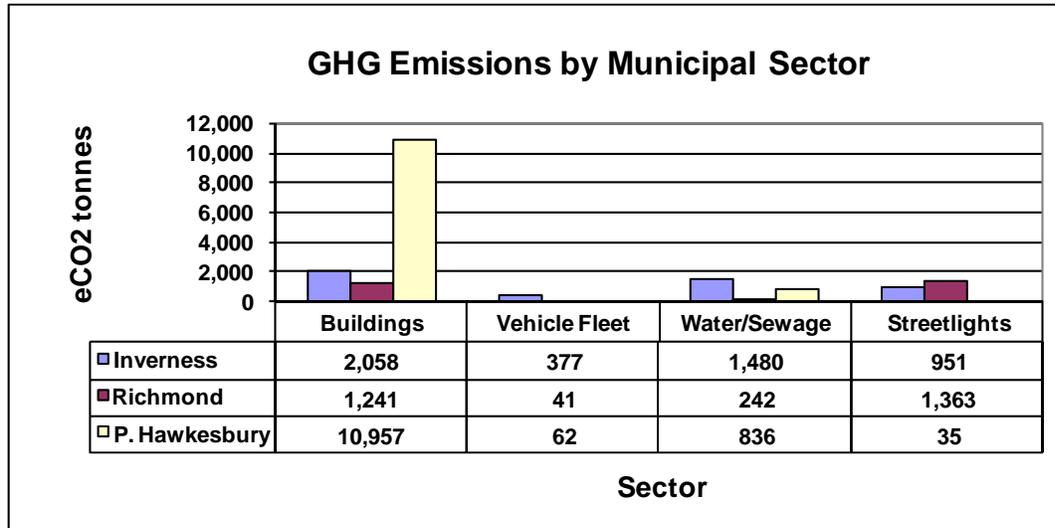


Figure 53. Municipal GHG Emissions by Sector and Energy Source (tonnes)

5.0 1995 COMMUNITY INVENTORY ESTIMATE

The information obtained and discussed in the preceding sections needs to be projected onto a year about 10 years back so that comparisons can be made, and trends established and observed. Trends and indicator comparisons between the base year in which data was compiled and analysed and the chosen prior year for back-casting enables the study to make predictions of what level of change in energy demand and emissions can be anticipated under a “business as usual” scenario. Taking into consideration the information gathered from across the region’s sectors, and projecting these onto the observed trends from the region’s energy use allows for the setting of an emissions reduction target for the future.

An estimate of the community residential housing inventory was based on several reasonable assumptions and extrapolations. These values were pro-rated into the various size categories of mini, small and large for residences, and small, medium and large for commercial and small industrial.

Based on the population size, changes in the number of occupied dwellings and the level of economic activity in the region, the emissions levels for 1995 will be back-cast using some of the following indicator trends for the community inventory, assuming that corporate inventory remained fairly unchanged:

Table 16. Observed trends in regional transportation sector

Transportation: Registered Vehicles (1998)	
REGION	TOTAL VEHICLES
Inverness	7,981
Richmond	4,624
Port Hawkesbury	1,848
Transportation: Registered Vehicles (2005)	
REGION	TOTAL VEHICLES
Inverness	6,764
Richmond	5,535
Port Hawkesbury	1,567

Sources: 1998 – Statistics Canada, Road Motor Vehicle Registrations, Cat. No. 53-219-XIB
 2005 –Service Nova Scotia and Municipal Relations, Vital Statistics Report, 2004, Tables 4 and 13,
<http://www.gov.ns.ca/snsmr/vstat/annualreports/>

Table 17. Captured trends in the Strait Highlands regional population

REGION	1996	2001	2005
Inverness County	17,514	16,663	15,979
Richmond County	11,281	10,490	9,982
Port Hawkesbury	3,905	3,799	3,702

Table 18. Captured trends in the number of occupied regional dwellings

REGION	1996	2001	CHANGE (%/YR)	2005 ESTIMATE
Nova Scotia	344,779	360,025	0.87%	372,706
Inverness County	6,461	6,042	-1.33%	5,727
Richmond County	3,994	3,935	-0.30%	3,888
Port Hawkesbury	1,203	1,125	-1.33%	1,066

Table 19. Changes in regional commercial and small industrial businesses

REGION	2000	2005
Inverness	716	574
Richmond	294	246
Port Hawkesbury	234	256

Table 20. Summary of annual % changes in the period between 1995 and 2005

INDICATOR	INVERNESS COUNTY	RICHMOND COUNTY	PORT HAWKESBURY
Transportation	-2.34%	2.60%	-2.33%
Population	-1.01%	-1.35%	-0.59%
Workforce (Region 21- 1996 to 2001)	-0.35%	-0.35%	-0.35%
Dwellings	-1.33%	-0.30%	-1.33%

Having adjusted emissions in accordance with the above changes, the 1995 emissions inventory for the region can be estimated and summarized in the comparison figures as follows:

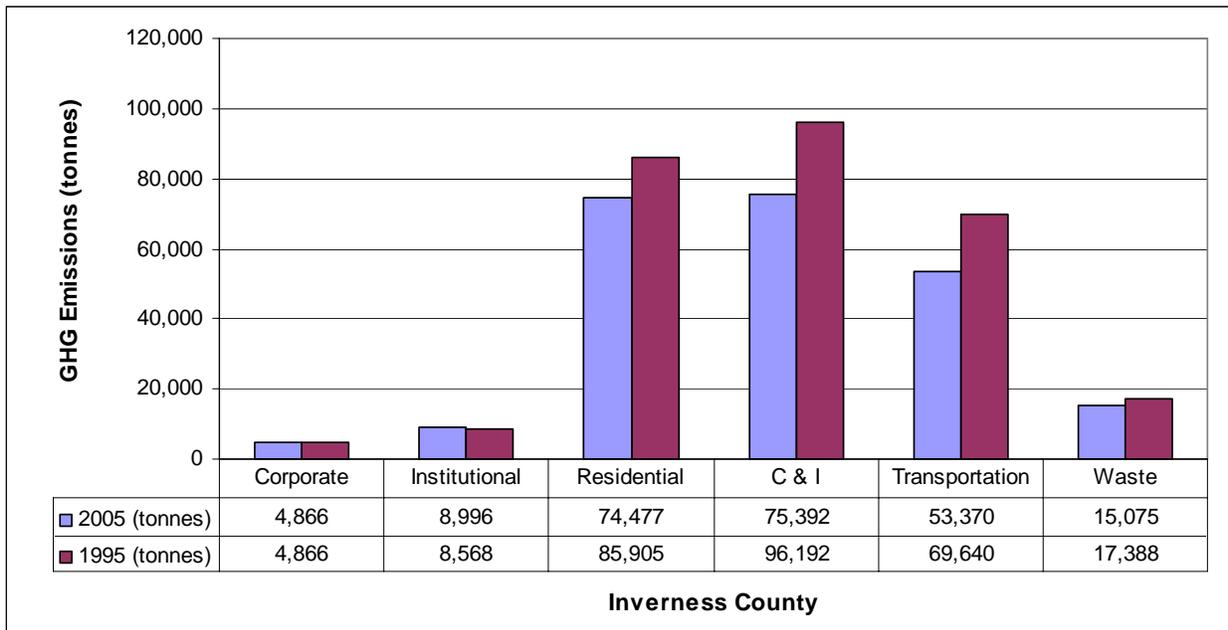


Figure 54. Inverness County Comparison of 2005 and 1995 Emissions Estimates

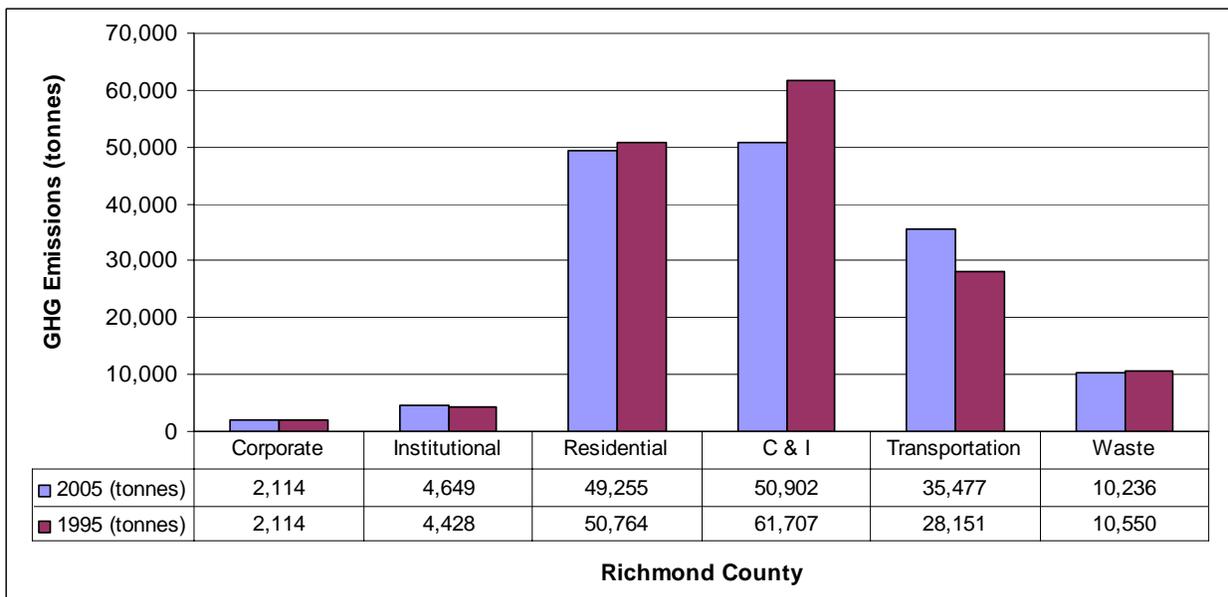


Figure 55. Richmond County Comparison of 2005 and 1995 Emissions Estimates

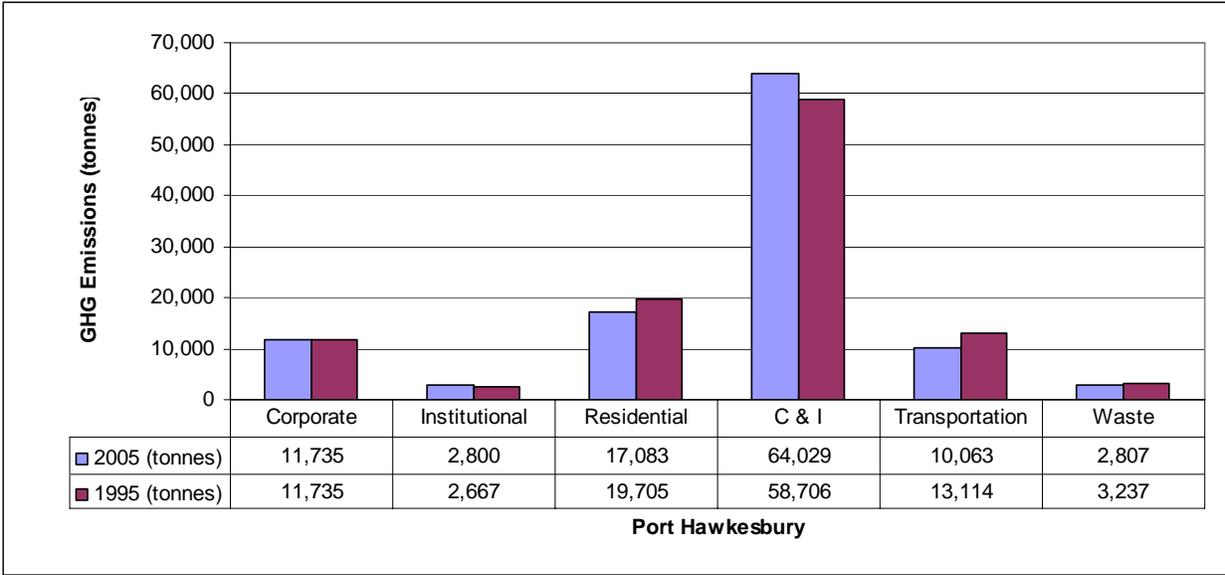


Figure 56. Town of Port Hawkesbury Comparison of 2005 and 1995 Emissions Estimates

6.0 2015 Emissions Inventory Forecast

If the trends observed in the 1995 back casting scenarios above were to carry on in the Strait-Highlands Region, it is tempting to assume that GHG emissions will be naturally diminishing under a Business as Usual scenario (BAU). What happens to the rate of the region's GHG emissions between 2005 and 2015 is not only an outcome of the trends described earlier, but also very strongly the function of what economic changes are likely for the region. While forecasting adopted in this analysis has taken a somewhat linear approach, certain events and regional developments can in fact bring about unexpected shifts.

A BAU scenario will assume that the trend established since 1995 will continue until 2015 and the overall energy consumption and resultant emissions in the region will continue to decline. Based on other PCP inventories for regions similar to the Strait-Highlands, it can be shown that apart from the BAU outcome to GHG emissions inventory, there are other possible variations depending on the level of implementation effort for each of the energy efficiency measures plausible in the jurisdiction. One way is to compare the BAU outcome with the 'Realistic' and the 'Optimistic' variations. While BAU predicts where emission rates would be if the observed trends from 1995 to 2005 continue unaltered, the Optimistic variation assumes a rigorous implementation and a high degree of acceptance of all energy efficiency actions and programs identifiable in the region. The Realistic scenario shows what emissions would be for a moderate implementation and degree of acceptance of these actions. A large portion of the reductions will be dependent upon the voluntary actions of private homeowners and business owners. From other jurisdictions it has been observed that the Realistic scenario can achieve about 13% GHG reductions below the 2005 rates for all sectors with the exception of Transportation which achieves just under 5% in fuel use efficiencies and GHG reduction. The Optimistic scenario assumes 10% achievable energy efficiencies in the Transportation sector, and about 30% in all other sectors. Community GHG emission rates for 2012 are obtained from Software and usually not subjected to these efficiency parameters. On the basis of these previous observations, which will be tested in Milestone 3 of this FCM process, Figure 57 presents the likely scenarios for the Strait Highlands region.

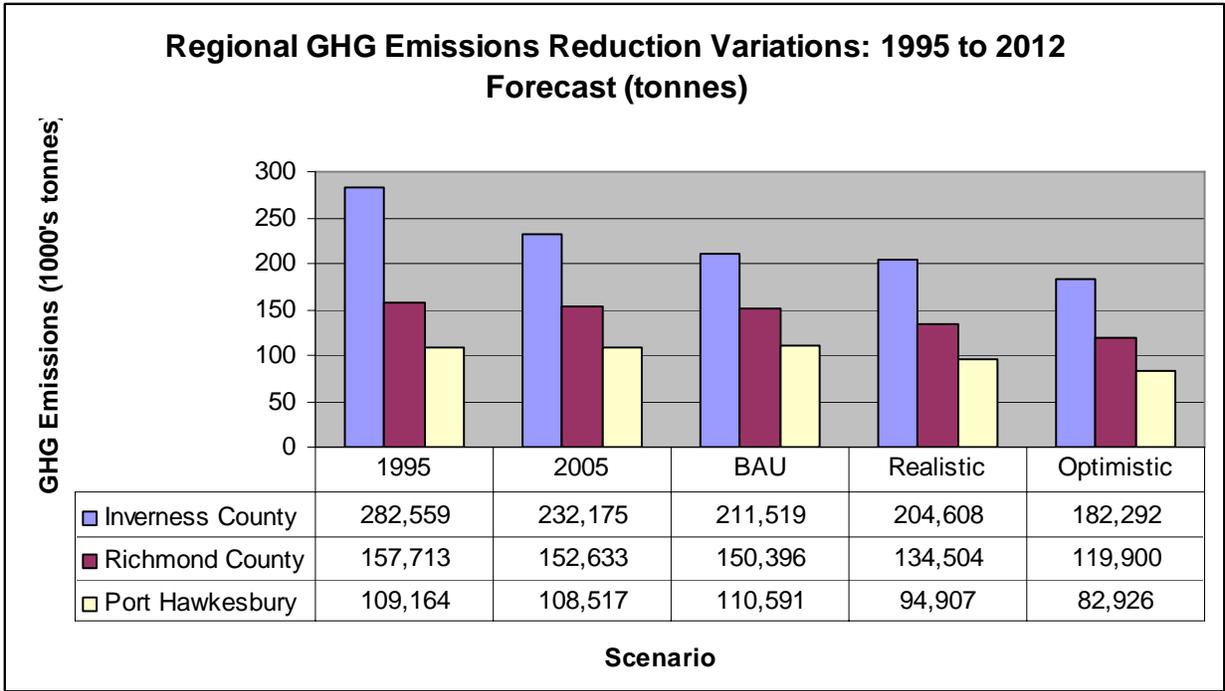


Figure 57. Variations of GHG Emissions Reduction for the Strait-Highlands Region

These scenarios are further shown for each area separately in Figures 58, 59 and 60 as follows:

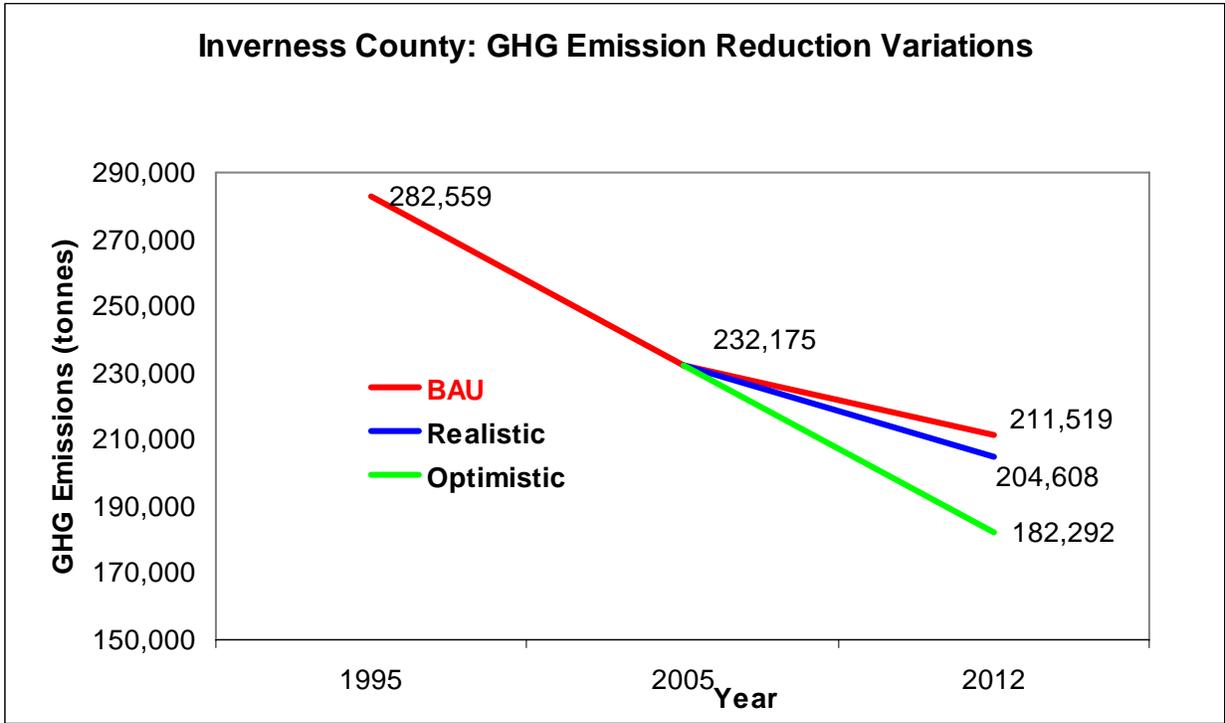


Figure 58. GHG Emissions Reduction Scenarios for Inverness County

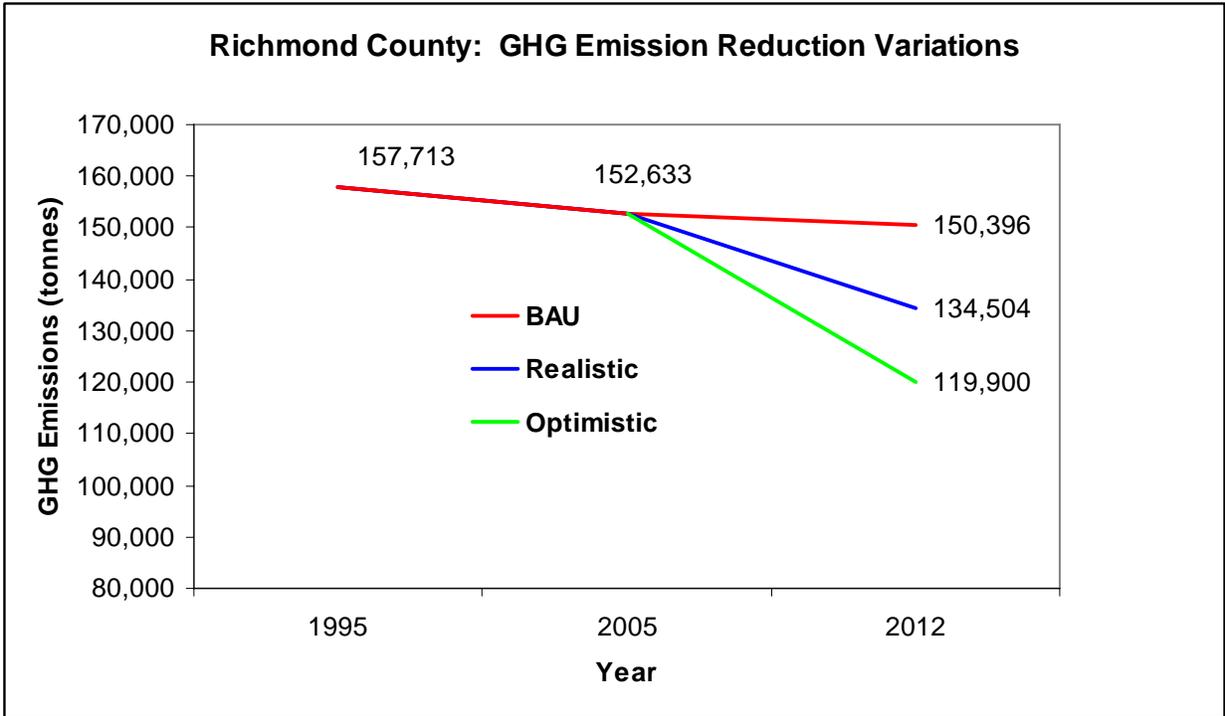


Figure 59. GHG Emissions Reduction Scenarios for Richmond County

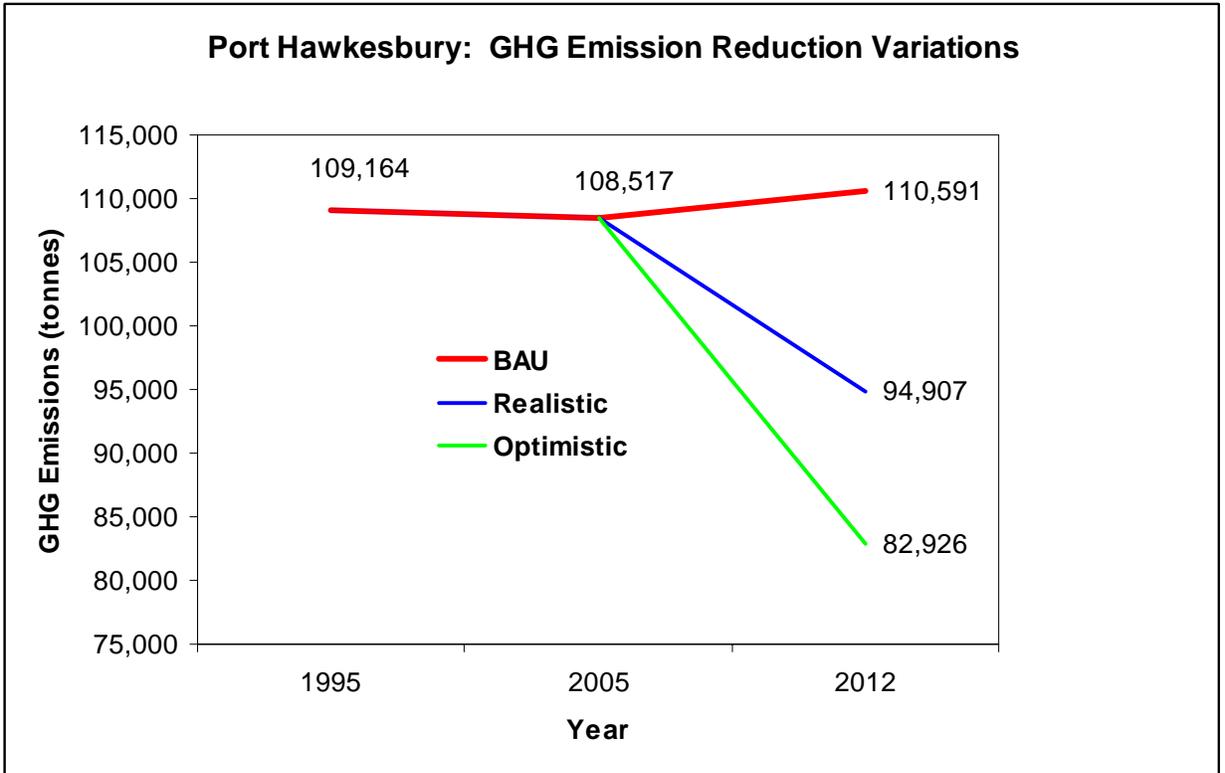


Figure 60. GHG Emissions Reduction Scenarios for Town of Port Hawkesbury



Strait-Highlands Green Action

Milestone One Report September 2007

Building Enterprising Communities!

Strait-Highlands Regional Development Agency

32 Paint St., Unit 5
Port Hawkesbury
Nova Scotia, Canada

Phone: (902) 625-3929
Fax: (902) 625-1559
E-Mail: info@strait-highlands.ns.ca