

FINAL REPORT

**CARBON FOOTPRINT OF PROCUREMENTS BY PUBLIC SERVICES AND
PROCUREMENTS CANADA (QUÉBEC EXCLUDED)**

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Public Services and Procurement Canada

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Abbreviations and acronyms

CA	Canada
CIRAIG	International Reference Centre for the Life Cycle of Products, Processes and Services
CO ₂	Carbon Dioxide
CO ₂ eq	Carbon Dioxide equivalent
EEIO	Environmentally Extended Input-Output
EPD	Environmental Product Declaration
FY	Fiscal year
GHG	Greenhouse gases
GSIN	Goods and Services Identification Number
GWP	Global Warming Potential
IO	Input-Output
IOCC	Input Output Commodity Classification
IOIC	Input Output Industry Classification
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
kWh	kiloWatt-hour
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment
NCR	National Capital Region
PSPC	Public Services and Procurement Canada
PSPC-QC	Public Services and Procurement Canada - Québec Region
UNSPSC	United Nations Standard Products and Services Code

Executive Summary

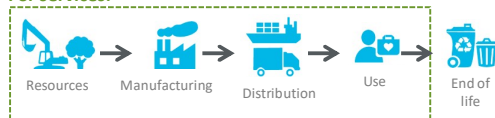
In line with the federal government's commitments to climate change and environmental protection, Public Services and Procurement Canada (PSPC) has to address the ecological and social aspects of federal procurements and seek to reduce their associated greenhouse gases emissions (GHG). This study evaluates the partial life cycle GHG (the carbon footprint) associated with the procurement under the authority of 5 PSPC regions, namely Pacific (acquisitions for British Columbia and the Yukon Territory), Western (Manitoba, Saskatchewan, Alberta, Nunavut, and the Northwest Territories), Ontario, the National Capital Region (NCR, for Ottawa and Gatineau), and Atlantic (New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland and Labrador) in order to identify those procurement that cause the most impacts and on which it would be a priority to act (e.g. close monitoring of the procurements, adding targeted criteria in its calls for tender).

Contracts for goods and services awarded by PSPC for a total of 93 different customers (including PSPC itself) have been evaluated for each of the last three fiscal years (FY2016-2017 to FY2018-2019)¹. First, an economic overview is provided for each region, highlighting the categories of goods and services that constitute most of procurement, per customer, in value. About 2 000 to 3 000 contracts are covered annually for a total amount of \$ 0.4 to 1 billion in every region, except for NCR (16 000 to 17 000 yearly contracts for \$ 11 to 13 billion). Then, the carbon footprint is calculated using *openIO-Canada*, a model for environmentally extended input-output analysis (EEIO), which is based on financial data and is an appropriate tool to evaluate thousands of goods and services that are very different from each other, and for which neither accurate description nor physical data is easily available. The footprint analysis is “cradle-to-gate” (gate of the manufacturing plant) for goods. Thus, the footprint does not cover the whole life cycle of a good with respect to the GHG associated with its distribution, use during lifetime and end-of-life management. However, for services, the carbon footprint includes the delivery/provision of the service to the user. The boundaries of the carbon footprint assessment can be pictured as follow. Thus, the footprint does not systematically cover the whole life cycle of a good with respect to the GHG associated with its distribution, lifetime use and end-of-life management. Therefore, it is only a partial life cycle assessment.

For goods:



For services:



Examples:

- For a fuel purchased by PSPC, life cycle GHGs up to its production is accounted for, but not GHGs emitted during fuel combustion.
- For a vehicle purchased, fuel use and combustion is not accounted for.
- For a construction service, the carbon footprint also includes the transport of materials and workers up to the construction site, the use of the machinery needed, and the management of construction waste generated on site. The fuel consumed by the contractor's machinery and GHG from its combustion are included.

Owing to some services purchased, the end of life of goods acquired during the year but **also in the past** may be partly accounted for. This is the case for services such as:

- Waste management;
- Repair and maintenance services (e.g. of buildings, of various infrastructures for transportation, for energy supply, for telecommunications) that may include the decommissioning of the infrastructure and the management of the resulting waste.

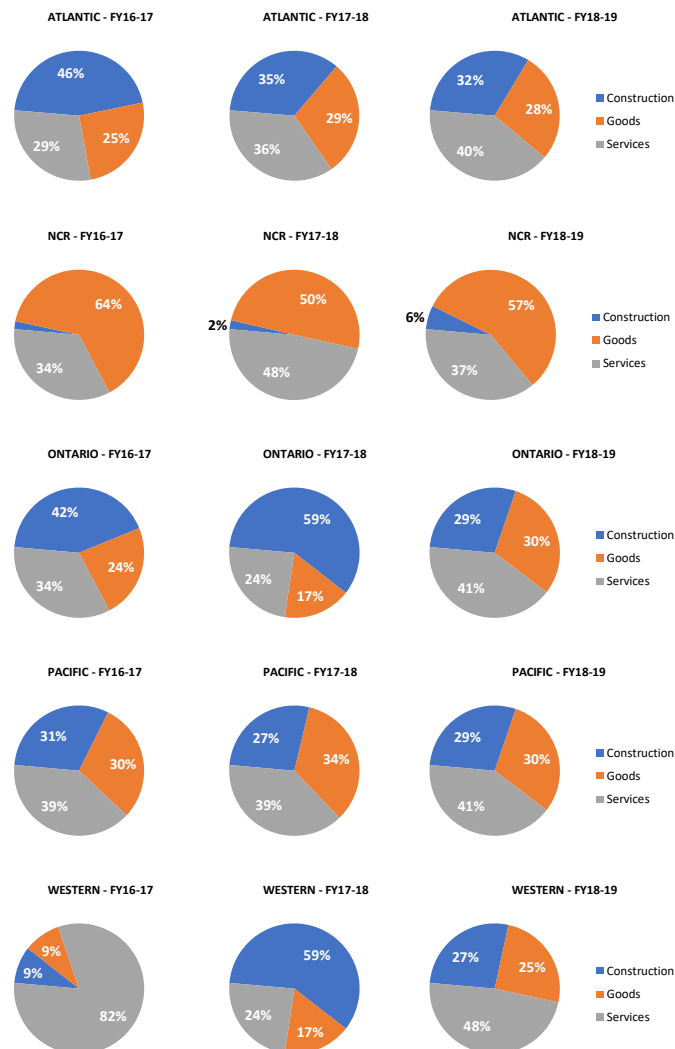
Scope and boundaries of the life cycle assessment.

¹ awards by the Direction of the acquisitions, through a purchase order #9200 - Requisition For Goods and Services and Construction.

Annual average over the three years of the carbon footprint (expressed as tonnes of CO₂-equivalent) and the resulting GHG intensity (t CO₂eq. per dollar purchased) are as follows.

Annual average (over FY16-17 to FY18-19)	ATLANTIC	NCR	ONTARIO	PACIFIC	WESTERN
GHG intensity (kg CO ₂ eq/\$) (Min – Max over the period)	0.329 (0.32 – 0.34)	0.292 (0.26 – 0.31)	0.248 (0.23 – 0.29)	0.284 (0.28 – 0.29)	0.470 (0.36 – 0.66)
Carbon footprint (t CO ₂ eq/year)	204 541	3 145 563	133 505	118 371	286 920

Inter annual variability of the carbon footprint can be relatively high within a region (especially in WESTERN and, to a lesser extent, NCR and ONTARIO), e.g. when a large specific project is engaged or due to an “unusual” large procurement one year. Except for the NCR, construction-related procurement account for usually about 30-40% of the total footprint of a region. However, the portrait can be affected due to large specific infrastructure projects that increase this share (e.g. ONTARIO in FY17-18, ATLANTIC in FY16-17, WESTERN in FY17-18) or owing to other types of procurement that dominates the profile and decrease this share (e.g. WESTERN in FY16-17).



Contribution of goods, services and construction-related procurements to the annual carbon footprint of each region.

In line with the share of contracts' value across customers, most of the carbon footprint in every region is associated to PSPC first, and then to the Department of National Defence, except for NCR where the Department of National Defence represents 52% to 66% of the footprint, and PACIFIC where Fisheries and Oceans Canada is the second contributor after PSPC. The top-commodities contributing to most of the carbon footprint of each region are as follows:

Commodity (GSIN)	Region	FY16-17 to FY18-19			
		Value, tax excl. (\$)	GHG (t CO ₂ e)	% Carbon footprint of the region	GHG intensity (kg CO ₂ e/\$)
5129B-Construction of Other Buildings	ATLANTIC	\$ 156 293 801	45 520	7.4%	0.291
5133C-Waterways, Harbours, Dams and Other Water Works	ATLANTIC	\$ 204 123 289	43 799	7.1%	0.215
JX1990A-Ships and Vessels (large) - Repair, Refits and Conversions (including Dry Docking)	ATLANTIC	\$ 80 541 070	33 808	5.5%	0.420
5131C-Highways, Roads, Railways, Airfield Runways	ATLANTIC	\$ 76 700 841	33 718	5.5%	0.440
N9140G-Marine Fuel	ATLANTIC	\$ 20 789 100	24 806	4.0%	1.193
N9130-Liquid Propellants and Fuels, Petroleum Base	NCR	\$ 463 715 015	742 915	7.9%	1.602
V502A-Relocation Services	NCR	\$ 767 675 699	655 937	7.0%	0.854
N9140-Middle Distillate Fuels	NCR	\$ 405 675 168	577 341	6.1%	1.423
N1510-Aircraft, Fixed Wing	NCR	\$ 2 812 839 600	437 891	4.6%	0.156
N6505-Drugs and Biologicals	NCR	\$ 1 183 602 481	389 290	4.1%	0.329
N1990-Vessels, Miscellaneous	NCR	\$ 801 447 300	360 690	3.8%	0.450
J019A-Maintenance, Repair, Modification, Rebuilding & Installation of Equipment related to Ships	NCR	\$ 821 027 167	333 659	3.5%	0.406
5133C-Waterways, Harbours, Dams and Other Water Works	ONTARIO	\$ 389 228 869	83 074	20.8%	0.213
V502BAB-Hotels Motels and Boarding Houses, as Detention Centres	ONTARIO	\$ 77 902 235	23 010	5.8%	0.295
5138C-Dredging Services - Floating Plant	ONTARIO	\$ 33 069 625	17 845	4.5%	0.540
N5840202-Weather Radar Equipment, Except Airborne	ONTARIO	\$ 96 474 697	15 998	4.0%	0.166
5132A-Bridges, Elevated Highways, Tunnels, Subways and Railroads	ONTARIO	\$ 31 130 974	13 237	3.3%	0.425
K105A-Commercial Security Guard and Related Services	ONTARIO	\$ 64 403 563	11 184	2.8%	0.174
5131C-Highways, Roads, Railways, Airfield Runways	PACIFIC	\$ 120 997 972	51 869	14.7%	0.429
5129B-Construction of Other Buildings	PACIFIC	\$ 145 087 203	41 636	11.8%	0.287
E199D-Environmental Services	PACIFIC	\$ 199 848 362	30 392	8.6%	0.152
N8905-Meat, Poultry and Fish (replaced by gsin N8905Z)	PACIFIC	\$ 21 523 154	17 341	4.9%	0.806
5133C-Waterways, Harbours, Dams and Other Water Works	PACIFIC	\$ 73 151 626	15 316	4.3%	0.209
JX1990A-Ships and Vessels (large) - Repair, Refits and Conversions (including Dry Docking)	PACIFIC	\$ 35 575 003	14 492	4.1%	0.407
S001A-Electricity Services	WESTERN	\$ 122 284 973	247 860	28.9%	2.027
E108F-Northern Contaminated Site Environmental Clean-up Work/Services	WESTERN	\$ 313 431 576	158 956	18.5%	0.507
5129B-Construction of Other Buildings	WESTERN	\$ 118 736 862	34 045	4.0%	0.287
5139A-Construction Services, Not Elsewhere Specified	WESTERN	\$ 93 677 273	26 963	3.1%	0.288
N8920C-Groceries, Miscellaneous (replaced by gsin N8920ZC)	WESTERN	\$ 24 988 453	21 394	2.5%	0.856

PSPC's significant contribution to the carbon footprint is due to the high proportion of construction works and architectural and civil engineering services. Goods and services of this type, and more broadly all those associated with the construction, maintenance and repair of buildings and all civil works, all embed a high GHG intensity. Fuels and all energy carriers (including electricity when it is fossil sources) also have a high GHG intensity and are especially contributing to the large NRC carbon footprint (through procurement for the Department of National Defense).

A rather limited number of commodities over the 3 700 different ones involved contribute to most of the carbon footprint. When regions and years are aggregated, 86 commodities contribute to 80% of the total footprint. Below, a table of the 23 top commodities are identified with their GSIN code, that contribute to close to 58% of the total footprint over all regions. They can be sorted according the following groups of procurement:

- Vehicles, ships, aircraft and related equipment;
- Energy carriers;
- Buildings related services (including relocation services);
- Construction (51);
- Office related services;
- Technology equipment and chemicals;
- Environmental Services.

All regions	FY16-17 to FY18-19		Grouping	% Carbon footprint
Unique GSIN	GHG (t CO ₂ eq)	% Carbon footprint		
V502A-Relocation Services	656 049	5.6%	Buildings related services	6.8%
M190A-Property and Facilities Management - Buildings	131 779	1.1%	Buildings related services	
5129B-Construction of Other Buildings	211 870	1.8%	Construction (51)	4.1%
5133C-Waterways, Harbours, Dams and Other Water Works	145 332	1.2%	Construction (51)	
5124B-Construction of Commercial Buildings	121 368	1.0%	Construction (51)	
N9130-Liquid Propellants and Fuels, Petroleum Base	742 915	6.4%	Energy	15.7%
N9140-Middle Distillate Fuels	577 527	5.0%	Energy	
N9130E-Aviation Fuel	257 415	2.2%	Energy	
S001A-Electricity Services	247 860	2.1%	Energy	
E108F-Northern Contaminated Site Environmental Clean-up Work/Services	159 003	1.4%	Environmental Services	1.4%
D302A-Informatics Professional Services	289 595	2.5%	Office related services	4.3%
R019BF-Human Resource Services, Business Consulting/Change Management	206 689	1.8%	Office related services	
N6505-Drugs and Biologicals	389 434	3.3%	Technol. equipment and chemicals	3.3%
N1510-Aircraft, Fixed Wing	437 891	3.8%	Vehicles, ships, aircraft and equipments	22.1%
N1990-Vessels, Miscellaneous	360 826	3.1%	Vehicles, ships, aircraft and equipments	
J019A-Maintenance, Repair, Modification, Rebuilding & Installation of Equip	335 020	2.9%	Vehicles, ships, aircraft and equipments	
N2355-Combat, Assault and Tactical Vehicles, Wheeled	313 566	2.7%	Vehicles, ships, aircraft and equipments	
JX1990A-Ships and Vessels (large) - Repair, Refits and Conversions (including Dry Docking)	286 339	2.5%	Vehicles, ships, aircraft and equipments	
N1905C-Submarines	279 996	2.4%	Vehicles, ships, aircraft and equipments	
C216BA-Marine Systems and Engineering	175 907	1.5%	Vehicles, ships, aircraft and equipments	
N2320-Trucks and Truck Tractors, Wheeled	146 848	1.3%	Vehicles, ships, aircraft and equipments	
JX1510A-Aircraft, Fixed Wing - Repair and Overhaul (Military)	121 559	1.0%	Vehicles, ships, aircraft and equipments	
N2310-Passenger Motor Vehicles	114 690	1.0%	Vehicles, ships, aircraft and equipments	

Recommendations are developed for these key procurements. Upstream contribution analysis reveals where PSPC's suppliers could reduce GHG emissions in their own operations or from their own supply chain (for example, during the manufacturing and the transportation of building materials, through energy efficiency during construction operations). For those procurements that have been identified here as the most contributing to the carbon footprint, PSPC could set up a protocol for an ex-post analysis of contracts details and/or service proposals to identify the suppliers who would have demonstrated proactivity with respect to reducing their GHGs or having made an environmental assessment of their activity or product. In this case, PSPC could conduct a market engagement to identify criteria that could be requested as mandatory for all suppliers in the same category of goods or services.

This study is a high-level assessment, for pointing out the "hot-spots" from the carbon footprint of tens of thousands of contracts of very different nature (1910 different GSIN commodities). These carbon footprint numbers are estimates and should therefore not be used outside of the context of this study. Noteworthy, due to the methodology and tool limitations, the carbon footprint calculated does not include the use phase and the end of life of the goods purchased, at least systematically as explained above. The environmental picture of procurement is therefore partial only, particularly for durable goods that consume energy during their lifetime and for goods which end of life management can be a large source of GHG.

1 Context of the study

In line with the federal government's commitments to climate change mitigation and environmental protection, Public Services and Procurement Canada (PSPC) has to address the ecological and social aspects of federal procurement and seek to reduce their associated greenhouse gases emissions (GHG). This study evaluates the life cycle GHG (the embodied carbon or carbon footprint) associated with the procurement under the authority of PSPC for the region of the national capital (NCR) and for all other Canadian regions except the province of Québec². PSPC is the central buyer for many departments, hence a large portion of the scope 3 GHG emissions by the departments is likely addressed. A key objective of the carbon footprint study is to identify the procurements that cause the most impacts and on which it would be a priority to act (e.g. via targeted criteria in its calls for tender).

This study builds on and extends a previous carbon footprint study conducted in early 2018 by the CIRAIG for PSPC-Québec region (PSPC-QC), that focused on the procurement under the authority of PSPC-QC for the three fiscal years FY 2014-2015 to FY 2016-2017. For the current study, PSPC asked the CIRAIG to apply the same methodology for estimating the carbon footprint of PSPC procurement of five other Canadian regions (namely, Pacific, Western, Ontario, the National capital region (NCR), and Atlantic) and for the three most recent years (FY 2016-2017 to FY 2018-2019).

² Addressed in a previous carbon footprint study for PSPC-QC (CIRAIG, 2018).

2 Objectives and Scope of the study

2.1 Objectives

More specifically, the objectives are to:

- I. Develop an economic portrait of the annual contracts awarded by each of the five PSPC regions under study, for the last three fiscal years (2016-2017, 2017-2018, and 2018-2019), providing a detailed analysis:
 - i. per fiscal year;
 - ii. per category of procurement (i.e. groupings of similar goods or services);
 - iii. per PSPC's Client Departments.
- II. Evaluate the life cycle GHGs associated with the supply of these procurement:
 - i. Identify the categories that contribute most to the overall carbon footprint;
 - ii. Analyze the results;
 - iii. Make recommendations.

Comparing side-by-side the five regions is not an objective of the study. Consequently, results will be presented in this report per individual region

2.2 Scope of the study

This section aims to clarify what the carbon footprint will refer to, especially in relation to the different stages of the life cycle of a purchased good or service, and also in relation to all the purchases that PSPC can make.

2.2.1 Boundaries of the system studied

The study focuses on the goods and services purchased by PSPC for its own account and for its client departments and agencies, through a purchase order #9200 - Requisition for Goods and Services and Construction. Three fiscal years from April 1, 2016 to March 31, 2017, then 2017-2018 and 2018-2019 are successively studied. It should be noted that:

- Purchases such as low value contracts, standing offers and supply arrangement are not addressed;
- Purchases made as part of business travel (transportation, accommodation, meal, etc.) are not addressed;
- Purchases made by government employees related to activities such as commuting to and from work, and daily meals are not addressed as well.

The regions under study are Atlantic (grouping of provinces PE, NS, NB, and NL), the National Capital Region (NCR), Ontario, Western (grouping of AB, SK, MB, NU and NT), and Pacific (BC and YT). Québec Region is not addressed in this report.

The annual amount of procurement can change significantly from year to year and across the region under study (Table 2-1), especially in value. More details on procurement will be provided below in paragraph 3.2.1 and discussed in the economic analysis section in chapter 4.

Table 2-1: Value (tax included) and number of procurement (contracts) per fiscal year and region

SECTOR	FY16-17		FY17-18		FY18-19	
	Value (TX incl.)	Contracts	Value (TX incl.)	Contracts	Value (TX incl.)	Contracts
ATLANTIC	\$ 768 834 266	2 833	\$ 637 502 460	2 746	\$ 715 139 740	2 370
NCR	\$ 12 832 497 789	16 935	\$ 10 932 494 424	15 938	\$ 12 334 389 386	16 833
ONTARIO	\$ 957 045 841	1 820	\$ 403 831 318	1 712	\$ 501 294 365	1 738
PACIFIC	\$ 413 832 171	1 816	\$ 566 433 231	1 777	\$ 404 298 886	1 571
WESTERN	\$ 731 195 626	3 044	\$ 585 848 989	3 399	\$ 605 280 872	3 117
Grand Total	\$ 15 703 405 693	26 448	\$ 13 126 110 422	25 572	\$ 14 560 403 249	25 629

Figure 2-1 shows how the life cycle of a product is broadly broken down into successive stages along its lifetime or the value chain.

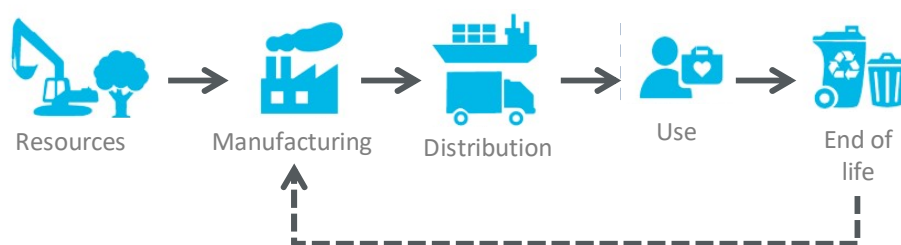
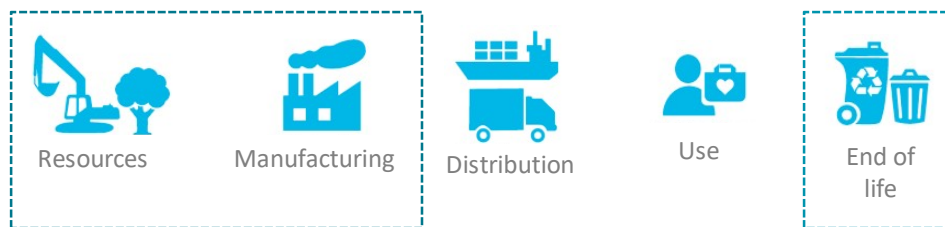


Figure 2-1 : Life cycle stages of a product.

Not all stages can be included when conducting a life cycle assessment depending on study's objectives, methodological aspects and data availability. Here, even though it would be relevant to include the whole life cycle of procurement, only the stages presented in Figure 2-2 are considered for the environmental assessment of goods and services purchased. Therefore, **carbon footprint estimates in this study are partial over the life cycle**. Explanations are provided below.

For goods:**For services:**

*Note: Owing to some services purchased (e.g. a waste management service), the end of life of goods acquired during the year but **also in the past** may be partly accounted for.*

Figure 2-2 : System boundaries for goods (top) and for services (bottom).

For **goods**, the carbon footprint is assessed from cradle to the exit gate of the manufacturing plant. The distribution up to the user (i.e. the customer department) is not included for the following reasons:

- i. information about the origin of the good and its specific destination are not necessarily known;
- ii. the environmental model used to calculate the carbon footprint, which is described below does not contain any default (even though generic) information for every good. This is a limitation of the model, and consequently of this study.

The use stage of goods purchased (e.g. electricity consumed by a computer, gasoline use and GHG from its combustion by a vehicle) is not included, because:

- i. data from PSPC about the procurement purchased do not contain enough descriptions and details about the goods in order to model their individual use stage (e.g. electricity consumption of a computer (power, use per day, lifetime), type of fuel and fuel consumption of a vehicle);
- ii. The thousands of contracts evaluated (about 25 000 per year, see Table 2-1) cannot be analyzed to attempt to model a representative use stage of each, even a generic one; Conversely, procurement are modeled after a grouping of individual contracts according to the GSIN code³;

³ For its procurements activities, the federal government is using the Goods and Services Identification Number (GSIN) classification to identify and describe the generic commodities, but is transitioning to the use of UNSPSC, consequently both classifications appear in the tables.

- iii. Here again, the environmental model used to calculate the carbon footprint does not contain any default information (even though it would be generic) for the use of every good.

For **services**, the environmental model used to calculate the carbon footprint includes the distribution and supply of the service, that is the provision of the service (Figure 2-2). For instance, an infrastructure repair service includes the movement of workers, the transport of materials up to the site, the use of the necessary machinery, the management of waste generated on the site. Direct GHG emissions by the service provider are included. For example, during a construction service, the fuel consumed by the contractor's machinery is included and the GHGs from its combustion are therefore accounted for.

The **end of life of goods purchased or used in the provision of services** is not included. However, through some services purchased, the end of life of goods acquired the same year or also in the past can be indirectly considered for a part of them. Unfortunately, due to lack of detail and information on these services, it is difficult to link them to specific goods and to a specific year of procurement. This may be the case for services such as:

- Waste management;
- Numerous repair and maintenance services (e.g. of buildings, of various civil infrastructures for transportation, for energy and other utilities supply, for communications, etc.) that include the repair or/and the decommissioning of the infrastructure and may include as well the service of managing the end of life of the residues generated during the operation, at least a part of it (e.g. collection of construction waste materials and transport to landfilling).

3 Methodology

This chapter presents the methodology developed for the realization of the project. The method and the model used for assessing the life cycle GHGs are first explained, then the procurement data provided is described.

3.1 GHG assessment methodology

The methodology is based on the **Environmentally Extended Input-Output analysis (EEIO)** derived from the Input-Output (IO) analysis commonly used in economics. EEIO is the choice solution in situations where traditional life cycle analysis (LCA), purely based on transformation processes relying on physical input and output data is less suitable. This is particularly the case when the system under study involves a large number of goods and services and where conducting a traditional LCA of each of them turns to be virtually impossible (because individual life cycle GHG data is not available in database⁴ or would be difficult, time consumptive and costly to model – which is especially the case for services). With EEIO, the environmental impacts are evaluated from the **purchase value** of goods and services, which are classified according to their type, using a model that provides the carbon footprint per dollar of each good or service. Therefore, as compared to standard LCA, EEIO has the advantage to cover services in addition to goods, but the drawback is that it is rather generic due to the low granularity associated with the classification of the commodities. Nevertheless, EEIO is well suited for a “hotspot” analysis of procurement that contains thousands of highly variable transactions. More details on the EEIO basics and principles are presented in Appendix A.1.

3.1.1 EEIO model

The carbon footprint assessment tool used is an adaptation of openIO-Canada. Open IO-Canada is a Canadian model for Environmentally Extended Input-Output (EEIO) analysis developed by CIRAIG in 2014⁵. It is a multi-criteria tool which goes beyond GHG since it covers emissions of other pollutants (such as those published in Environment Canada’s National pollutant release inventory – see Appendices A.1 and A.3) and allows assessing other impacts than climate change, such as acidification, ecotoxicity, human toxicity, water withdrawal, etc. For the current study, it is used for GHG assessment only. Originally, open IO-Canada geographic scope is Canada, that is, it represents Canada's domestic economic activities and does not consider interactions with foreign countries. In other words, any good or service that would be imported is modeled with the tool as if it were produced in Canada.

Compared to the public version, the adaptation of openIO-Canada for this study concerns the **integration of electricity generation in 10 provinces**, with the corresponding provincial carbon footprint of the electricity (BC, AB, SK, MB, ON, QC, NB, PE, NS and NL), in addition to the average electricity in Canada. Hence, the carbon footprint of a commodity can be more accurately estimated when the province of its origin is known (i.e. the province of the supplier). It should be noted that this **provincial contextualization is only partial** since:

- i. provincial economies are not modelled and trade between provinces is not considered;

⁴ For instance, *ecoinvent* which is the most comprehensive physical life cycle inventory database, does not address services (www.ecoinvent.org)

⁵ www.ciraig.org/en/open_io_canada/

- ii. every province is a duplicate of the national economy in terms of economic flows between sectors;
- iii. only the energy mix of the electricity consumed is modified from one province to another (i.e. all economic activities of the provinces other than the electricity generation industry are identical to their Canadian counterparts for their direct GHG emissions).

Some commodities are purchased in Yukon, Nunavut and Northwest Territories (0.4% of the total amount over the three years). However, to reduce the burden of the modelling, these territories have been modelled as NL (for YT) and as NB (for NU and NT) for the carbon footprint, based on the similar value for their electricity gridmix carbon intensity (Source: Environment Canada, National inventory report on GHG sources and sinks).

The economic model of openIO-Canada distinguishes 238 different types of goods and services (and virtually 2 618 when we also distinguish the 10 provinces modelled and Canada) that cover all Canadian economic activities and for each of which a portion of life cycle GHG emissions can be calculated, according to the boundaries presented in Figure 2-2. It should be noted that these goods and services are identified according to Statistics Canada's Input-Output Commodity Classification (IOCC, 238 codes) used for the national economic and environmental accounts, which is different from the GSIN classification used by the federal government for its procurement (about 5 000 codes).

The methodology and the openIO-Canada tool used are described in more detail in Appendix A.1; the IOCC classification is presented in Appendix A.2; **limitations of the analysis model** are listed in Appendix A.3.

3.1.2 GHG assessment

The carbon footprint or life cycle GHG emissions is assessed using the "IPCC 2007" method, considering the cumulative radiative forcing over a 100-year horizon. This method is based on the global warming potential (GWP) published by the Intergovernmental Panel on Climate Change (IPCC) in 2007 for each GHG. The GHGs considered by openIO-Canada model are those provided by Statistics Canada's Environment Accounts (CO₂, CH₄, and N₂O). The potential of each GHG to affect the climate is calculated in kilogram of carbon dioxide equivalent (kg CO₂eq), which is the reference unit for climate change impact. The GWP used are in line with those currently used for the National inventory report on GHG sources and sinks published by the federal government (25 and 298 kg CO₂eq/kg for CH₄ and N₂O, respectively). See Appendix A.3 for additional details.

It is important to keep in mind that the carbon footprint results represent potential and not actual environmental impacts. These are relative expressions that do not predict the final impact or risk on receiving environments and the exceeding of safety standards or margins.

3.2 Procurement data

3.2.1 Raw data from PSPC

PSPC provided the procurement data for the last three fiscal years in the form of a spreadsheet compiling about 84 500 contracts of goods and services. These can be either initial contracts, amendments to these contracts, or amendments to contracts of a previous year. Other relevant information for each contract is: the amount (in Canadian dollars, taxes included), the PSPC regional sector, the customer department (93 different customers, including PSPC itself), the GSIN commodity code corresponding to the good or service, a brief description of the commodity, the

region of the supplier (Canadian province, state of United States, or else the unique code “0” for any other foreign country). All raw data is contained in the Excel appendix of this report.

3.2.2 Processing of raw procurement data

In order to perform the carbon footprinting, several treatments on the raw data of procurement provided by PSPC had to be carried out. They are described below. It is recalled that the openIO-Canada environmental analysis model is based on Statistics Canada’s IOCC Classification and uses basic price amounts as input data. The CIRAIG owns a mapping table that allows the crosswalk between the UNSPSC⁶ and the IOCC classifications⁷. On the other hand, PSPC procurement are still classified with GSIN codes. An incomplete GSIN-UNSPSC mapping table exists, partly elaborated by PSPC in 2016 and later expanded by CIRAIG to make up for the missing GSIN codes required during the PSPC-QC carbon footprint study in 2018. Here again, an issue of mis-alignment between classifications occurred and missing mappings had to be solved.

3.2.2.1 Procurement with a GSIN not yet mapped to an UNSPSC code

About 5 200 contracts (over the three years), for a total amount close to \$2.1 billion (about 4.8% of total procurement) were associated to a GSIN code not yet mapped to an UNSPSC code in the mapping file currently available, or were coded with the undefined GSIN “N9999 - Miscellaneous Items” which cannot be associated to any UNSPSC code.

A manual GSIN-to-UNSPSC mapping was done for 49 of the 169 missing GSIN codes (proceeding by decreasing order of amount). See paragraph 3.2.2.6 for the methodology.

For the N9999, contract details were analysed by PSPC⁸ who could identify a GSIN for most of them. Afterwards, three new GSIN had to be mapped to the UNSCPC classification.

Lastly, where required, the UNSPSC-to-IOCC mapping was also completed in order to ensure the GSIN-to-IOCC match. See paragraph 3.2.2.6 for the methodology.

Hence, about **98% of the total value of the codes not yet mapped initially or undefined (i.e. about \$ 2.03 billions) has been “recovered” for the carbon footprint**. The Excel appendix of this report presents the table of the new GSIN-UNSPSC manual mappings and the table of GSIN N9999 assignments.

3.2.2.2 Exclusion of certain contracts

- All contracts for the **Canadian Commercial Corporation** since this department is not the actual user of the commodity purchased;
- **GSIN N9999**: The carbon footprint of 12 contracts (over the three years) coded N9999 remain excluded, for a total amount of about \$ 193 200.
- **GSIN not mapped to UNSPSC**: 619 contracts (over the three years) have been cut-off the manual GSIN-UNSPC mapping, for a total amount of about \$39.5 million (0.09% of total procurement). They remain with a GSIN code not yet mapped to an UNSPSC code and could not be considered for the carbon footprint. This concerns 114 different GSIN codes, which list is provided in the Excel appendix file.

⁶ United Nations Standard Products and Services Code (www.unspsc.org).

⁷ Currently, the UNSPSC classification is not fully mapped to IOCC.

⁸ Laure Gérard, August 2019.

- **NULL:** 1 contract (over the three years) is associated with the customer “NULL” (in NCR) and has been excluded for the carbon footprint, for an amount of about \$ 2 731.

3.2.2.3 Multiannual contracts

Some contracts may relate to procurement that will be spread over several years. However, there is no raw data on how much of the total contract amount is allocated to each year of the period under study or excluded from that period. Even though it was possible to allocate an amount of year n over several years would imply that any future analysis for the year $n + 1$, $n + 2$, etc. be able to recognize the shares of the amount already allocated to previous years. It is recommended for future studies that continuity and traceability of the accounting (of actual shipments every year) is mapped to ensure that all shares are properly accounted for, and to avoid any risk of under- or over-estimating the carbon footprint. Such an accounting is not set up presently; for this study, we follow the rule previously agreed on with PSPC-QC at the time of the 2018 carbon footprint study **to allocate 100% of the amount of multi-year contracts to the year of their signature.**

3.2.2.4 Contract amendments

Also in accordance with the rule decided with PSPC-QC for the 2018 carbon footprint study, **all contract amendments are included** in the analysis, whatever its amount and the year of the original contract. So, it is assumed that an amendment with a positive value (respectively negative value) corresponds to the shipment of an additional quantity of goods or services (respectively a reduced quantity), and it is entirely allocated to the year of the amendment.

3.2.2.5 Sales taxes removal

The carbon footprint tool requires values as close as possible to a basic price. Hence, sales taxes must be removed from the amount provided with the raw data, where applicable. The following rules are considered, that have been provided by PSPC-QC during the 2018 carbon footprint study.

- Goods (GSIN with first letter N):
 - a. Canadian supplier: sales taxes are applied, and the tax rate applied is the one applicable at the shipment address. Depending on the region considered, the corresponding tax rate will be used to remove taxes from the amount provided with PSPC raw data.
 - b. Non-Canadian supplier: For suppliers outside Canada, no tax has been added, so the amount provided with PSPC raw data is free of sales tax.
- Services :
 - a. Canadian supplier: sales taxes are applied, and the tax rate applied is the one applicable at the shipment address. Hence, depending on the region considered, the corresponding tax rate will be used to remove taxes from the amount provided with PSPC raw data.
 - b. Non-Canadian supplier: For suppliers outside Canada, no tax has been added, so the amount provided with PSPC raw data is free of sales tax.
- Construction (GSIN beginning with 51):
 - a. Canadian supplier: sales taxes are applied, and the tax rate applied is the one applicable at the shipment address. Hence, depending on the region considered, the corresponding tax rate will be used to remove taxes from the amount provided with PSPC raw data.

- b. Non-Canadian supplier: There should be no supplier outside Canada for construction contracts.

Table 3-1: Estimated sales tax rates per fiscal year and region

Province															Source
	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	NU	YT	NT		
Sale tax rate	12%	5%	11%	12%	13%	14.975%	15% (13% < July 1, 2016)	15%	15%	15% (13% < July 1, 2016)	5%	5%	5%	https://www.retailcouncil.org/resources/quick-facts/sales-tax-rates-by-province/ Rate is applicable to every of the three fiscal years (FY16-17 to FY 18-19) unless otherwise mentionned.	
Province share for the calculation of an average tax rate of the regional sector														Resulting tax rate considered for FY16-17 to FY18-19	Source and Assumption The share is estimated from the final expenditures on goods and services by federal government in every province; average of 2016 and 2017 (Source: Statistics Canada, Table 36-10-0450-01) For NCR, it is assumed that 80% of the contracts are shipped to Ontario (e.g. Ottawa) and 20% to Quebec (e.g. Gatineau)
PACIFIC	98.0%											2.0%		11.86%	
WESTERN		51.3%	16.2%	27.5%							1.8%		3.2%	8.172%	
NCR					80.0%	20.0%								13.395%	
ONTARIO					100.0%									13%	
QUEBEC						100.0%								14.975%	
ATLANTIC							27.5%	54.4%	5.8%	12.3%				14.8% (FY16-17) and 15%	

3.2.2.6 Mapping between G SIN-UNSPSC and UNSPSC-IOCC classifications

GSIN to UNSPSC: As mentioned above, the federal government uses the Goods and Services Identification Number (GSIN) codes to identify generic product descriptions as part of its procurement activities. PSPC source data contains a GSIN code for each contract. The federal government plans in the near future to use the UNSPSC classification to replace the GSIN, which is an international classification used by many other countries, institutions and governments (e.g. the Government of Quebec, some U.S. states). The federal government has already published a partial correspondence (or mapping) table in June 2016⁹ to allow a GSIN code to be matched with a unique UNSPSC code. It contains the matches for 4 835 GSIN codes. During the carbon footprint study in 2018 for PSPC-QC, the CIRAIG had to complete the mapping for 82 key GSIN missing from the mapping table (CIRAIG, 2018). Here, **51 key GSIN-to-UNSPSC additional correspondences** were done manually (available in the Excel appendix file).

UNSPSC to IOCC: On the other hand, the openIO-Canada environmental analysis model is based on Statistics Canada's IOCC classification. From previous studies, including the carbon footprint assessment for PSPC-QC (CIRAIG, 2018), the CIRAIG has elaborated a partial correspondence table that contains 1 325 matches for the crosswalk from UNSPSC to IOCC¹⁰. Here, due to the new GSIN-to-UNSPSC elaborated, it turns out that **34 new UNSPSCs do not have an IOCC match in the available table. These correspondences were therefore manually established** (see Excel appendix file). The table now contains 1 359 matches. For any other UNSPSC codes not mapped yet to an IOCC, an automated approach was used taking advantage of the hierarchical structure of the UNSPSC classification¹¹. It consists of finding out whether the immediate parent UNSPSC

⁹ <https://achatsetventes.gc.ca/donnees-sur-l-provisionnement/unspsc/telecharger-la-classification-unspsc>.

¹⁰ Note there is no existing GSIN-to-IOCC mapping that could have been developed by either PSPC or Statistics Canada.

¹¹ A UNSPSC code always has 8 digits. Two by two the first digits define successively the segment (e.g. 72000000: Services - building, construction and maintenance), the family (e.g. 72190000: Maintenance and

code has an IOCC match in the existing table. Otherwise, the grandparent UNSPSC is searched for, etc.

3.2.2.7 Region of origin of procurement and carbon footprint modelling

For this specific project, openIO-Canada has been expanded and contextualized for every Canadian province (contextualization is limited to the electricity gridmix as explained in 3.1.1). Hence, for every IOCC commodity, it makes it possible to consider between a production in a specific province or anywhere in Canada (when the production can most likely take place anywhere in Canada). The rules presented in Table 3-2 have been used for the modelling, based on the origin of the supplier as indicated in PSPC source data and on the type of commodity.

It should be noted that a product from a supplier located in a given province are not necessarily manufactured in that province, particularly when the corresponding industry does not exist in that province or is not well developed, in which case the probability is high that the product is manufactured elsewhere in Canada or abroad and imported into the province by the supplier.

For suppliers from abroad Canada, the carbon footprint will be modelled with the Canadian model (considering the Canadian average electricity gridmix) since openIO-Canada scope does not cover other countries.

Table 3-2: Region of the openIO-Canada model chosen based on supplier location and type of commodity

Origin	Region of openIO-Canada model
Supplier from USA and rest of the world	CA
Supplier in a Canadian province:	
Services	supplier province
Goods related to construction (NIBS beginning with 51)	supplier province
Forestry, wood products and food products	supplier province
Other goods	CA

repair of infrastructure), the class (e.g. 72191500: Road Maintenance) and the commodity (e.g. 72191501: Snow Removal). There is therefore a kinship on these four levels.

4 Results and discussion

The first section of this chapter presents an economic overview of PSPC procurement for the three years under study. Subsequently, the GHG estimates associated with the partial life cycle of the procurement are presented and discussed.

4.1 Economic analysis of PSPC procurement

4.1.1 ATLANTIC region

The Atlantic region consists of the provinces of New Brunswick (NB), Nova Scotia (NS), Prince Edward Island (PE) and Newfoundland and Labrador (NL).

The contracts evaluated for add up to \$673.5 million, \$ 562.8 million and \$631.8 million in FY16-17, FY17-18 and FY18-19 respectively (sales taxes excluded). The annual average over the three years is worth \$622.7 million and 2 650 contracts per year.

Table 4-1 presents the customers of PSPC-ATLANTIC. They are ranked from the largest to the lowest buyer based on FY17-18 expenditures (arbitrary choice of year). The gauge in the % Total column easily identifies for the other years any departures from this ranking. PSPC (here Public Works and Government Services Canada) is always the largest buyer due to their role as central purchaser and/or manager of real property for the whole region, accounting for about 40% to 56% of the value of procurement. Together with the Department of National Defence and Fisheries and Oceans Canada, these three departments cover 85% (in FY18-19) to 90% (the other years) of total PSPC-ATLANTIC expenditures.

One also notes significantly higher procurement for Veterans Affairs Canada and Correctional Service of Canada in FY18-19.

Figure 4-1 presents for the FY17-18 the main goods and services according to the GSIN classification that contribute to 70% of the annual procurement (similar figures for FY16-17 and FY18-19 are available in Appendix D.1). Main sectors of concern are:

- By far, construction works (buildings, harbours and waterways infrastructure) and associated engineering services for repair and maintenance;
- also, marine ship and vessels construction, maintenance and operation (incl. fuels);
- and to a lesser extent: food and catering services, environmental audit and management services, maintenance and management of buildings (cleaning, concierge, security, etc.)

Lastly, Table 4-2 details the information in the previous figure by specifying for each of the main products (those contributing to more than 1% of the year total value) the contributions of the customers. Full table without cut-off is available in the Excel appendix of this report.

Table 4-1 : Value, tax excluded, of PSPC-ATLANTIC procurement, per customer (sorted on FY17-18 amounts)

ATLANTIC CUSTOMER NAME	FY16-17			FY17-18			FY18-19		
	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts
Public Works and Government Services Canada	\$ 377'554'763	56.1%	1'328	\$ 259'251'218	46.1%	1'197	\$ 246'244'625	39.0%	911
Department of National Defence	\$ 118'909'695	17.7%	635	\$ 140'693'759	25.0%	575	\$ 153'104'326	24.2%	580
Fisheries and Oceans Canada	\$ 104'433'942	15.5%	448	\$ 109'624'455	19.5%	621	\$ 140'408'865	22.2%	529
Veterans Affairs Canada	\$ 27'633'805	4.1%	80	\$ 14'961'977	2.7%	55	\$ 53'682'394	8.5%	44
Royal Canadian Mounted Police	\$ 10'011'346	1.5%	20	\$ 10'132'512	1.8%	13	\$ 6'042'310	1.0%	5
Correctional Service of Canada	\$ 11'297'264	1.7%	126	\$ 8'855'481	1.6%	87	\$ 16'272'771	2.6%	101
Transport Canada	\$ 1'546'559	0.2%	9	\$ 6'035'062	1.1%	38	\$ 4'017'720	0.6%	40
Parks Canada	\$ 4'635'343	0.7%	35	\$ 4'494'709	0.8%	28	\$ 2'687'700	0.4%	30
Employment and Social Development Canada	\$ 1'419'851	0.2%	36	\$ 2'021'704	0.4%	47	\$ 1'267'321	0.2%	37
Environment Canada	\$ 329'763	0.0%	6	\$ 1'365'179	0.2%	8	\$ 828'863	0.1%	8
Canadian Food Inspection Agency	\$ 6'697'418	1.0%	21	\$ 1'264'305	0.2%	18	\$ 1'940'310	0.3%	11
Citizenship and Immigration Canada	\$ 230'909	0.0%	9	\$ 912'596	0.2%	7	\$ 251'100	0.0%	3
Health Canada	\$ 432'580	0.1%	5	\$ 842'000	0.1%	4	\$ 204'114	0.0%	2
Agriculture and Agri-Food Canada	\$ 1'406'843	0.2%	24	\$ 838'870	0.1%	16	\$ 1'827'365	0.3%	27
Atlantic Canada Opportunities Agency	\$ 1'991'187	0.3%	11	\$ 682'456	0.1%	12	\$ 390'912	0.1%	12
National Research Council Canada	\$ 3'023'349	0.4%	20	\$ 498'771	0.1%	14	\$ 916'855	0.1%	19
Natural Resources Canada	\$ 1'818'457	0.3%	16	\$ 285'664	0.1%	6	\$ 1'162'234	0.2%	7
Innov, Sci and Econ Devt Can	\$ 145'642	0.0%	4		0.0%		\$ 53'500	0.0%	1
Canada Border Services Agency		0.0%			0.0%		\$ 541'193	0.1%	3
Grand Total	\$ 673'518'717	100.0%	2'833	\$ 562'760'719	100.0%	2'746	\$ 631'844'478	100.0%	2'370

Note: Ranking of customers from the largest to the lowest buyer is based on FY17-18 expenditures. The gauge in the % Total column easily identifies for the other years any departures from this ranking.

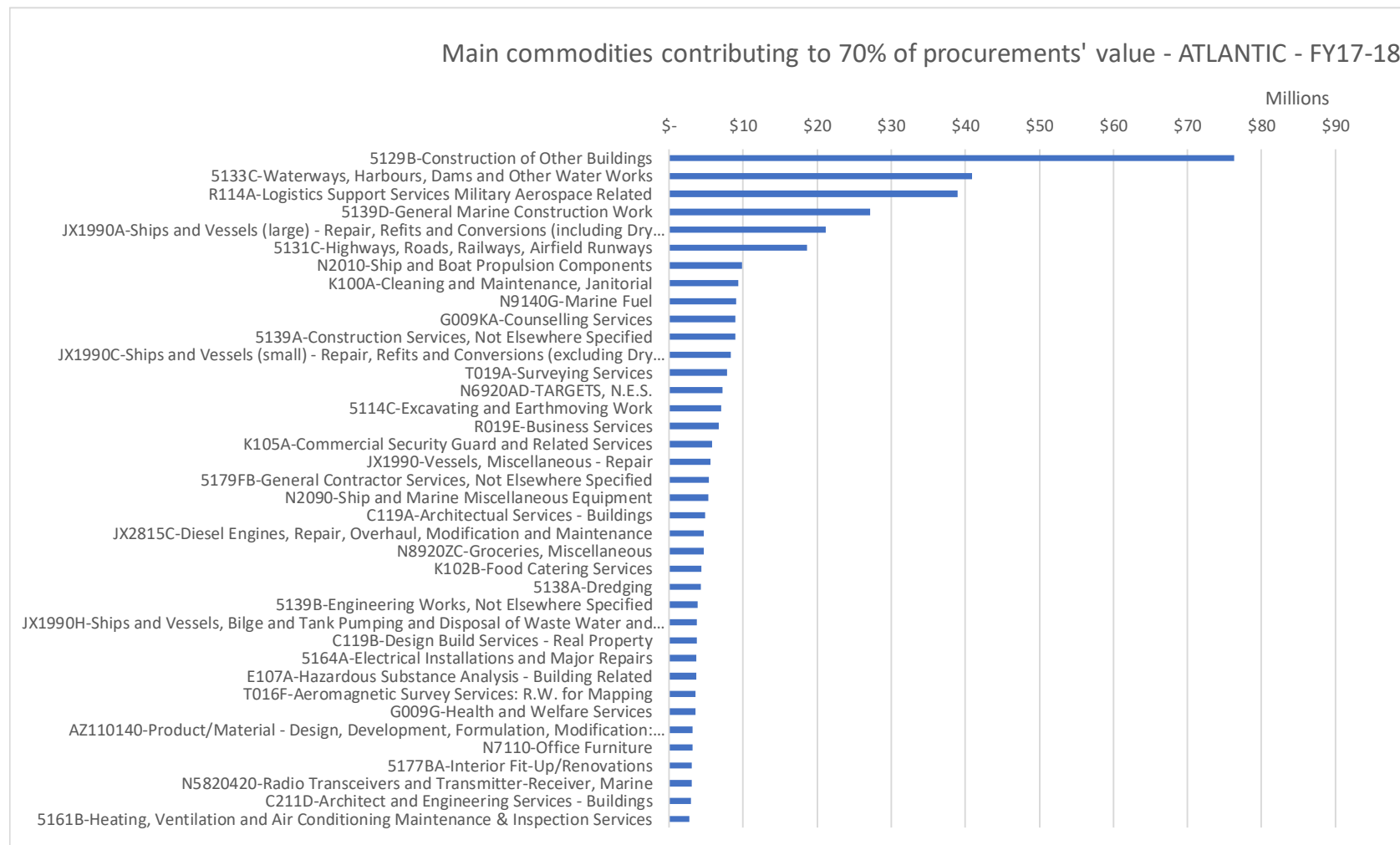


Figure 4-1 : Main goods and services, according to GSIN classification, contributing to 70% of annual PSPC-ATLANTIC procurement, by value (tax excluded) in FY17-18.

Table 4-2 : Main commodities and customer by decreasing order of contribution to PSPC-ATLANTIC procurement total value (sorting: FY17-18, cut-off: 1% of FY17-18 total value) (contribution expressed in % of the total value for the year for commodity and customer)

ATLANTIC Commodity (GSIN) Customer	FY16-17			FY17-18			FY18-19		
	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts
5129B-Construction of Other Buildings	\$ 60'187'799	8.9%	94	\$ 76'250'487	13.5%	79	\$ 19'855'516	3.1%	112
Public Works and Government Services Canada	\$ 59'351'991	8.8%	89	\$ 76'250'487	13.5%	79	\$ 19'267'937	3.0%	107
Department of National Defence	\$ 835'808	0.1%	5		0.0%			0.0%	
Fisheries and Oceans Canada		0.0%			0.0%		\$ 587'579	0.1%	5
5133C-Waterways, Harbours, Dams and Other Water Works	\$ 88'901'292	13.2%	215	\$ 40'908'891	7.3%	158	\$ 74'313'106	11.8%	80
Public Works and Government Services Canada	\$ 71'562'047	10.6%	172	\$ 36'152'326	6.4%	111	\$ 52'958'569	8.4%	60
Fisheries and Oceans Canada	\$ 15'616'057	2.3%	37	\$ 4'756'565	0.8%	47	\$ 21'354'537	3.4%	20
Canadian Food Inspection Agency	\$ 1'127'156	0.2%	5		0.0%			0.0%	
Department of National Defence	\$ 596'031	0.1%	1		0.0%			0.0%	
R114A-Logistics Support Services Military Aerospace Related	\$ 84'750	0.0%	10	\$ 38'999'999	6.9%	3	\$ 49'764'359	7.9%	5
Department of National Defence	\$ -	0.0%	9	\$ 38'999'999	6.9%	3	\$ 49'764'359	7.9%	5
Fisheries and Oceans Canada	\$ 84'750	0.0%	1		0.0%			0.0%	
5139D-General Marine Construction Work	\$ 26'938'026	4.0%	125	\$ 27'113'287	4.8%	63	\$ 29'802'560	4.7%	38
Public Works and Government Services Canada	\$ 25'762'077	3.8%	122	\$ 25'611'858	4.6%	60	\$ 20'737'982	3.3%	28
Fisheries and Oceans Canada	\$ 1'175'949	0.2%	3	\$ 989'229	0.2%	2	\$ 2'901'074	0.5%	6
Department of National Defence		0.0%		\$ 512'200	0.1%	1	\$ 6'163'504	1.0%	4
JX1990A-Ships and Vessels (large) - Repair, Refits and Conversions (including Dry Docking)	\$ 26'775'790	4.0%	28	\$ 21'158'961	3.8%	63	\$ 32'606'319	5.2%	61
Fisheries and Oceans Canada	\$ 26'543'254	3.9%	24	\$ 19'708'643	3.5%	55	\$ 32'606'319	5.2%	58
Transport Canada	\$ 232'536	0.0%	2	\$ 1'450'317	0.3%	6	\$ -	0.0%	2
Public Works and Government Services Canada	\$ -	0.0%	2	\$ -	0.0%	2	\$ -	0.0%	1
5131C-Highways, Roads, Railways, Airfield Runways	\$ 56'606'860	8.4%	45	\$ 18'558'221	3.3%	57	\$ 1'535'761	0.2%	20
Public Works and Government Services Canada	\$ 56'606'860	8.4%	45	\$ 18'402'221	3.3%	55	\$ 1'535'761	0.2%	20
Department of National Defence		0.0%		\$ 156'000	0.0%	2		0.0%	
N2010-Ship and Boat Propulsion Components	\$ 5'356'971	0.8%	6	\$ 9'887'688	1.8%	10	\$ 4'550'204	0.7%	7
Fisheries and Oceans Canada	\$ 4'323'999	0.6%	4	\$ 9'561'707	1.7%	2	\$ 4'550'204	0.7%	7
Transport Canada	\$ 1'032'972	0.2%	2	\$ 325'981	0.1%	8		0.0%	
K100A-Cleaning and Maintenance, Janitorial	\$ 9'194'879	1.4%	53	\$ 9'351'925	1.7%	51	\$ 10'760'186	1.7%	50
Department of National Defence	\$ 7'699'262	1.1%	43	\$ 8'207'313	1.5%	40	\$ 9'211'236	1.5%	38
Public Works and Government Services Canada	\$ 1'269'465	0.2%	8	\$ 863'809	0.2%	6	\$ 1'365'023	0.2%	10
Veterans Affairs Canada	\$ 132'550	0.0%	1	\$ 171'760	0.0%	2	\$ 153'448	0.0%	1
Canadian Food Inspection Agency	\$ 93'602	0.0%	1	\$ 93'440	0.0%	1	\$ 30'480	0.0%	1
Fisheries and Oceans Canada		0.0%		\$ 15'603	0.0%	2		0.0%	
N9140G-Marine Fuel	\$ 11'789'100	1.8%	1	\$ 9'000'000	1.6%	2	\$ -	0.0%	1
Department of National Defence	\$ 11'789'100	1.8%	1	\$ 9'000'000	1.6%	2	\$ -	0.0%	1
G009KA-Counselling Services	\$ 469'125	0.1%	4	\$ 8'976'764	1.6%	3	\$ 147'391	0.0%	2
Veterans Affairs Canada	\$ 365'850	0.1%	3	\$ 8'925'217	1.6%	2	\$ 147'391	0.0%	2
Correctional Service of Canada	\$ 103'274	0.0%	1	\$ 51'548	0.0%	1		0.0%	
5139A-Construction Services, Not Elsewhere Specified	\$ 8'430'884	1.3%	29	\$ 8'924'726	1.6%	34	\$ 6'905'130	1.1%	31
Public Works and Government Services Canada	\$ 2'577'923	0.4%	16	\$ 4'179'925	0.7%	17	\$ 2'392'045	0.4%	10
Department of National Defence	\$ 4'251'270	0.6%	5	\$ 4'103'370	0.7%	8	\$ 3'797'500	0.6%	14
Correctional Service of Canada	\$ 452'959	0.1%	5	\$ 636'597	0.1%	8	\$ 715'585	0.1%	7
Fisheries and Oceans Canada	\$ 1'148'733	0.2%	3	\$ 4'834	0.0%	1		0.0%	
JX1990C-Ships and Vessels (small) - Repair, Refits and Conversions (excluding Dry Docks)	\$ 4'670'531	0.7%	20	\$ 8'295'210	1.5%	46	\$ 6'699'281	1.1%	56
Fisheries and Oceans Canada	\$ 4'670'531	0.7%	20	\$ 8'295'210	1.5%	46	\$ 6'699'281	1.1%	56
T019A-Surveying Services	\$ 491'143	0.1%	6	\$ 7'830'689	1.4%	19	\$ 10'586'327	1.7%	34
Fisheries and Oceans Canada	\$ 447'485	0.1%	3	\$ 7'830'689	1.4%	19	\$ 10'586'327	1.7%	34
Public Works and Government Services Canada	\$ 43'658	0.0%	3		0.0%			0.0%	
N6920AD-TARGETS, N.E.S.	\$ 143'551	0.0%	1	\$ 7'259'371	1.3%	3		0.0%	
Department of National Defence	\$ 143'551	0.0%	1	\$ 7'259'371	1.3%	3		0.0%	
5114C-Excavating and Earthmoving Work	\$ 7'334'678	1.1%	24	\$ 7'050'850	1.3%	15	\$ 4'335'388	0.7%	7
Public Works and Government Services Canada	\$ 7'334'678	1.1%	24	\$ 7'050'850	1.3%	15	\$ 4'335'388	0.7%	7
R019E-Business Services	\$ 1'828'627	0.3%	14	\$ 6'660'801	1.2%	26	\$ 2'484'122	0.4%	15
Public Works and Government Services Canada	\$ 1'096'360	0.2%	11	\$ 5'940'201	1.1%	24	\$ 2'004'022	0.3%	14
Correctional Service of Canada	\$ 732'267	0.1%	3	\$ 720'600	0.1%	2	\$ 480'100	0.1%	1

4.1.2 NCR region

The National Capital Region of PSPSC manages the acquisitions for Ottawa and Gatineau.

The contracts evaluated in the National Capital Region add up to \$ 11.72 billion, \$ 9.77 billion and \$ 11 billion in FY16-17, FY17-18 and FY18-19 respectively (sales taxes excluded). The annual average over the three years is worth \$ 10.83 billion (\$ 12.03 billion, taxes included) and 16 569 contracts per year. **NCR accounts for 82% to 85% of procurement of the five regions.**

Table 4-3 presents the customers of PSPC-NCR. They are ranked from the largest to the lowest buyer based on FY17-18 expenditures (cut-off 0.06% - see note). The Department of National Defence is the largest buyer by far (66% in FY16-17, 54% FY17-18, and 56% in FY18-19), followed by PSPC (22%, 26%, and 18%).

Figure 4-2, Figure 4-3 and Figure 4-4 present the main goods and services according to the GSIN classification that contribute to 70% of the annual procurement for every of the three years (figure for the total over the three years is available in Appendix D.2). The categories with the largest expenditures are:

- By far, military vehicles, ship and vessels and aircraft construction, maintenance and repair;
- Informatic services and software (payroll and human resources ADP);
- And also drugs and biologicals;
- Relocation services;
- Buildings management, construction services and related engineering services;
- and to a lesser extent fuels, propellers, and ammunitions

Lastly, Table 4-4 details the information in the previous figures by specifying for each of the main products (those contributing individually to more than 1.6% of FY17-18 total value) the contributions of the customers. Full table without cut-off is available in the Excel appendix of this report.

Table 4-3 : Value, tax excluded, of PSPC-NRC procurement, per customer (sorted on FY17-18 amounts)

NCR CUSTOMER NAME	FY16-17			FY17-18			FY18-19		
	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts
Department of National Defence	\$ 7 786 317 457	66.5%	3 609	\$ 5 235 929 165	53.6%	2 997	\$ 6 177 777 005	56.1%	3 313
Public Works and Government Services Canada	\$ 2 631 368 352	22.5%	8 123	\$ 2 579 072 408	26.4%	8 011	\$ 1 962 285 670	17.8%	8 233
Fisheries and Oceans Canada	\$ 146 664 600	1.3%	395	\$ 247 120 758	2.5%	386	\$ 1 072 318 522	9.7%	361
Citizenship and Immigration Canada	\$ 108 911 533	0.9%	203	\$ 235 429 114	2.4%	224	\$ 184 876 410	1.7%	251
Health Canada	\$ 68 006 468	0.6%	320	\$ 233 705 040	2.4%	376	\$ 236 141 739	2.1%	479
Royal Canadian Mounted Police	\$ 123 350 137	1.1%	345	\$ 214 949 195	2.2%	369	\$ 136 898 511	1.2%	417
Employment and Social Development Canada	\$ 146 698 667	1.3%	244	\$ 190 741 445	2.0%	249	\$ 301 043 391	2.7%	235
Foreign Affairs, Trade and Development (Department of	\$ 86 011 071	0.7%	239	\$ 181 721 330	1.9%	235	\$ 94 227 039	0.9%	221
Treasury Board of Canada	\$ 153 768 578	1.3%	99	\$ 93 088 549	1.0%	83	\$ 79 901 903	0.7%	81
Canada Border Services Agency	\$ 53 987 733	0.5%	179	\$ 83 111 250	0.9%	235	\$ 146 611 194	1.3%	260
Transport Canada	\$ 12 738 964	0.1%	176	\$ 81 521 053	0.8%	199	\$ 34 350 375	0.3%	276
Correctional Service of Canada	\$ 37 830 924	0.3%	187	\$ 75 232 511	0.8%	202	\$ 54 788 036	0.5%	251
Innov, Sci and Econ Devt Can	\$ 18 792 431	0.2%	182	\$ 43 881 133	0.4%	167	\$ 20 376 623	0.2%	175
Veterans Affairs Canada	\$ 13 951 523	0.1%	53	\$ 27 231 394	0.3%	50	\$ 20 889 922	0.2%	103
Parks Canada	\$ 23 993 240	0.2%	340	\$ 26 090 690	0.3%	146	\$ 16 239 071	0.1%	129
Agriculture and Agri-Food Canada	\$ 18 356 240	0.2%	142	\$ 20 916 881	0.2%	133	\$ 27 878 957	0.3%	135
Natural Resources Canada	\$ 34 269 964	0.3%	267	\$ 20 598 034	0.2%	248	\$ 22 851 788	0.2%	222
Privy Council Office	\$ 8 275 351	0.1%	74	\$ 20 146 926	0.2%	71	\$ 16 290 808	0.1%	60
National Research Council Canada	\$ 23 115 093	0.2%	188	\$ 15 580 224	0.2%	178	\$ 18 428 498	0.2%	167
Environment Canada	\$ 12 145 463	0.1%	147	\$ 14 021 942	0.1%	124	\$ 14 826 645	0.1%	152
Canadian Heritage	\$ 13 049 468	0.1%	140	\$ 13 078 893	0.1%	109	\$ 5 373 430	0.0%	49
Canadian Food Inspection Agency	\$ 21 140 062	0.2%	122	\$ 12 555 034	0.1%	117	\$ 4 422 034	0.0%	71
Department of Justice Canada	\$ 11 847 964	0.1%	71	\$ 12 272 233	0.1%	83	\$ 11 949 973	0.1%	83
Statistics Canada	\$ 12 341 585	0.1%	141	\$ 11 254 666	0.1%	98	\$ 21 093 448	0.2%	97
Courts Administration Service	\$ 1 288 090	0.0%	12	\$ 9 505 327	0.1%	25	\$ 800 936	0.0%	33
Public Health Agency of Canada	\$ 17 006 742	0.1%	116	\$ 8 491 853	0.09%	87	\$ 33 958 711	0.3%	77
Office of the Chief Electoral Officer	\$ 36 570 448	0.3%	37	\$ 6 630 213	0.07%	20	\$ 26 966 874	0.2%	27
Indigenous and Northern Affairs Canada	\$ 37 898 180	0.3%	135	\$ 6 471 611	0.07%	130	\$ 18 955 897	-0.2%	192
Office of Infrastructure of Canada	\$ 9 561 995	0.1%	16	\$ 5 964 580	0.06%	11	\$ 212 870 228	1.9%	22
All 66 other customers <0.06% (FY17-18)	\$ 47 834 229	0.4%	633	\$ 38 855 209	0.4%	575	\$ 68 216 376	0.6%	661
Grand Total	\$11 717 092 552	100.0%	16 935	\$ 9 765 168 661	100.0%	15 938	\$11 005 698 220	100.0%	16 833

Note: Ranking of customers from the largest to the lowest buyer is based on FY17-18 expenditures. Customers contributing to less than 0.06% of the total that year are cut-off). The gauge in the % Total column easily identifies for the other years any departures from this ranking.

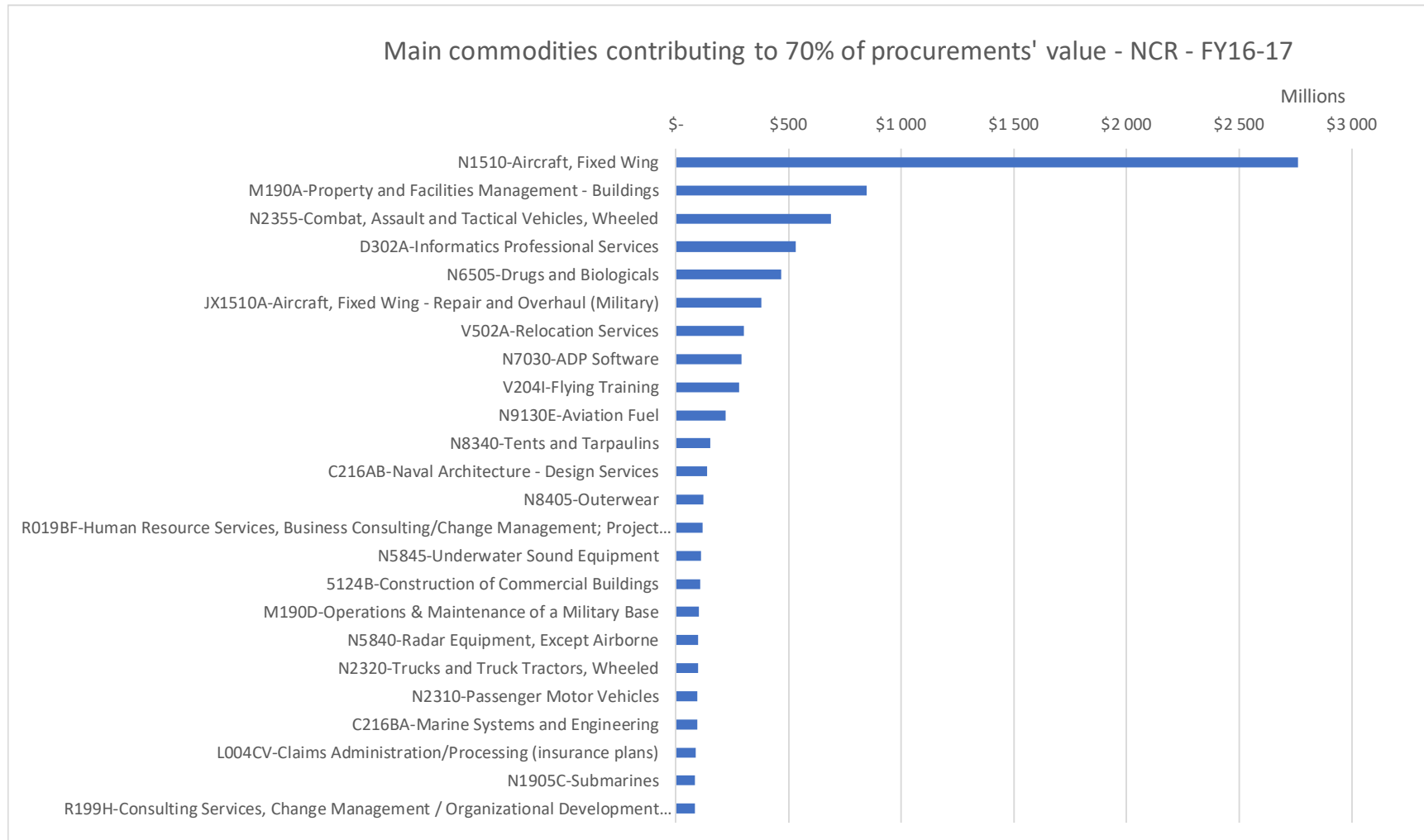


Figure 4-2 : Main goods and services, according to GSIN classification, contributing to 70% of annual PSPC-NCR procurement, by value (tax excluded) in FY16-17.

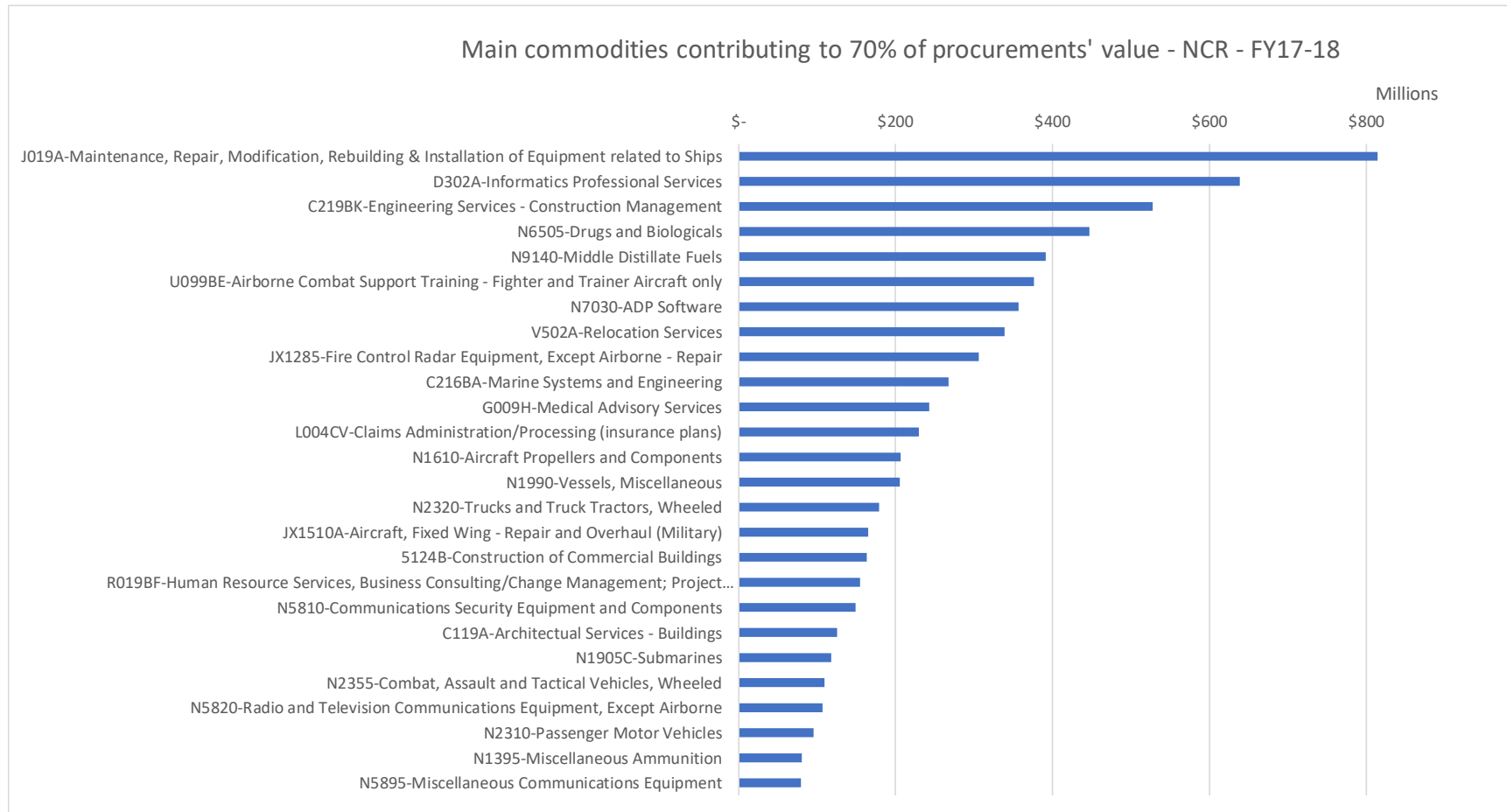


Figure 4-3 : Main goods and services, according to G SIN classification, contributing to 70% of annual PSPC-NCR procurement, by value (tax excluded) in FY17-18.

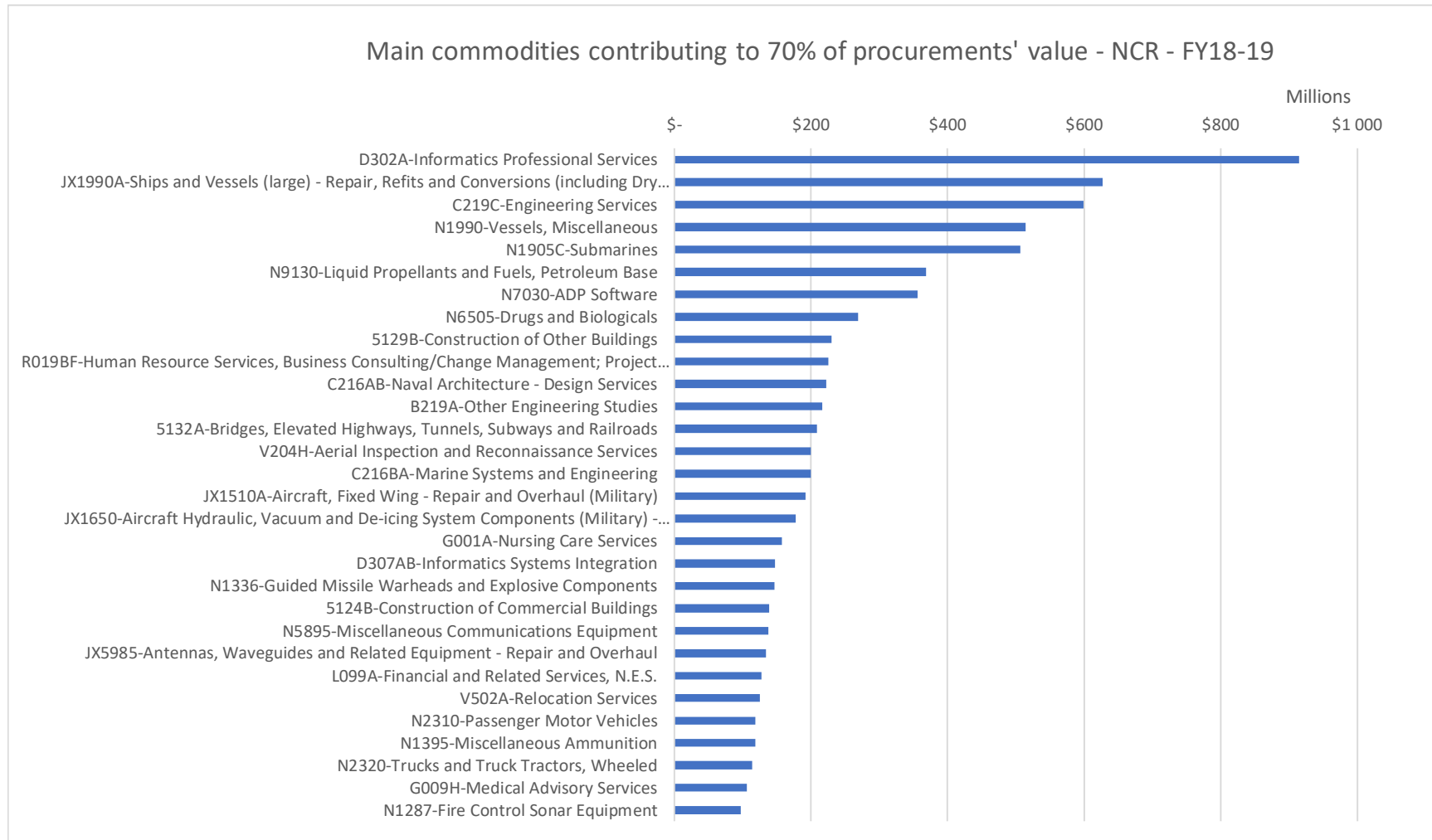


Figure 4-4 : Main goods and services, according to G SIN classification, contributing to 70% of annual PSPC-NCR procurement, by value (tax excluded) in FY18-19.

Table 4-4 : Main commodities and customer by decreasing order contributing up to 60% PSPC-NCR procurement total value (sorting: FY17-18, cut-off: 1.6% of FY17-18 total value)
(contribution expressed in % of the total value for the year for commodity and customer)

NCR Commodity (GSIN) Customer	FY16-17			FY17-18			FY18-19		
	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts
J019A-Maintenance, Repair, Modification, Rebuilding & Installation of Equipment related to Ships	\$ -	0.0%	1	\$ 814 365 713	8.3%	5	\$ 6 661 454	0.1%	5
Department of National Defence	\$ -	0.0%	1	\$ 814 365 713	8.3%	5	\$ 6 661 454	0.1%	5
D302A-Informatics Professional Services	\$ 533 461 218	4.6%	1 359	\$ 638 466 944	6.5%	1 692	\$ 914 925 038	8.3%	1 316
Department of National Defence	\$ 180 754 178	1.5%	140	\$ 185 452 319	1.9%	144	\$ 311 415 091	2.8%	223
Citizenship and Immigration Canada	\$ 87 371 201	0.7%	47	\$ 156 198 164	1.6%	61	\$ 67 368 749	0.6%	31
<i>All others customers <1% in FY17-18</i>									
C219BK-Engineering Services - Construction Management	-\$ 1 474 115	0.0%	1	\$ 527 428 415	5.4%	4	\$ -	0.0%	2
Public Works and Government Services Canada	-\$ 1 474 115	0.0%	1	\$ 527 428 415	5.4%	4	\$ -	0.0%	2
N6505-Drugs and Biologicals	\$ 467 449 868	4.0%	207	\$ 446 849 907	4.6%	156	\$ 269 302 706	2.4%	151
Public Works and Government Services Canada	\$ 449 511 190	3.8%	169	\$ 429 861 143	4.4%	123	\$ 239 851 553	2.2%	109
Department of National Defence	\$ 3 316 146	0.0%	19	\$ 12 469 840	0.1%	15	\$ 2 779 460	0.0%	20
N9140-Middle Distillate Fuels	\$ 6 529 900	0.1%	29	\$ 391 508 980	4.0%	88	\$ 7 636 288	0.1%	27
Department of National Defence	\$ 395 347	0.0%	2	\$ 182 638 807	1.9%	32	\$ 435 477	0.0%	2
Fisheries and Oceans Canada	\$ 4 962 491	0.0%	10	\$ 102 231 211	1.0%	21	\$ -	0.0%	0
<i>All others customers <1% in FY17-18</i>									
U099BE-Airborne Combat Support Training - Fighter and Trainer Aircraft only	\$ -	0.0%	1	\$ 376 205 060	3.9%	2	\$ -	0.0%	3
Department of National Defence	\$ -	0.0%	1	\$ 376 205 060	3.9%	2	\$ -	0.0%	0
Transport Canada	\$ -	0.0%	0	\$ -	0.0%	0	\$ -	0.0%	3
N7030-ADP Software	\$ 291 941 942	2.5%	1 289	\$ 356 865 184	3.7%	1 025	\$ 355 735 061	3.2%	1 261
Public Works and Government Services Canada	\$ 174 416 806	1.5%	527	\$ 158 387 964	1.6%	284	\$ 232 922 109	2.1%	518
Department of National Defence	\$ 45 766 779	0.4%	212	\$ 103 602 343	1.1%	188	\$ 47 735 948	0.4%	191
<i>All others customers <1% in FY17-18</i>									
V502A-Relocation Services	\$ 303 275 012	2.6%	34	\$ 338 899 214	3.5%	18	\$ 125 501 473	1.1%	16
Public Works and Government Services Canada	\$ 172 832 135	1.5%	24	\$ 338 272 394	3.5%	16	\$ 125 501 473	1.1%	14
Treasury Board of Canada	\$ 40 756 383	0.3%	6	\$ 626 820	0.0%	2	\$ -	0.0%	0
JX1285-Fire Control Radar Equipment, Except Airborne - Repair	\$ -	0.0%	0	\$ 305 604 372	3.1%	1	\$ -	0.0%	0
Department of National Defence	\$ -	0.0%	0	\$ 305 604 372	3.1%	1	\$ -	0.0%	0
C216BA-Marine Systems and Engineering	\$ 94 322 036	0.8%	14	\$ 267 780 910	2.7%	12	\$ 199 789 539	1.8%	19
Department of National Defence	\$ 66 695 286	0.6%	9	\$ 232 814 224	2.4%	8	\$ 102 567 538	0.9%	8
Fisheries and Oceans Canada	\$ 27 626 750	0.2%	5	\$ 34 966 686	0.4%	4	\$ 97 222 001	0.9%	11
G009H-Medical Advisory Services	\$ -	0.0%	0	\$ 242 515 102	2.5%	4	\$ 105 824 772	1.0%	7
Department of National Defence	\$ -	0.0%	0	\$ 242 515 102	2.5%	4	\$ 105 824 772	1.0%	7
L004CV-Claims Administration/Processing (insurance plans)	\$ 87 778 106	0.7%	2	\$ 229 385 585	2.3%	4	\$ -	0.0%	5
Health Canada	\$ -	0.0%	1	\$ 153 667 096	1.6%	3	\$ -	0.0%	4
Treasury Board of Canada	\$ 87 778 106	0.7%	1	\$ 75 718 489	0.8%	1	\$ -	0.0%	1
N1610-Aircraft Propellers and Components	\$ 24 155	0.0%	3	\$ 206 450 268	2.1%	1	\$ -	0.0%	0
Department of National Defence	\$ 24 155	0.0%	3	\$ 206 450 268	2.1%	1	\$ -	0.0%	0
N1990-Vessels, Miscellaneous	\$ 82 322 225	0.7%	30	\$ 205 154 300	2.1%	11	\$ 513 970 775	4.7%	10
Department of National Defence	\$ 72 981 813	0.6%	8	\$ 205 137 920	2.1%	10	\$ 513 883 275	4.7%	9
Parks Canada	\$ 143 125	0.0%	4	\$ 16 380	0.0%	1	\$ -	0.0%	0
N2320-Trucks and Truck Tractors, Wheeled	\$ 97 693 026	0.8%	117	\$ 179 221 124	1.8%	70	\$ 113 723 802	1.0%	75
Department of National Defence	\$ 94 728 560	0.8%	36	\$ 127 391 695	1.3%	30	\$ 110 413 579	1.0%	48
Public Works and Government Services Canada	\$ 158 310	0.0%	3	\$ 50 279 907	0.5%	14	\$ -	0.0%	16
JX1510A-Aircraft, Fixed Wing - Repair and Overhaul (Military)	\$ 381 119 730	3.3%	14	\$ 165 112 192	1.7%	12	\$ 192 579 205	1.7%	6
Department of National Defence	\$ 381 119 730	3.3%	14	\$ 165 112 192	1.7%	12	\$ 192 579 205	1.7%	6
5124B-Construction of Commercial Buildings	\$ 109 572 591	0.9%	52	\$ 163 513 741	1.7%	48	\$ 138 627 019	1.3%	30
Public Works and Government Services Canada	\$ 109 572 591	0.9%	52	\$ 163 217 366	1.7%	47	\$ 138 261 067	1.3%	27
Agriculture and Agri-Food Canada	\$ -	0.0%	0	\$ 296 376	0.0%	1	\$ 365 952	0.0%	3
<i>All others goods and services <1.6% in FY17-18</i>	\$ 9 263 076 858	79.1%	13 782	\$ 3 909 841 650	40.0%	12 785	\$ 8 061 421 087	73.2%	13 900
Grand Total	\$11 717 092 552	100.0%	16 935	\$ 9 765 168 661	100.0%	15 938	\$ 11 005 698 220	100.0%	16 833

4.1.3 **ONTARIO region**

The Ontario region consists of the province of Ontario (ON), excluding business in the National Capital Region.

Contracts evaluated for the Ontario region add up to \$ 858.7 millions, \$ 360.5 millions and \$ 446.3 millions in FY16-17, FY17-18 and FY18-19 respectively (sales taxes excluded). The annual average over the three years is worth \$ 555.2 millions and 1 757 contracts per year.

Table 4-5 presents the customers of PSPC-ONTARIO. They are ranked from the largest to the lowest buyer based on FY17-18 expenditures. PSPC is always the largest buyer (34% to 54% of the value of procurement), followed by the Department of National Defence (20% to 33%). Then Environment and Climate Change Canada and the Canada Border Services Agency are two important customers. Altogether these four departments cover at the minimum 83% (in FY18-19) to a maximum of 96% (in FY16-17) of total PSPC-ONTARIO expenditures.

One also notes significantly higher procurement by Fisheries and Oceans Canada, Correctional Service of Canada and Citizenship and Immigration Canada in FY18-19.

Figure 4-5 presents for the FY17-18 the main goods and services according to the GSIN classification that contribute to 70% of the annual procurement (similar figures for FY16-17 and FY18-19 are available in Appendix D.3). Main categories involved are:

- By far, construction works and architectural and engineering services (mostly for buildings, but also for road transportation and marine infrastructures) and associated services for repair and maintenance;
- environmental services;
- meteorological equipment;
- maintenance and management of buildings (cleaning, concierge, security, etc.).

Lastly, Table 4-6 details the information in the previous figure by specifying for each of the main products (those contributing to more than 1.2% of the year total value) the contributions of the customers. Full table without cut-off is available in the Excel appendix of this report.

Table 4-5 : Value, tax excluded, of PSPC-ONTARIO procurement, per customer (sorted on FY17-18 amounts)

ONTARIO	FY16-17			FY17-18			FY18-19		
CUSTOMER NAME	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts
Public Works and Government Services Canada	\$ 460'599'518	53.6%	685	\$ 157'866'220	43.8%	633	\$ 152'989'443	34.3%	629
Department of National Defence	\$ 168'329'439	19.6%	729	\$ 118'900'648	33.0%	682	\$ 140'711'674	31.5%	715
Environment Canada	\$ 108'896'937	12.7%	126	\$ 24'922'806	6.9%	130	\$ 26'477'832	5.9%	123
Canada Border Services Agency	\$ 86'131'960	10.0%	9	\$ 23'782'418	6.6%	7	\$ 51'917'069	11.6%	17
Fisheries and Oceans Canada	\$ 9'872'188	1.1%	66	\$ 12'052'798	3.3%	79	\$ 29'730'702	6.7%	75
Correctional Service of Canada	\$ 10'233'364	1.2%	88	\$ 11'210'151	3.1%	93	\$ 18'185'867	4.1%	82
Health Canada	\$ 870'173	0.1%	9	\$ 2'906'061	0.8%	9	\$ 677'343	0.2%	12
Natural Resources Canada	\$ 1'084'144	0.1%	12	\$ 1'977'258	0.5%	21	\$ 3'672'207	0.8%	19
Parks Canada	\$ 2'327'459	0.3%	20	\$ 1'881'688	0.5%	16	\$ 2'051'447	0.5%	21
Agriculture and Agri-Food Canada	\$ 1'254'612	0.1%	10	\$ 1'198'070	0.3%	14	\$ 913'948	0.2%	16
Transport Canada	\$ 1'261'367	0.1%	6	\$ 1'093'580	0.3%	4	\$ 3'737'912	0.8%	6
FedDev Ontario	\$ 1'086'765	0.1%	2	\$ 814'714	0.2%	4	\$ 635'394	0.1%	2
Public Health Agency of Canada	\$ -	0.0%	1	\$ 627'250	0.2%	2	\$ -	0.0%	1
Canadian Food Inspection Agency	\$ 300'885	0.0%	1	\$ 388'885	0.1%	2	\$ 378'712	0.1%	5
Canadian Space Agency	\$ 247'025	0.0%	7	\$ 204'624	0.1%	4		0.0%	
Office of Infrastructure of Canada	\$ 492'268	0.1%	3	\$ 200'000	0.1%	1	\$ -	0.0%	1
National Research Council Canada	\$ 452'853	0.1%	8	\$ 149'154	0.0%	3	\$ 551'574	0.1%	4
Statistics Canada	\$ 350'368	0.0%	2	\$ 125'288	0.0%	1		0.0%	
Innov, Sci and Econ Devt Can	\$ 344'315	0.0%	12	\$ 84'245	0.0%	4	\$ 210'821	0.0%	4
Royal Canadian Mounted Police	\$ 1'812'925	0.2%	7	\$ 72'700	0.0%	2	\$ 165'837	0.0%	1
Department of Justice Canada	\$ 13'274	0.0%	1	\$ 13'274	0.0%	1	\$ -	0.0%	1
Veterans Affairs Canada	\$ 428'252	0.0%	9		0.0%			0.0%	
Citizenship and Immigration Canada	\$ 2'342'658	0.3%	7		0.0%		\$ 13'274'336	3.0%	2
Canadian Heritage		0.0%			0.0%		\$ 30'826	0.0%	2
Grand Total	\$ 858'732'750	100.0%	1'820	\$ 360'471'832	100.0%	1'712	\$ 446'312'943	100.0%	1'738

Note: Ranking of customers from the largest to the lowest buyer is based on FY17-18 expenditures. The gauge in the % Total column easily identifies for the other years any departures from this ranking.

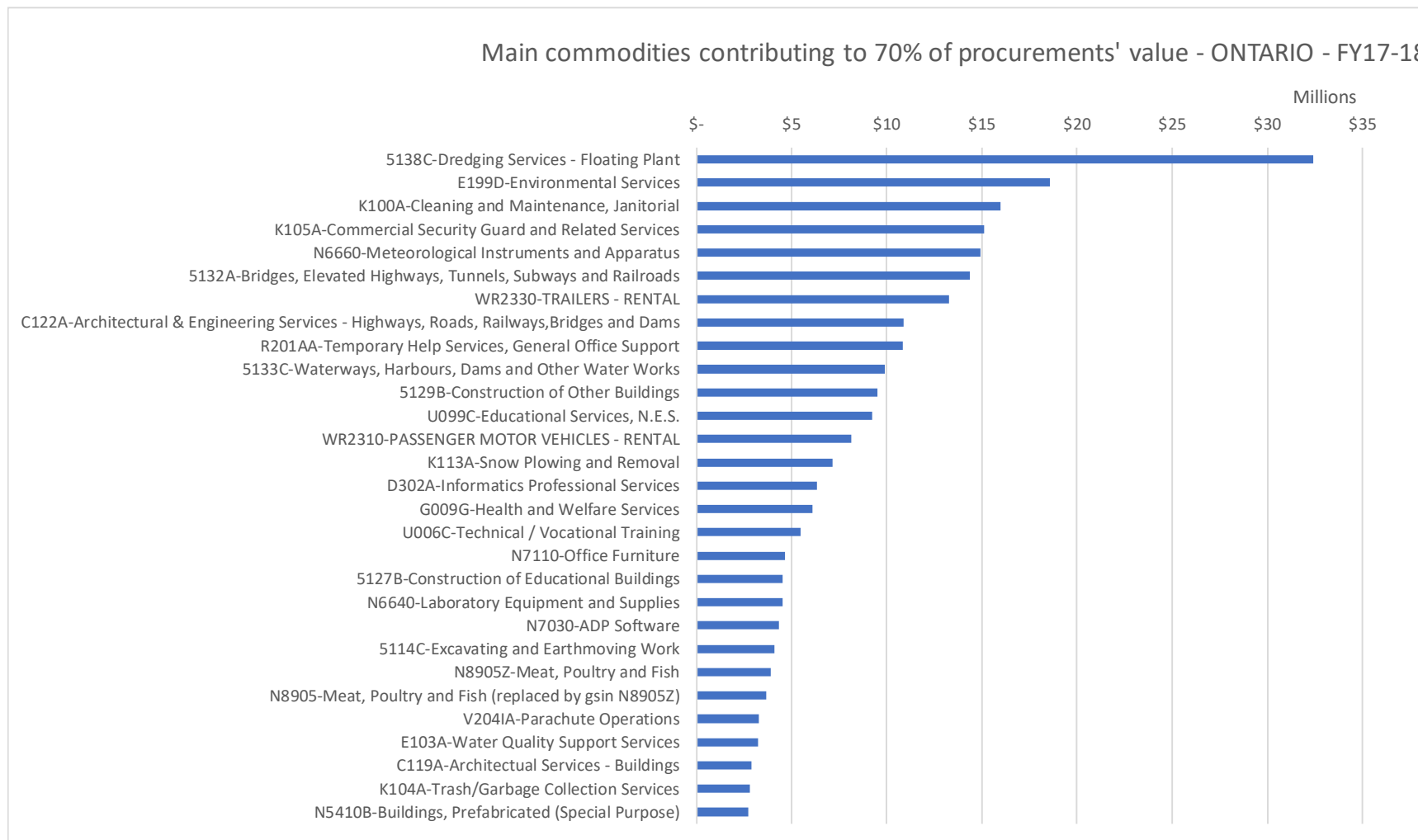


Figure 4-5 : Main goods and services, according to G SIN classification, contributing to 70% of annual PSPC- ONTARIO procurement, by value (tax excluded) in FY17-18.

Table 4-6 : Main commodities and customer by decreasing order of contribution to PSPC-ONTARIO procurement total value (sorting: FY17-18, cut-off: 1.2% of FY17-18 total value) (contribution expressed in % of the total value for the year for commodity and customer)

ONTARIO Commodity (GSIN) Customer	FY16-17			FY17-18			FY18-19		
	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts
5138C-Dredging Services - Floating Plant		0.0%		\$ 32'422'897	9.0%	3	\$ 646'727	0.1%	4
Public Works and Government Services Canada		0.0%		\$ 32'422'897	9.0%	3	\$ 646'727	0.1%	4
E199D-Environmental Services	\$ 922'982	0.1%	11	\$ 18'557'653	5.1%	41	\$ 2'760'568	0.6%	18
Public Works and Government Services Canada	\$ 922'982	0.1%	11	\$ 18'557'653	5.1%	41	\$ 990'656	0.2%	14
Transport Canada		0.0%			0.0%		\$ 1'769'912	0.4%	4
K100A-Cleaning and Maintenance, Janitorial	\$ 929'947	0.1%	17	\$ 15'971'109	4.4%	25	\$ 26'120'295	5.9%	22
Department of National Defence	\$ 430'867	0.1%	11	\$ 15'722'137	4.4%	20	\$ 25'549'581	5.7%	17
Public Works and Government Services Canada	\$ 299'050	0.0%	5	\$ 205'772	0.1%	3	\$ 299'935	0.1%	4
Agriculture and Agri-Food Canada		0.0%		\$ 43'200	0.0%	2		0.0%	
Natural Resources Canada	\$ 200'029	0.0%	1		0.0%			0.0%	
Environment Canada		0.0%			0.0%		\$ 270'778	0.1%	1
K105A-Commercial Security Guard and Related Services	\$ 11'983'148	1.4%	6	\$ 15'106'214	4.2%	2	\$ 37'314'201	8.4%	6
Canada Border Services Agency	\$ 11'841'822	1.4%	3	\$ 15'106'214	4.2%	2	\$ 37'314'201	8.4%	6
Public Works and Government Services Canada	\$ 141'326	0.0%	3		0.0%			0.0%	
N6660-Meteorological Instruments and Apparatus	\$ 11'519'457	1.3%	28	\$ 14'940'242	4.1%	14	\$ 1'496'289	0.3%	16
Environment Canada	\$ 11'376'108	1.3%	23	\$ 14'872'159	4.1%	13	\$ 1'496'289	0.3%	16
Fisheries and Oceans Canada		0.0%		\$ 68'082	0.0%	1		0.0%	
National Research Council Canada	\$ 143'349	0.0%	5		0.0%			0.0%	
5132A-Bridges, Elevated Highways, Tunnels, Subways and Railroads	\$ 1'689'311	0.2%	7	\$ 14'377'448	4.0%	8	\$ 15'064'216	3.4%	5
Public Works and Government Services Canada	\$ 1'689'311	0.2%	7	\$ 14'377'448	4.0%	8	\$ 15'064'216	3.4%	5
WR2330-TRAILERS - RENTAL	\$ -	0.0%	1	\$ 13'274'336	3.7%	3	\$ 578'559	0.1%	6
Public Works and Government Services Canada	\$ -	0.0%	1	\$ 13'274'336	3.7%	3	\$ 578'559	0.1%	6
C122A-Architectural & Engineering Services - Highways, Roads, Railways, Bridges and Dams	\$ 28'034'636	3.3%	65	\$ 10'902'184	3.0%	77	\$ 4'975'956	1.1%	69
Public Works and Government Services Canada	\$ 27'657'673	3.2%	56	\$ 10'783'866	3.0%	72	\$ 3'975'135	0.9%	58
Parks Canada	\$ 122'582	0.0%	5	\$ 97'318	0.0%	4	\$ 953'500	0.2%	8
Fisheries and Oceans Canada	\$ 254'381	0.0%	4	\$ 21'000	0.0%	1	\$ 47'320	0.0%	3
R201AA-Temporary Help Services, General Office Support	\$ 884'956	0.1%	99	\$ 10'830'973	3.0%	123	\$ 2'123'894	-0.5%	127
Public Works and Government Services Canada	\$ 884'956	0.1%	99	\$ 10'830'973	3.0%	123	\$ 2'123'894	-0.5%	127
5133C-Waterways, Harbours, Dams and Other Water Works	\$ 300'718'209	35.0%	37	\$ 9'894'845	2.7%	39	\$ 78'615'815	17.6%	42
Fisheries and Oceans Canada	\$ 4'523'819	0.5%	13	\$ 7'205'450	2.0%	23	\$ 24'854'739	5.6%	18
Public Works and Government Services Canada	\$ 296'194'390	34.5%	24	\$ 2'689'395	0.7%	16	\$ 53'761'076	12.0%	24
5129B-Construction of Other Buildings	\$ 26'396'114	3.1%	35	\$ 9'506'602	2.6%	7	\$ 1'474'999	0.3%	1
Public Works and Government Services Canada	\$ 26'396'114	3.1%	35	\$ 9'506'602	2.6%	7	\$ 1'474'999	0.3%	1
U099C-Educational Services, N.E.S.	\$ 9'727'158	1.1%	6	\$ 9'256'226	2.6%	5	\$ 9'363'007	2.1%	3
Department of National Defence	\$ 9'713'883	1.1%	5	\$ 9'242'951	2.6%	4	\$ 9'363'007	2.1%	2
Department of Justice Canada	\$ 13'274	0.0%	1	\$ 13'274	0.0%	1	\$ -	0.0%	1
WR2310-PASSENGER MOTOR VEHICLES - RENTAL	\$ 180'512	0.0%	7	\$ 8'150'000	2.3%	26	\$ 92'388	0.0%	20
Department of National Defence	\$ 180'512	0.0%	7	\$ 8'150'000	2.3%	26	\$ 92'388	0.0%	20
K113A-Snow Plowing and Removal	\$ 755'535	0.1%	2	\$ 7'160'875	2.0%	5	\$ 1'427'320	0.3%	5
Department of National Defence	\$ 755'535	0.1%	2	\$ 7'160'875	2.0%	5	\$ 1'390'820	0.3%	4
Public Works and Government Services Canada		0.0%			0.0%		\$ 36'500	0.0%	1
D302A-Informatics Professional Services	\$ 2'808'836	0.3%	27	\$ 6'333'654	1.8%	11	\$ 8'042'882	1.8%	17
Department of National Defence	\$ 2'661'772	0.3%	26	\$ 6'333'654	1.8%	11	\$ 8'042'882	1.8%	17
Natural Resources Canada	\$ 147'065	0.0%	1		0.0%			0.0%	
G009G-Health and Welfare Services	\$ 1'147'004	0.1%	1	\$ 6'091'963	1.7%	2	\$ 3'530'224	0.8%	3
Canada Border Services Agency	\$ 1'147'004	0.1%	1	\$ 6'091'963	1.7%	1	\$ 3'530'224	0.8%	3
Correctional Service of Canada		0.0%		\$ -	0.0%	1		0.0%	
U006C-Technical / Vocational Training	\$ 6'275'904	0.7%	7	\$ 5'469'566	1.5%	9	\$ 5'553'683	1.2%	3
Department of National Defence	\$ 6'275'904	0.7%	7	\$ 5'469'566	1.5%	9	\$ 5'553'683	1.2%	3
N7110-Office Furniture	\$ 1'205'213	0.1%	16	\$ 4'672'593	1.3%	23	\$ 8'088'546	1.8%	93
Public Works and Government Services Canada	\$ 787'017	0.1%	12	\$ 4'547'306	1.3%	22	\$ 3'697'585	0.8%	81
Statistics Canada	\$ 350'368	0.0%	2	\$ 125'288	0.0%	1		0.0%	
Department of National Defence	\$ 41'212	0.0%	1		0.0%		\$ 610'135	0.1%	8
Canadian Heritage		0.0%			0.0%		\$ 30'826	0.0%	2
Canada Border Services Agency	\$ 26'617	0.0%	1		0.0%			0.0%	
Correctional Service of Canada		0.0%			0.0%		\$ 3'750'000	0.8%	2
5127B-Construction of Educational Buildings		0.0%		\$ 4'542'166	1.3%	5	\$ 6'185'170	1.4%	10
Public Works and Government Services Canada		0.0%		\$ 4'542'166	1.3%	5	\$ 6'185'170	1.4%	10
N6640-Laboratory Equipment and Supplies	\$ 1'731'788	0.2%	25	\$ 4'517'087	1.3%	40	\$ 3'657'952	0.8%	49
Health Canada	\$ 511'620	0.1%	2	\$ 2'654'826	0.7%	7	\$ 209'903	0.0%	2
Environment Canada	\$ 310'037	0.0%	4	\$ 854'402	0.2%	14	\$ 426'154	0.1%	5
Department of National Defence	\$ 312'072	0.0%	14	\$ 642'065	0.2%	15	\$ 2'258'682	0.5%	31
Agriculture and Agri-Food Canada	\$ 328'374	0.0%	3	\$ 145'356	0.0%	2	\$ 139'771	0.0%	3
Natural Resources Canada	\$ 86'000	0.0%	1	\$ 132'438	0.0%	1	\$ 288'375	0.1%	5
Canadian Food Inspection Agency		0.0%		\$ 88'000	0.0%	1	\$ 77'827	0.0%	1
National Research Council Canada	\$ 183'685	0.0%	1		0.0%		\$ 257'240	0.1%	2

4.1.4 PACIFIC region

The Pacific region consists of British Columbia (BC) and the Yukon Territory (YT).

The contract evaluated add up to \$ 373.1 millions, \$ 509.2 millions and \$ 364.3 millions in FY16-17, FY17-18 and FY18-19 respectively (sales taxes excluded). The annual average over the three years is worth \$ 415.5 millions and 1 721 contracts per year.

Table 4-7 presents the customers of PSPC-PACIFIC. They are ranked from the largest to the lowest buyer based on FY17-18 expenditures. PSPC is always the largest buyer (55% to 72% of the value of procurement), followed by Fisheries and Oceans Canada and the Department of National Defence. These three departments cover from 92% to 94% of total PSPC-PACIFIC expenditures.

Figure 4-6 presents for the FY17-18 the main goods and services according to the GSIN classification that contribute to 70% of the annual procurement (similar figures for FY16-17 and FY18-19 are available in Appendix D.4). Main categories are rather similar as for ONTARIO and involved are:

- By far, construction works and architectural and engineering services (mostly for buildings, but also for road transportation and marine infrastructures) and associated services for repair and maintenance;
- environmental services;
- maintenance and management of buildings (cleaning, concierge, security, etc.);
- and food products also.

Lastly, Table 4-8 details the information in the previous figure by specifying for each of the main products (those contributing to more than 1.1% of the year total value) the contributions of the customers. Full table without cut-off is available in the Excel appendix of this report.

Table 4-7 : Value, tax excluded, of PSPC-PACIFIC procurement, per customer (sorted on FY17-18 amounts)

PACIFIC CUSTOMER NAME	FY16-17			FY17-18			FY18-19		
	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts
Public Works and Government Services Canada	\$ 224'778'154	60.2%	1'008	\$ 367'176'975	72.1%	964	\$ 200'320'799	55.0%	834
Fisheries and Oceans Canada	\$ 78'718'561	21.1%	342	\$ 78'875'083	15.5%	408	\$ 73'684'258	20.2%	329
Department of National Defence	\$ 41'363'951	11.1%	214	\$ 34'193'420	6.7%	183	\$ 66'873'689	18.4%	197
Parks Canada	\$ 4'369'904	1.2%	25	\$ 6'207'530	1.2%	31	\$ 1'642'422	0.5%	28
Canadian Food Inspection Agency	\$ 254'686	0.1%	5	\$ 5'783'616	1.1%	3	\$ 578'781	0.2%	6
Royal Canadian Mounted Police	\$ 4'555'380	1.2%	59	\$ 4'536'846	0.9%	44	\$ 7'078'470	1.9%	51
Environment Canada	\$ 1'242'576	0.3%	7	\$ 3'687'331	0.7%	33	\$ 1'564'506	0.4%	26
National Research Council Canada	\$ 5'431'644	1.5%	69	\$ 3'328'074	0.7%	45	\$ 666'612	0.2%	20
Transport Canada	\$ 1'510'597	0.4%	17	\$ 2'220'881	0.4%	18	\$ 8'525'730	2.3%	30
Natural Resources Canada	\$ 1'063'995	0.3%	12	\$ 1'507'149	0.3%	13	\$ 647'291	0.2%	11
Correctional Service of Canada	\$ 3'338'584	0.9%	30	\$ 699'147	0.1%	16	\$ 176'537	0.0%	7
Agriculture and Agri-Food Canada	\$ 680'384	0.2%	8	\$ 416'553	0.1%	8	\$ 542'831	0.1%	11
Department of Justice Canada				\$ 185'961	0.0%	2	\$ 310'682	0.1%	3
Library and Archives Canada	\$ 336'542	0.1%	2	\$ 173'326	0.0%	4	\$ 33'023	0.0%	1
Statistics Canada		0.0%		\$ 73'757	0.0%	1	\$ 15'380	0.0%	1
Canadian Grain Commission	\$ 52'378	0.0%	1	\$ 52'941	0.0%	1	\$ 26'471	0.0%	1
Canada Border Services Agency	\$ 3'465'600	0.9%	10	\$ 47'574	0.0%	3	\$ 703'196	0.2%	7
Citizenship and Immigration Canada	\$ 844'806	0.2%	3				\$ 503'153	0.1%	1
Employment and Social Development Canada							\$ 41'812	0.0%	1
Treasury Board of Canada							\$ 69'145	0.0%	1
Veterans Affairs Canada	\$ 89'643	0.0%	2						
Communications Security Establishment	\$ 977'170	0.3%	1						
Health Canada							\$ 345'111	0.1%	5
Government of the Northwest Territories	\$ 47'004	0.0%	1						
Grand Total	\$ 373'121'560	100.0%	1'816	\$ 509'166'165	100.0%	1'777	\$ 364'349'899	100.0%	1'571

Note: Ranking of customers from the largest to the lowest buyer is based on FY17-18 expenditures. The gauge in the % Total column easily identifies for the other years any departures from this ranking.

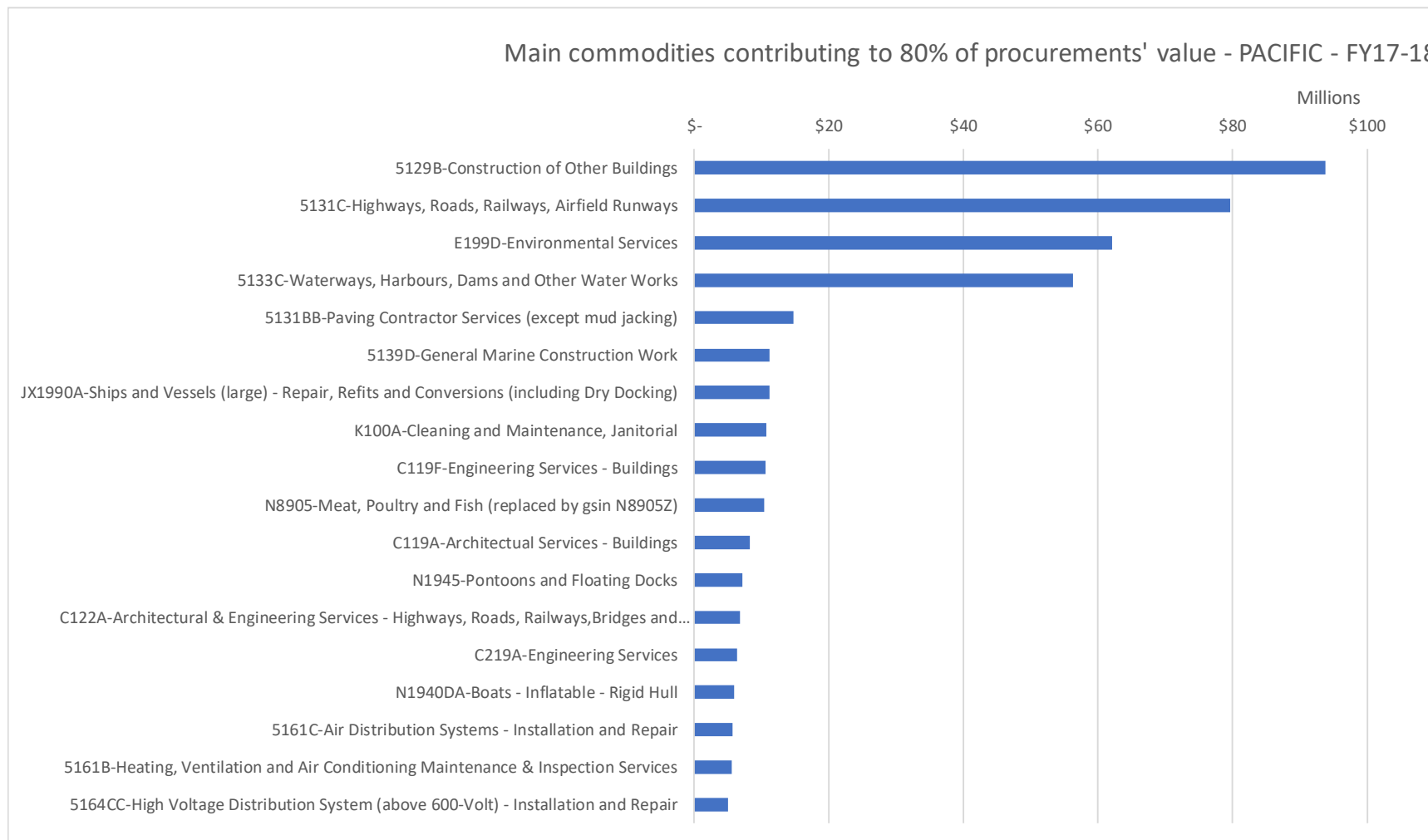


Figure 4-6 : Main goods and services, according to G SIN classification, contributing to 80% of annual PSPC- PACIFIC procurement, by value (tax excluded) in FY17-18.

Table 4-8 : Main commodities and customer by decreasing order of contribution to PSPC-PACIFIC procurement total value (sorting: FY17-18, cut-off: 1.1% of FY17-18 total value) (contribution expressed in % of the total value for the year for commodity and customer)

PACIFIC Commodity (GSIN) Customer	FY16-17			FY17-18			FY18-19		
	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts
5129B-Construction of Other Buildings	\$ 30'709'640	8.2%	163	\$ 93'826'256	18.4%	168	\$ 20'551'307	5.6%	164
Public Works and Government Services Canada	\$ 26'698'984	7.2%	143	\$ 88'375'940	17.4%	143	\$ 15'953'992	4.4%	126
Fisheries and Oceans Canada	\$ 1'720'790	0.5%	15	\$ 3'922'330	0.8%	16	\$ 4'476'669	1.2%	33
Environment Canada	\$ 661'541	0.2%	1	\$ 1'259'793	0.2%	6	\$ 120'646	0.0%	5
Department of National Defence	\$ 1'609'154	0.4%	1	\$ 268'192	0.1%	3		0.0%	
Canadian Food Inspection Agency	\$ 19'169	0.0%	3		0.0%			0.0%	
5131C-Highways, Roads, Railways, Airfield Runways	\$ 18'859'896	5.1%	58	\$ 79'617'278	15.6%	38	\$ 22'520'797	6.2%	39
Public Works and Government Services Canada	\$ 18'859'896	5.1%	58	\$ 79'617'278	15.6%	38	\$ 22'520'797	6.2%	39
E199D-Environmental Services	\$ 69'226'526	18.6%	86	\$ 62'127'673	12.2%	91	\$ 68'494'163	18.8%	75
Public Works and Government Services Canada	\$ 69'226'526	18.6%	86	\$ 62'127'673	12.2%	91	\$ 68'494'163	18.8%	75
5133C-Waterways, Harbours, Dams and Other Water Works	\$ 7'774'573	2.1%	67	\$ 56'308'674	11.1%	75	\$ 9'068'379	2.5%	29
Public Works and Government Services Canada	\$ 3'238'290	0.9%	33	\$ 44'972'419	8.8%	17	\$ 2'785'682	0.8%	10
Fisheries and Oceans Canada	\$ 4'536'283	1.2%	34	\$ 11'112'761	2.2%	56	\$ 6'282'697	1.7%	19
Department of National Defence		0.0%		\$ 223'494	0.0%	2		0.0%	
5131BB-Paving Contractor Services (except mud jacking)	\$ 4'172'512	1.1%	9	\$ 14'718'611	2.9%	25	\$ 886'938	0.2%	9
Public Works and Government Services Canada	\$ 4'003'542	1.1%	6	\$ 14'271'623	2.8%	24	\$ 94'399	0.0%	1
Department of National Defence		0.0%		\$ 446'987	0.1%	1	\$ 536'385	0.1%	3
Fisheries and Oceans Canada	\$ 168'970	0.0%	3		0.0%		\$ 256'154	0.1%	5
5139D-General Marine Construction Work	\$ 6'876'104	1.8%	27	\$ 11'198'503	2.2%	49	\$ 1'783'119	0.5%	23
Fisheries and Oceans Canada	\$ 6'582'603	1.8%	24	\$ 10'681'486	2.1%	45	\$ 1'783'119	0.5%	23
Public Works and Government Services Canada	\$ 293'501	0.1%	3	\$ 517'018	0.1%	4		0.0%	
JX1990A-Ships and Vessels (large) - Repair, Refits and Conversions (including Dry Docking)	\$ 8'882'589	2.4%	13	\$ 11'101'667	2.2%	13	\$ 15'590'746	4.3%	23
Fisheries and Oceans Canada	\$ 8'882'589	2.4%	13	\$ 11'101'667	2.2%	13	\$ 15'590'746	4.3%	23
K100A-Cleaning and Maintenance, Janitorial	\$ 4'267'983	1.1%	28	\$ 10'741'747	2.1%	37	\$ 5'163'380	1.4%	40
Department of National Defence	\$ 3'271'459	0.9%	13	\$ 9'654'158	1.9%	8	\$ 4'281'918	1.2%	19
Public Works and Government Services Canada	\$ 478'716	0.1%	7	\$ 928'478	0.2%	21	\$ 690'681	0.2%	14
Natural Resources Canada	\$ 79'933	0.0%	1	\$ 82'246	0.0%	1	\$ 39'335	0.0%	3
Transport Canada	\$ 28'114	0.0%	1	\$ 76'866	0.0%	6	\$ 112'551	0.0%	3
Royal Canadian Mounted Police	\$ 114'971	0.0%	4		0.0%			0.0%	
Agriculture and Agri-Food Canada	\$ 288'532	0.1%	1	\$ -	0.0%	1	\$ 38'895	0.0%	1
National Research Council Canada	\$ 6'258	0.0%	1		0.0%			0.0%	
C119F-Engineering Services - Buildings	\$ 7'867'876	2.1%	142	\$ 10'636'715	2.1%	125	\$ 3'392'036	0.9%	93
Department of National Defence		0.0%		\$ 5'314'679	1.0%	2		0.0%	
Public Works and Government Services Canada	\$ 7'656'139	2.1%	136	\$ 4'212'768	0.8%	110	\$ 3'383'302	0.9%	90
Fisheries and Oceans Canada	\$ 211'737	0.1%	6	\$ 1'109'268	0.2%	13	\$ 8'734	0.0%	2
Environment Canada		0.0%			0.0%		\$ -	0.0%	1
N8905-Meat, Poultry and Fish (replaced by gsln N8905Z)	\$ 11'192'562	3.0%	7	\$ 10'330'592	2.0%	18	\$ -	0.0%	18
Public Works and Government Services Canada	\$ 11'192'562	3.0%	7	\$ 10'330'592	2.0%	18	\$ -	0.0%	18
C119A-Architectural Services - Buildings	\$ 14'013'285	3.8%	106	\$ 8'224'550	1.6%	68	\$ 6'264'752	1.7%	86
Public Works and Government Services Canada	\$ 11'666'602	3.1%	97	\$ 8'224'550	1.6%	68	\$ 6'185'099	1.7%	85
Environment Canada		0.0%			0.0%		\$ 79'653	0.0%	1
Fisheries and Oceans Canada	\$ 2'346'683	0.6%	9		0.0%			0.0%	
N1945-Pontoons and Floating Docks	\$ 2'718'729	0.7%	28	\$ 7'166'296	1.4%	2		0.0%	
Fisheries and Oceans Canada	\$ 2'613'461	0.7%	23	\$ 7'166'296	1.4%	2		0.0%	
Department of National Defence	\$ 105'268	0.0%	5		0.0%			0.0%	
C122A-Architectural & Engineering Services - Highways, Roads, Railways, Bridges and Dams	\$ 9'988'117	2.7%	38	\$ 6'832'547	1.3%	45	\$ 4'208'229	1.2%	43
Public Works and Government Services Canada	\$ 8'372'689	2.2%	36	\$ 6'832'547	1.3%	45	\$ 4'208'229	1.2%	43
Fisheries and Oceans Canada	\$ 1'615'428	0.4%	2		0.0%			0.0%	
C219A-Engineering Services	\$ 301'190	0.1%	8	\$ 6'374'333	1.3%	4		0.0%	
Public Works and Government Services Canada		0.0%		\$ 6'257'822	1.2%	2		0.0%	
National Research Council Canada	\$ 301'190	0.1%	8	\$ 116'511	0.0%	2		0.0%	
N1940DA-Boats - Inflatable - Rigid Hull	\$ 1'773'569	0.5%	22	\$ 5'874'930	1.2%	29	\$ 2'673'816	0.7%	23
Fisheries and Oceans Canada	\$ 66'151	0.0%	8	\$ 5'229'188	1.0%	16	\$ 2'030'822	0.6%	15
Royal Canadian Mounted Police	\$ 1'219'939	0.3%	10	\$ 408'487	0.1%	9		0.0%	
Transport Canada	\$ 150'795	0.0%	1	\$ 150'795	0.0%	1		0.0%	
Parks Canada	\$ 336'684	0.1%	3	\$ 86'461	0.0%	3	\$ -	0.0%	2
Canada Border Services Agency		0.0%			0.0%		\$ 642'994	0.2%	6

4.1.5 *WESTERN region*

The Western region consists of Manitoba (MB), Saskatchewan (SK), Alberta (AB), Nunavut (NU), and the Northwest Territories (NT).

The contract evaluated add up to \$ 677.5 millions, \$ 543.2 millions and \$ 560.9 millions in FY16-17, FY17-18 and FY18-19 respectively (sales taxes excluded). The annual average over the three years is worth \$ 593.8 millions and 3'187 contracts per year.

Table 4-9 presents the customers of PSPC-WESTERN. They are ranked from the largest to the lowest buyer based on FY17-18 expenditures. Again, PSPC is always the largest buyer (54% to 63% of the total value of procurement), followed by the Department of National Defence (19% to 23%). Next, the Royal Canadian Mounted Police, Health Canada, and the Correctional Service of Canada are minor contributors (2 to 5%, even if the Royal Canadian Mounted Police topped 11% in FY18-19).

Figure 4-7 presents for the FY17-18 the main goods and services according to the G SIN classification that contribute to 70% of the annual procurement (similar figures for FY16-17 and FY18-19 are available in Appendix D.5). Main categories involved are:

- Mostly, construction works and architectural and engineering services (mostly for buildings, but also for road and rail transportation infrastructures) and associated services for repair and maintenance;
- also important, the recurrent special environmental services (G SIN E108F-Northern Contaminated Site Environmental Clean-up Work/Services);
- maintenance and management of buildings (cleaning, concierge, security, etc.).

Lastly, Table 4-10 details the information in the previous figure by specifying for each of the main products (those contributing to more than 1.1% of the year total value) the contributions of the customers. Full table without cut-off is available in the Excel appendix of this report.

It is also worth noting in FY16-17 a single procurement for electricity services (customer is PSPSC) that accounts for 18% of the total amount that year. It is not displayed in Table 4-10 because it is sorted for the FY17-18, but it appears in Appendix D.5 and in the Excel appendix. This procurement will affect the carbon footprint results.

Table 4-9 : Value, tax excluded, of PSPC-WESTERN procurement, per customer (sorted on FY17-18 amounts)

WESTERN CUSTOMER NAME	FY16-17			FY17-18			FY18-19		
	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts
Public Works and Government Services Canada	\$ 428'238'824	63.2%	1'605	\$ 310'950'079	57.2%	1'870	\$ 300'564'308	53.6%	1'574
Department of National Defence	\$ 133'142'397	19.7%	766	\$ 101'177'980	18.6%	759	\$ 127'629'574	22.8%	814
Correctional Service of Canada	\$ 13'586'225	2.0%	180	\$ 31'795'606	5.9%	228	\$ 13'359'220	2.4%	178
Public Health Agency of Canada	\$ 5'576'652	0.8%	58	\$ 28'764'596	5.3%	96	\$ 10'837'788	1.9%	88
Parks Canada	\$ 6'005'844	0.9%	38	\$ 19'237'335	3.5%	57	\$ 5'562'779	1.0%	68
Health Canada	\$ 36'727'048	5.4%	55	\$ 16'249'282	3.0%	42	\$ 16'008'591	2.9%	42
Royal Canadian Mounted Police	\$ 16'095'949	2.4%	47	\$ 8'835'405	1.6%	52	\$ 62'692'426	11.2%	70
Agriculture and Agri-Food Canada	\$ 12'792'457	1.9%	126	\$ 7'259'664	1.3%	92	\$ 5'976'730	1.1%	83
Environment Canada	\$ 4'574'995	0.7%	35	\$ 5'445'745	1.0%	34	\$ 5'134'656	0.9%	36
Fisheries and Oceans Canada	\$ 3'095'921	0.5%	31	\$ 4'967'052	0.9%	64	\$ 5'797'876	1.0%	42
Canadian Grain Commission	\$ 890'601	0.1%	16	\$ 3'226'787	0.6%	30	\$ 732'242	0.1%	15
Natural Resources Canada	\$ 3'043'890	0.4%	23	\$ 1'661'529	0.3%	17	\$ 1'446'039	0.3%	24
Indigenous and Northern Affairs Canada	\$ 2'410'850	0.4%	8	\$ 1'371'997	0.3%	28	\$ 1'106'979	0.2%	22
National Research Council Canada	\$ 1'324'780	0.2%	16	\$ 738'395	0.1%	5	\$ 1'574'542	0.3%	24
Canadian Food Inspection Agency	\$ 6'994'818	1.0%	26	\$ 728'882	0.1%	17	\$ 872'517	0.2%	15
Western Economic Diversification Canada	\$ 40'671	0.0%	1	\$ 426'088	0.1%	3	\$ 332'803	0.1%	1
Employment and Social Development Canada	\$ 389'018	0.1%	1	\$ 231'060	0.0%	1	\$ -	0.0%	5
National Energy Board	\$ 316'773	0.0%	2	\$ 62'213	0.0%	1	\$ 533'609	0.1%	9
Polar Knowledge Canada		0.0%		\$ 26'880	0.0%	1	\$ 160'061	0.0%	3
Citizenship and Immigration Canada	\$ 1'093'898	0.2%	4	\$ 26'154	0.0%	1	\$ 6'818	0.0%	2
Transport Canada	\$ 358'619	0.1%	3	\$ 18'977	0.0%	1	\$ 141'719	0.0%	1
Shared Services Canada	\$ 659'818	0.1%	1		0.0%			0.0%	
Department of Justice Canada		0.0%			0.0%		\$ 405'672	0.1%	1
Innov, Sci and Econ Devt Can	\$ 79'075	0.0%	1		0.0%			0.0%	
Canada Border Services Agency	\$ 11'463	0.0%	1		0.0%			0.0%	
Grand Total	\$ 677'450'588	100.0%	3'044	\$ 543'201'706	100.0%	3'399	\$ 560'876'949	100.0%	3'117

Note: Ranking of customers from the largest to the lowest buyer is based on FY17-18 expenditures. The gauge in the % Total column easily identifies for the other years any departures from this ranking.

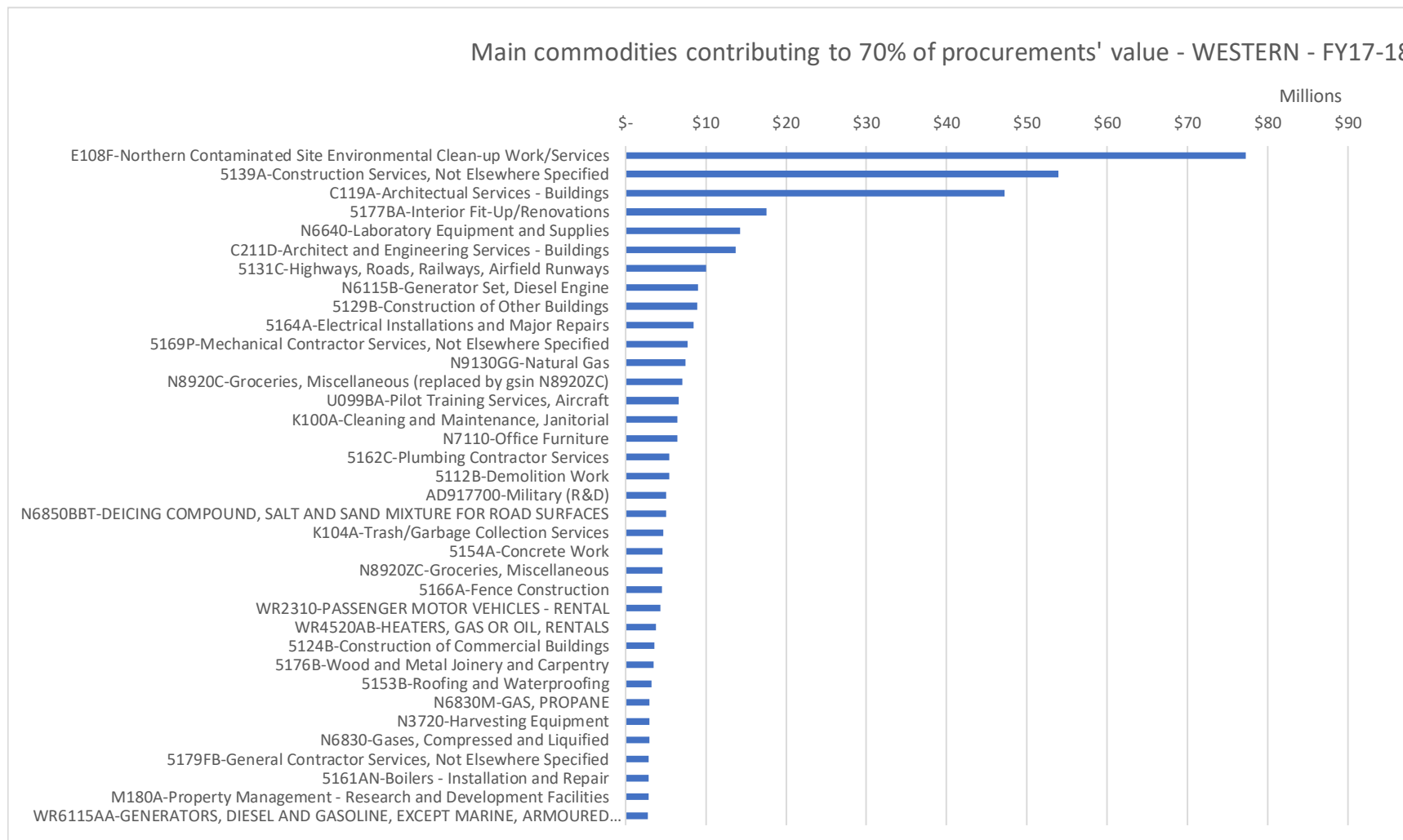


Figure 4-7 : Main goods and services, according to G SIN classification, contributing to 70% of annual PSPC-WESTERN procurement, by value (tax excluded) in FY17-18.

Table 4-10 : Main commodities and customer by decreasing order of contribution to PSPC-WESTERN procurement total value (sorting: FY17-18, cut-off: 1.3% of FY17-18 total value) (contribution expressed in % of the total value for the year for commodity and customer)

WESTERN Commodity (GSIN) Customer	FY16-17			FY17-18			FY18-19		
	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts	Net Value (tax excluded)	% Total	# Contracts
E108F-Northern Contaminated Site Environmental Clean-up Work/Services	\$ 120'302'593	17.8%	81	\$ 77'230'683	14.2%	87	\$ 115'898'300	20.7%	63
Public Works and Government Services Canada	\$ 119'298'204	17.6%	80	\$ 76'824'192	14.1%	85	\$ 115'845'004	20.7%	61
Department of National Defence	\$ 1'004'389	0.1%	1	\$ 406'491	0.1%	2	\$ 53'296	0.0%	2
5139A-Construction Services, Not Elsewhere Specified	\$ 8'052'906	1.2%	20	\$ 53'940'757	9.9%	52	\$ 31'683'609	5.6%	41
Public Works and Government Services Canada	\$ 7'907'305	1.2%	19	\$ 45'080'663	8.3%	49	\$ 31'325'788	5.6%	37
Correctional Service of Canada		0.0%		\$ 8'860'094	1.6%	2	\$ 357'822	0.1%	4
Department of National Defence	\$ 145'601	0.0%	1	\$ -	0.0%	1		0.0%	
C119A-Architectural Services - Buildings	\$ 44'421'637	6.6%	262	\$ 47'239'294	8.7%	383	\$ 7'578'347	1.4%	261
Public Works and Government Services Canada	\$ 41'953'145	6.2%	254	\$ 46'926'235	8.6%	378	\$ 7'549'620	1.3%	259
Agriculture and Agri-Food Canada	\$ 65'853	0.0%	1	\$ 178'027	0.0%	1		0.0%	
Environment Canada		0.0%		\$ 96'984	0.0%	1	\$ 13'294	0.0%	1
Royal Canadian Mounted Police	\$ 2'202'195	0.3%	4	\$ 38'048	0.0%	3	\$ 15'434	0.0%	1
Correctional Service of Canada	\$ 79'041	0.0%	1		0.0%			0.0%	
Canada Border Services Agency	\$ 11'463	0.0%	1		0.0%			0.0%	
Indigenous and Northern Affairs Canada	\$ 109'940	0.0%	1		0.0%			0.0%	
5177BA-Interior Fit-Up/Renovations	\$ 15'869'429	2.3%	87	\$ 17'522'495	3.2%	141	\$ 15'944'250	2.8%	167
Public Works and Government Services Canada	\$ 15'869'429	2.3%	87	\$ 16'869'633	3.1%	134	\$ 15'913'494	2.8%	163
Fisheries and Oceans Canada		0.0%		\$ 652'862	0.1%	7	\$ 30'756	0.0%	4
N6640-Laboratory Equipment and Supplies	\$ 4'578'751	0.7%	56	\$ 14'290'029	2.6%	109	\$ 7'031'250	1.3%	100
Public Health Agency of Canada	\$ 943'543	0.1%	10	\$ 4'431'942	0.8%	30	\$ 2'325'877	0.4%	32
Public Works and Government Services Canada		0.0%		\$ 3'882'705	0.7%	1		0.0%	
Department of National Defence	\$ 228'044	0.0%	2	\$ 1'356'863	0.2%	11	\$ 568'422	0.1%	12
Agriculture and Agri-Food Canada	\$ 922'800	0.1%	16	\$ 1'351'503	0.2%	22	\$ 1'586'487	0.3%	16
Indigenous and Northern Affairs Canada		0.0%		\$ 1'122'066	0.2%	18	\$ 188'426	0.0%	5
Canadian Grain Commission	\$ 504'713	0.1%	5	\$ 774'041	0.1%	7	\$ 438'967	0.1%	7
Royal Canadian Mounted Police	\$ 39'053	0.0%	1	\$ 459'881	0.1%	3		0.0%	
Fisheries and Oceans Canada	\$ 131'614	0.0%	2	\$ 257'166	0.0%	6	\$ 420'313	0.1%	7
National Research Council Canada	\$ 643'337	0.1%	9	\$ 208'387	0.0%	3	\$ 565'746	0.1%	7
Canadian Food Inspection Agency	\$ 939'146	0.1%	7	\$ 178'611	0.0%	3	\$ 551'500	0.1%	4
Natural Resources Canada		0.0%		\$ 133'877	0.0%	2	\$ 338'244	0.1%	9
Correctional Service of Canada		0.0%		\$ 55'402	0.0%	1		0.0%	
Health Canada	\$ 92'389	0.0%	1	\$ 48'534	0.0%	1		0.0%	
Environment Canada	\$ 134'111	0.0%	3	\$ 29'053	0.0%	1	\$ 47'268	0.0%	1
C211D-Architect and Engineering Services - Buildings	\$ 6'445'250	1.0%	109	\$ 13'728'237	2.5%	155	\$ 12'547'938	2.2%	100
Public Works and Government Services Canada	\$ 5'732'394	0.8%	104	\$ 10'454'513	1.9%	149	\$ 12'413'011	2.2%	94
Royal Canadian Mounted Police		0.0%		\$ 3'224'020	0.6%	3	\$ 4'368	0.0%	3
Agriculture and Agri-Food Canada	\$ 64'525	0.0%	1	\$ 40'775	0.0%	1		0.0%	
Environment Canada	\$ 374'715	0.1%	2	\$ 8'929	0.0%	2	\$ 130'560	0.0%	3
Natural Resources Canada	\$ 140'672	0.0%	1		0.0%			0.0%	
Correctional Service of Canada	\$ 132'944	0.0%	1		0.0%			0.0%	
5131C-Highways, Roads, Railways, Airfield Runways	\$ 1'983'902	0.3%	20	\$ 10'063'524	1.9%	5	\$ 9'248'756	1.6%	14
Parks Canada		0.0%		\$ 9'851'753	1.8%	2	\$ 4'368'258	-0.8%	6
Public Works and Government Services Canada	\$ 390'404	0.1%	9	\$ 211'771	0.0%	3	\$ 13'247'232	2.4%	7
Agriculture and Agri-Food Canada	\$ 374'748	0.1%	4		0.0%			0.0%	
Department of National Defence		0.0%			0.0%		\$ 369'781	0.1%	1
Natural Resources Canada	\$ 1'218'751	0.2%	7		0.0%			0.0%	
N6115B-Generator Set, Diesel Engine		0.0%		\$ 9'059'646	1.7%	9	\$ 5'650'317	1.0%	7
Public Works and Government Services Canada		0.0%		\$ 8'320'083	1.5%	6	\$ 4'678'336	0.8%	4
Department of National Defence		0.0%		\$ 739'563	0.1%	3	\$ 924'454	0.2%	2
Parks Canada		0.0%			0.0%		\$ 47'527	0.0%	1
5129B-Construction of Other Buildings	\$ 38'846'879	5.7%	244	\$ 8'931'332	1.6%	228	\$ 70'958'651	12.7%	154
Public Works and Government Services Canada	\$ 38'713'246	5.7%	242	\$ 7'680'290	1.4%	221	\$ 18'749'404	3.3%	142
Fisheries and Oceans Canada		0.0%		\$ 1'251'042	0.2%	7	\$ 167'101	0.0%	7
Royal Canadian Mounted Police		0.0%			0.0%		\$ 52'042'146	9.3%	5
Agriculture and Agri-Food Canada	\$ 36'566	0.0%	1		0.0%			0.0%	
Health Canada	\$ 97'068	0.0%	1		0.0%			0.0%	
5164A-Electrical Installations and Major Repairs	\$ 873'609	0.1%	3	\$ 8'479'095	1.6%	12	\$ 12'462'868	2.2%	23
Public Health Agency of Canada	\$ -	0.0%	2	\$ 4'622'268	0.9%	4		0.0%	
Public Works and Government Services Canada		0.0%		\$ 3'856'827	0.7%	8	\$ 12'462'868	2.2%	23
Department of National Defence	\$ 873'609	0.1%	1		0.0%			0.0%	
5169P-Mechanical Contractor Services, Not Elsewhere Specified	\$ 536'183	0.1%	4	\$ 7'715'052	1.4%	4	\$ 3'355'915	0.6%	58
Public Works and Government Services Canada	\$ 258'847	0.0%	2	\$ 5'403'918	1.0%	2	\$ 1'091'003	0.2%	56
Department of National Defence	\$ 277'336	0.0%	2	\$ 2'311'134	0.4%	2	\$ 2'264'911	0.4%	2
N9130GG-Natural Gas		0.0%		\$ 7'445'648	1.4%	1		0.0%	
Public Works and Government Services Canada		0.0%		\$ 7'445'648	1.4%	1		0.0%	

4.2 Carbon footprint of PSPC procurement

Unlike the economic analysis above, carbon footprint figures are reported for all procurement that could be assessed, that is it does not account for the procurement that had to be excluded from the analysis (about 0.08% in value, see 3.2.2.2). Annual estimates of life cycle GHG associated with the procurement of the five regions under study add up to:

- **4 052 150 tonnes CO₂eq for FY16-17**, or 0.283 kg CO₂eq/\$ tax excluded (GHG intensity);
- **3 642 599 tonnes CO₂eq for FY17-18**, or 0.310 kg CO₂eq/\$;
- **3 964 327 tonnes CO₂eq for FY18-19**, or 0.305 kg CO₂eq/\$.

As suspected from the economic analysis above, the environmental footprint of the regions varies significantly with time and from one region to another (Figure 4-8).

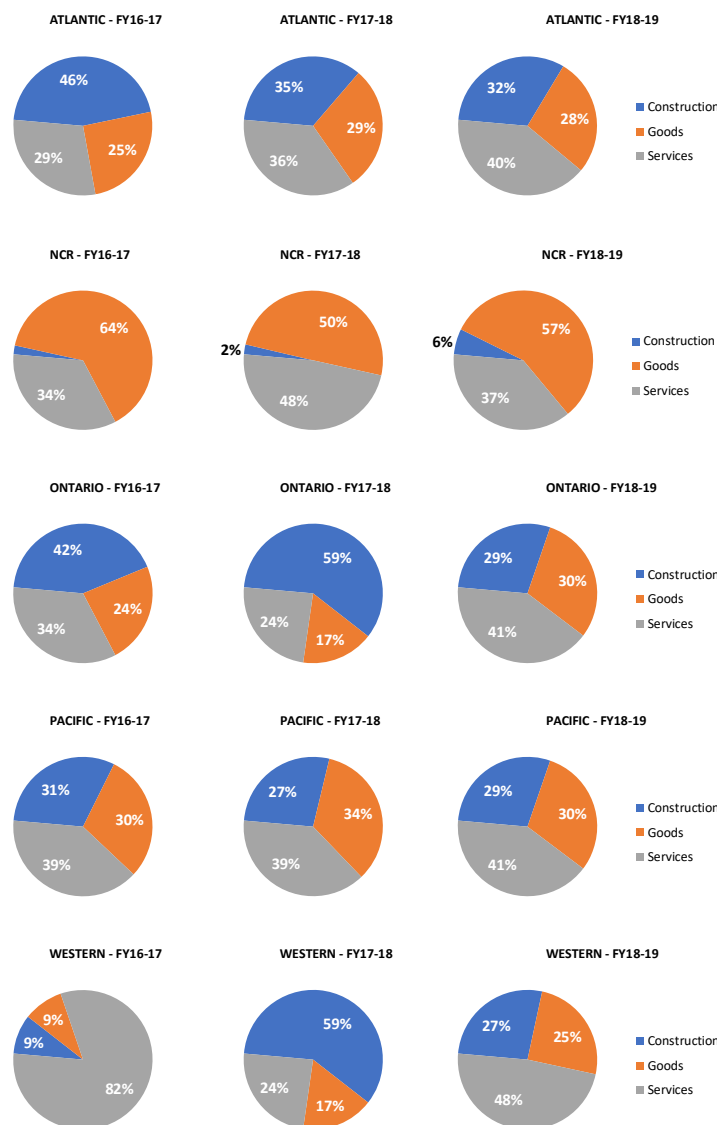


Figure 4-8 : Share of the three main groups of commodities in the carbon footprint of every region.

Regional results below will be presented with a first table showing, as for the economic analysis, for each of the three years, the carbon footprint (as tonnes of CO₂eq) per customer. The table also displays the resulting GHG emission intensity of the customer (kg CO₂eq/\$ tax excluded). Customers are ranked from the largest to the lowest contributor to the footprint of the FY17-18 (arbitrary choice of year). Again, the gauge in the % Total column easily identifies for the other years any departures from this ranking.

To overcome the interannual variability (and any bias), and to help identifying the key categories of procurement that will deserve a particular attention in the perspective of reducing the GHG from the federal government's procurement, a second table is provided. With the carbon footprint results aggregated over the three years, it presents the top-6 customers contributing the most to the footprint of the region's procurement and, for each of them, the top-5 commodities (according to the G SIN classification) contributing to their own footprint.

Appendix E also presents the variability with year of the GHG emissions intensity of every customer and compares it with the average GHG intensity of the region.

4.2.1 ATLANTIC region

Every year, PSPC (i.e. Public Works and Government Services Canada), then the Department of National Defence and Fisheries and Oceans Canada are the associated with most of the carbon footprint (over 90%) (Table 4-11).

From Table 4-12, PSPC contributes significantly through construction activities for non-residential buildings, for waterways and harbours, and for transportation. Goods and services of this type, and more broadly all those associated with the construction, maintenance and repair of infrastructure and all civil works, all have a high life cycle GHG intensity. For Fisheries and Oceans Canada, GHG emissions are associated with large vessel repair activities and with fisheries resources management services which is very likely consuming marine fuel, hence emitting GHG. For the Department of National Defence, GHG are mainly associated with the production of the marine fuel required for vessels.

Through the interannual change in the GHG emissions intensity of every customer (see Figure in Appendix E.1), we can identify the marked variability with years of procurement for some customers, in proportion and/or in kind (e.g. the Department of National Defence, from 0.25 to 0.40 kg CO₂eq/\$). For some others however, the variability remains weak (e.g. PSPC). The average intensity over the three years studied is 0.329 kg CO₂eq/\$.

Table 4-11 : Carbon footprint (t CO₂eq) and GHG emission intensity of PSPC-ATLANTIC procurement, per customer (sorted on FY17-18 amounts)

ATLANTIC CUSTOMER NAME	FY16-17			FY17-18			FY18-19		
	GHG (t CO ₂ eq)	% Total	kg CO ₂ eq/\$	GHG (t CO ₂ eq)	% Total	kg CO ₂ eq/\$	GHG (t CO ₂ eq)	% Total	kg CO ₂ eq/\$
Public Works and Government Services Canada	120'466	52.7%	0.319	75'421	40.8%	0.291	76'372	38.3%	0.310
Department of National Defence	46'341	20.3%	0.393	47'963	25.9%	0.344	39'926	20.0%	0.264
Fisheries and Oceans Canada	43'508	19.0%	0.417	45'321	24.5%	0.414	63'815	32.0%	0.455
Correctional Service of Canada	6'024	2.6%	0.534	5'361	2.9%	0.605	6'257	3.1%	0.385
Transport Canada	629	0.3%	0.407	2'944	1.6%	0.488	1'340	0.7%	0.334
Royal Canadian Mounted Police	2'021	0.9%	0.202	2'152	1.2%	0.212	1'150	0.6%	0.195
Veterans Affairs Canada	3'901	1.7%	0.142	2'087	1.1%	0.139	6'925	3.5%	0.129
Parks Canada	1'885	0.8%	0.410	1'759	1.0%	0.391	1'604	0.8%	0.597
Environment Canada	85	0.0%	0.365	485	0.3%	0.355	304	0.2%	0.367
Canadian Food Inspection Agency	1'889	0.8%	0.282	293	0.2%	0.232	393	0.2%	0.203
Employment and Social Development Canada	226	0.1%	0.159	290	0.2%	0.143	169	0.1%	0.133
Agriculture and Agri-Food Canada	318	0.1%	0.226	210	0.1%	0.250	467	0.2%	0.255
Citizenship and Immigration Canada	41	0.0%	0.235	196	0.1%	0.215	38	0.0%	0.150
Health Canada	68	0.0%	0.156	128	0.1%	0.152	33	0.0%	0.164
National Research Council Canada	597	0.3%	0.198	90	0.0%	0.180	160	0.1%	0.174
Atlantic Canada Opportunities Agency	272	0.1%	0.138	81	0.0%	0.128	43	0.0%	0.119
Natural Resources Canada	414	0.2%	0.228	58	0.0%	0.204	213	0.1%	0.184
Canada Border Services Agency		0.0%			0.0%		273	0.1%	0.505
Innov, Sci and Econ Devt Can	41	0.0%	0.281		0.0%		7	0.0%	0.137
Grand Total	228'724	100.0%	0.340	184'838	100.0%	0.329	199'490	100.0%	0.317

Note: Ranking of customers from the largest to the lowest buyer is based on FY17-18 carbon footprint. The gauge in the % Total column easily identifies for the other years any departures from this ranking.

Table 4-12 : Top-5 commodities (GSIN) of every of the top-6 most contributing customers over the three years; PSPC-ATLANTIC.

ATLANTIC CUSTOMER NAME Commodity (GSIN)	FY16-17 to FY18-19	
	GHG (t CO2eq)	% of total footprint (bold); % of customer footprint (plain)
Public Works and Government Services Canada	272'259	44.4%
5129B-Construction of Other Buildings	45'110	16.6%
5133C-Waterways, Harbours, Dams and Other Water Works	34'698	12.7%
5131C-Highways, Roads, Railways, Airfield Runways	33'652	12.4%
5169G-Refrigeration Systems - Installation and Repair	17'228	6.3%
N8910-Dairy Foods and Eggs (replaced by gsin N8910Z)	14'768	5.4%
<i>Other commodities</i>	126'804	46.6%
Fisheries and Oceans Canada	152'643	24.9%
JX1990A-Ships and Vessels (large) - Repair, Refits and Conversions (including Dry Docking)	32'935	21.6%
F030A-Fisheries Resources Management Services	18'511	12.1%
N9150-Oils and Greases, Cutting, Lubricating, and Hydraulic	10'702	7.0%
5133C-Waterways, Harbours, Dams and Other Water Works	8'718	5.7%
JX1990C-Ships and Vessels (small) - Repair, Refits and Conversions (excluding Dry Docks)	8'043	5.3%
<i>Other commodities</i>	73'734	48.3%
Department of National Defence	134'229	21.9%
N9140G-Marine Fuel	24'806	18.5%
R114A-Logistics Support Services Military Aerospace Related	11'626	8.7%
N8920ZC-Groceries, Miscellaneous	5'398	4.0%
K100A-Cleaning and Maintenance, Janitorial	4'977	3.7%
X112A-Conference Space and Facilities	4'539	3.4%
<i>Other commodities</i>	82'883	61.7%
Correctional Service of Canada	17'642	2.9%
N8920ZC-Groceries, Miscellaneous	3'475	19.7%
G103B-Social Rehabilitation Services for Prisoners	1'925	10.9%
N8905-Meat, Poultry and Fish (replaced by gsin N8905Z)	1'831	10.4%
N8135E-FIBERBOARD, SOLID, HARD PRESSED	1'685	9.6%
N5680-Construction Material, Miscellaneous	1'377	7.8%
<i>Other commodities</i>	7'348	41.6%
Veterans Affairs Canada	12'913	2.1%
D302A-Informatics Professional Services	4'664	36.1%
G009G-Health and Welfare Services	4'135	32.0%
G009KA-Counselling Services	1'152	8.9%
G009N-Occupational Therapy	647	5.0%
K107DA-Grounds Maintenance	443	3.4%
<i>Other commodities</i>	1'872	14.5%
Royal Canadian Mounted Police	5'322	0.9%
K105A-Commercial Security Guard and Related Services	3'840	72.1%
V502CA-Accommodation and/or Food Support Services	570	10.7%
D316AB-Radio Broadcasting Services	446	8.4%
JX6350-Alarm and Signal Systems, Miscellaneous - Repair, Overhaul and Maintenance	120	2.3%
N5620-Tiles, Bricks and Blocks	85	1.6%
<i>Other commodities</i>	261	4.9%
Other customers	18'043	2.9%
Grand Total	613'053	100.0%

4.2.2 NCR region

The NCR is a particular region due, first, to the large amount of procurement (in value and in number of contracts) compared to other regions (see Table 2-1). They involve 93 different customers, with as many different needs in terms of commodities bought. In comparison, other regions have a maximum of 25 customers. Summed over the three years, the carbon footprint of PSPC-NCR amounts to 9 435 957 t CO₂eq, that is 81% of the total footprint of the five regions, 11 times higher than that of the region emitting the most (PSPC-WESTERN) and about 27 times higher than the least-emitting (PSPC-PACIFIC). The nature of these procurement also differs, and this translates into how commodities contributes to the carbon footprint. Figure 4-8 above shows that construction-related goods or services are almost absent from PSPC-NCR's footprint, whereas all other regions display rather homogeneous combination between goods, services and construction (WESTERN is a special case in FY16-17 and FY17-18, though).

Table 4-14 presents the 25 first customers contributing the most to the carbon footprint (cut-off 0.06% - see note). Full table is available in Appendix E.2. Every year, the Department of National Defence is causing by far most of the GHGs emitted (66% in FY16-17, 52% in FY17-18 and 58% in FY18-19), followed by PSPC (23%, 28%, and 19%).

Table 4-15 identifies the most contributing commodities per customer, while Table 4-13 below aggregate the top-12 commodities of concern for PSPC-NCR. The production of fuels (propellants and fuels, especially for DND and Fisheries and Oceans Canada) causes large GHG by the petroleum industry, hence their large GHG intensity (even though GHG from the combustion of the fuels by the user is not included in our assessment) and their large contribution here, despite their (proportionally) low contribution to the value of the procurement. One of the largest contributions relates to the fabrication of military vehicles (aircraft, vessels, submarines) and their maintenance. Noteworthy, and especially in FY16-17 and FY17-18, relocation services (which relies on transportation involving fuel combustion) and drugs and biologicals purchased by PSPC are key contributing procurement.

Table 4-13 : Top-12 G SIN commodities of concern for PSPC-NCR contributing to 52% of the carbon footprint (t CO₂eq), over the three years, and GHG emission intensity.

NCR	FY16-17 to FY18-19			
	Value (Tax excl.)	GHG (t CO ₂ eq)	% carbon footprint of the region	GHG intensity (kg CO ₂ eq/\$ tx excl.)
N9130-Liquid Propellants and Fuels, Petroleum Base	\$ 463 715 015	742 915	7.9%	1.602
V502A-Relocation Services	\$ 767 675 699	655 937	7.0%	0.854
N9140-Middle Distillate Fuels	\$ 405 675 168	577 341	6.1%	1.423
N1510-Aircraft, Fixed Wing	\$ 2 812 839 600	437 891	4.6%	0.156
N6505-Drugs and Biologicals	\$ 1 183 602 481	389 290	4.1%	0.329
N1990-Vessels, Miscellaneous	\$ 801 447 300	360 690	3.8%	0.450
J019A-Maintenance, Repair, Modification, Rebuilding & Installation of Equipment related to Ships	\$ 821 027 167	333 659	3.5%	0.406
N2355-Combat, Assault and Tactical Vehicles, Wheeled	\$ 825 291 873	313 566	3.3%	0.380
D302A-Informatics Professional Services	\$ 2 086 853 199	281 609	3.0%	0.135
N1905C-Submarines	\$ 708 889 455	279 996	3.0%	0.395
N9130E-Aviation Fuel	\$ 216 824 013	257 415	2.7%	1.187
JX1990A-Ships and Vessels (large) - Repair, Refits and Conversions (including Dry Docking)	\$ 631 142 509	238 039	2.5%	0.377

A larger table with the top-65 G SIN commodities contributing to 84% of the region carbon footprint is available in Appendix E.2.

The average intensity over the three years studied is 0.292 kg CO₂eq/\$ tax excluded for PSPC-NCR. Noteworthy, in FY17-18, Fisheries and Oceans Canada and Foreign Affairs, Trade and Development exhibit a much higher GHG intensity for their procurement (0.77 and 0.71,

respectively) compared to the two other years. This is associated with large fuel procurement, that year, for both departments.

Table 4-14 : carbon footprint (t CO2eq) and GHG emission intensity of PSPC-NCR procurement, per customer (top-25, sorted on FY17-18 amount)

NCR CUSTOMER NAME	FY16-17			FY17-18			FY18-19		
	GHG (t CO2eq)	% Total	kg CO2eq/\$	GHG (t CO2eq)	% Total	kg CO2eq/\$	GHG (t CO2eq)	% Total	kg CO2eq/\$
Department of National Defence	2 042 338	66.3%	0.262	1 561 425	51.8%	0.298	1 934 636	57.9%	0.313
Public Works and Government Services Canada	715 478	23.2%	0.272	850 846	28.2%	0.330	628 390	18.8%	0.320
Fisheries and Oceans Canada	56 740	1.8%	0.387	191 025	6.3%	0.773	364 429	10.9%	0.340
Foreign Affairs, Trade and Development (Department of	28 933	0.9%	0.336	128 690	4.3%	0.708	27 443	0.8%	0.291
Employment and Social Development Canada	43 336	1.4%	0.295	44 222	1.5%	0.232	64 180	1.9%	0.213
Citizenship and Immigration Canada	16 387	0.5%	0.150	43 022	1.4%	0.183	40 584	1.2%	0.220
Royal Canadian Mounted Police	17 047	0.6%	0.138	36 740	1.2%	0.171	25 252	0.8%	0.184
Health Canada	10 291	0.3%	0.151	26 042	0.9%	0.111	30 748	0.9%	0.130
Correctional Service of Canada	11 278	0.4%	0.298	23 777	0.8%	0.316	11 296	0.3%	0.206
Canada Border Services Agency	8 355	0.3%	0.155	17 096	0.6%	0.206	22 926	0.7%	0.156
Transport Canada	5 353	0.2%	0.420	13 911	0.5%	0.171	6 368	0.2%	0.185
Natural Resources Canada	17 510	0.6%	0.511	11 459	0.4%	0.556	13 804	0.4%	0.604
Treasury Board of Canada	47 470	1.5%	0.309	8 899	0.3%	0.096	10 351	0.3%	0.130
Parks Canada	6 825	0.2%	0.284	7 493	0.2%	0.287	6 569	0.2%	0.405
Agriculture and Agri-Food Canada	2 892	0.1%	0.158	7 007	0.2%	0.335	8 578	0.3%	0.308
Innov, Sci and Econ Devt Can	3 311	0.1%	0.176	4 833	0.2%	0.110	3 380	0.1%	0.166
National Research Council Canada	7 158	0.2%	0.310	4 118	0.1%	0.264	5 431	0.2%	0.295
Environment Canada	3 538	0.1%	0.291	3 696	0.1%	0.264	4 003	0.1%	0.270
Veterans Affairs Canada	2 127	0.1%	0.152	3 691	0.1%	0.136	2 895	0.1%	0.139
Privy Council Office	1 413	0.0%	0.171	3 039	0.1%	0.151	2 394	0.1%	0.147
Statistics Canada	1 989	0.1%	0.161	2 741	0.09%	0.244	9 028	0.3%	0.428
Department of Justice Canada	1 934	0.1%	0.163	2 203	0.07%	0.180	1 832	0.1%	0.153
Canadian Heritage	2 093	0.1%	0.160	2 156	0.07%	0.165	1 036	0.0%	0.193
Courts Administration Service	352	0.0%	0.273	2 096	0.07%	0.220	135	0.0%	0.169
Canadian Food Inspection Agency	3 380	0.1%	0.160	1 985	0.07%	0.158	814	0.0%	0.184
All 70 other customers <0.06% (FY17-18)	25 232	0.8%	NR	11 599	0.4%	NR	112 884	3.4%	NR
Grand Total	3 082 758	100.0%	0.263	3 013 812	100.0%	0.309	3 339 387	100.0%	0.303

Note: Ranking of customers from the largest to the lowest buyer is based on FY17-18 carbon footprint. The gauge in the % Total column easily identifies for the other years any departures from this ranking. 70 customers contributing to less than 0.06% of the total carbon footprint in FY17-18 are cut-off. NR: not relevant.

Table 4-15 : Top-6 commodities (GSIN) of every of the top-6 most contributing customers over the three years; PSPC-NCR.

NCR CUSTOMER NAME Commodity (GSIN)	FY16-17 to FY18-19	
	GHG (t CO2eq)	% of total footprint (bold); % of customer footprint (plain)
Department of National Defence	5 538 400	58.7%
N9130-Liquid Propellants and Fuels, Petroleum Base	736 051	13.3%
N1510-Aircraft, Fixed Wing	437 875	7.9%
N1990-Vessels, Miscellaneous	356 597	6.4%
J019A-Maintenance, Repair, Modification, Rebuilding & Installation of Equipment related to Ships	333 659	6.0%
N2355-Combat, Assault and Tactical Vehicles, Wheeled	313 566	5.7%
N1905C-Submarines	279 996	5.1%
<i>Other commodities</i>	<i>3 080 656</i>	<i>55.6%</i>
Public Works and Government Services Canada	2 194 713	23.3%
V502A-Relocation Services	542 910	24.7%
N6505-Drugs and Biologicals	367 841	16.8%
M190A-Property and Facilities Management - Buildings	129 204	5.9%
5124B-Construction of Commercial Buildings	117 368	5.3%
N2310-Passenger Motor Vehicles	96 849	4.4%
R019BF-Human Resource Services, Business Consulting/Change Management; Project Management Services	91 201	4.2%
<i>Other commodities</i>	<i>849 340</i>	<i>38.7%</i>
Fisheries and Oceans Canada	612 194	6.5%
JX1990A-Ships and Vessels (large) - Repair, Refits and Conversions (including Dry Docking)	238 039	38.9%
N9140-Middle Distillate Fuels	151 247	24.7%
C216BA-Marine Systems and Engineering	49 759	8.1%
N1940-Small Craft	34 426	5.6%
V101AA-Vessel Charter	27 539	4.5%
V204H-Aerial Inspection and Reconnaissance Services	23 297	3.8%
<i>Other commodities</i>	<i>87 887</i>	<i>14.4%</i>
Foreign Affairs, Trade and Development (Department of)	185 067	2.0%
N9140-Middle Distillate Fuels	77 800	42.0%
T014D1-Security Printing, Paper Documents (including bonds)	68 458	37.0%
JD2310-PASSENGER MOTOR VEHICLES - PRODUCTION DESIGN	4 539	2.5%
N2310-Passenger Motor Vehicles	4 101	2.2%
N9140C-Diesel Fuel, Automotive	3 495	1.9%
N6350-Alarm, Signal, and Security Detection Systems , Miscellaneous	3 381	1.8%
<i>Other commodities</i>	<i>23 293</i>	<i>12.6%</i>
Employment and Social Development Canada	151 738	1.6%
R199H-Consulting Services, Change Management / Organizational Development (CM/OD)	94 022	62.0%
D302A-Informatics Professional Services	16 489	10.9%
L099A-Financial and Related Services, N.E.S.	16 244	10.7%
R019BF-Human Resource Services, Business Consulting/Change Management; Project Management Services	7 630	5.0%
T000K-Telephone Services / Contact Centre Services	5 741	3.8%
N7030-ADP Software	2 587	1.7%
<i>Other commodities</i>	<i>9 025</i>	<i>5.9%</i>
Citizenship and Immigration Canada	99 993	1.1%
D302A-Informatics Professional Services	42 132	42.1%
R199B-Miscellaneous Business Services	26 447	26.4%
T014D1-Security Printing, Paper Documents (including bonds)	7 705	7.7%
N7025-ADP Input-Output and Storage Devices	5 591	5.6%
R019BF-Human Resource Services, Business Consulting/Change Management; Project Management Services	3 469	3.5%
T014D10-Security ID Printing Passes/Cards	3 337	3.3%
<i>Other commodities</i>	<i>11 311</i>	<i>11.3%</i>
Other customers	653 852	6.9%
Grand Total	9 435 957	100.0%

4.2.3 ONTARIO region

Every year, PSPC (i.e. Public Services and Procurement Canada), followed by the Department of National Defence are together associated with 70% to 80% of the carbon footprint (Table 4-16). The Canada Border Services Agency, Environment and Climate Change Canada and the Correctional Service of Canada add together 15% to 25% to the footprint, depending of the year.

Over the three years, engineering water works related to waterways, harbours, dams and also to dredging account for 25% of the carbon footprint. Then comes the construction and repair of transportation infrastructure and buildings, the construction of boarding houses and detention centre (Canada Border Services Agency, see Table 4-17). Overall, construction-related procurement account for 29% (in FY17-18) to 59% (in FY18-18) of PSPC-ONTARIO footprint (see Figure 4-8).

Food is an important source of the footprint for the Correctional Service of Canada and for the Department of National Defence as well. Food and catering services typically have a high GHG intensity (largely associated with the agricultural production stage, especially for meat and dairy products), which explains the high intensity observed for the Correctional Service of Canada (0.4 to 0.5 kg CO₂eq/\$). Lastly, Technical equipment (e.g. weather and meteorological instruments) cause most of Environment Canada's footprint.

The average intensity over the three years studied is 0.248 kg CO₂eq/\$ (see Figure in Appendix E.3), which is the lowest of the five regions under study.

Table 4-16 : carbon footprint (t CO₂eq) and GHG emission intensity of PSPC-ONTARIO procurement, per customer (sorted on FY17-18 amounts)

ONTARIO CUSTOMER NAME	FY16-17			FY17-18			FY18-19		
	GHG (t CO ₂ eq)	% Total	kg CO ₂ eq/\$	GHG (t CO ₂ eq)	% Total	kg CO ₂ eq/\$	GHG (t CO ₂ eq)	% Total	kg CO ₂ eq/\$
Public Works and Government Services Canada	100'764	52.1%	0.219	48'408	46.9%	0.307	33'815	33.1%	0.221
Department of National Defence	39'354	20.3%	0.236	34'712	33.6%	0.297	37'679	36.9%	0.272
Correctional Service of Canada	5'062	2.6%	0.504	5'435	5.3%	0.485	6'777	6.6%	0.373
Environment Canada	18'751	9.7%	0.173	4'666	4.5%	0.188	4'504	4.4%	0.174
Canada Border Services Agency	23'941	12.4%	0.278	4'128	4.0%	0.174	8'531	8.3%	0.164
Fisheries and Oceans Canada	1'883	1.0%	0.191	2'103	2.0%	0.174	6'151	6.0%	0.207
Parks Canada	505	0.3%	0.217	1'337	1.3%	0.710	461	0.5%	0.225
Health Canada	258	0.1%	0.297	853	0.8%	0.294	157	0.2%	0.232
Transport Canada	513	0.3%	0.409	468	0.5%	0.428	1'077	1.1%	0.288
Natural Resources Canada	188	0.1%	0.174	423	0.4%	0.214	592	0.6%	0.161
Agriculture and Agri-Food Canada	260	0.1%	0.207	362	0.4%	0.302	257	0.3%	0.281
FedDev Ontario	144	0.1%	0.132	106	0.1%	0.130	88	0.1%	0.138
Public Health Agency of Canada	0	0.0%		85	0.1%	0.135	0	0.0%	
Statistics Canada	139	0.1%	0.396	49	0.0%	0.390		0.0%	
Canadian Food Inspection Agency		0.0%		27	0.0%	0.305	23	0.0%	0.298
Office of Infrastructure of Canada	65	0.0%	0.132	26	0.0%	0.130	0	0.0%	
National Research Council Canada	98	0.1%	0.215	16	0.0%	0.107	264	0.3%	0.479
Canadian Space Agency	18	0.0%	0.072	15	0.0%	0.072		0.0%	
Innov, Sci and Econ Devt Can	63	0.0%	0.184	14	0.0%	0.161	37	0.0%	0.174
Royal Canadian Mounted Police	444	0.2%	0.245	5	0.0%	0.072	33	0.0%	0.198
Department of Justice Canada	2	0.0%	0.175	2	0.0%	0.170	0	0.0%	
Citizenship and Immigration Canada	937	0.5%	0.400		0.0%		1'764	1.7%	0.133
Veterans Affairs Canada	53	0.0%	0.123		0.0%			0.0%	
Canadian Heritage		0.0%			0.0%		12	0.0%	0.383
Grand Total	193'441	100.0%	0.226	103'238	100.0%	0.288	102'222	100.0%	0.231

Table 4-17 : Top-5 commodities (GSIN) of every of the top-6 most contributing customers over the three years; PSPC-ONTARIO.

ONTARIO CUSTOMER NAME Commodity (GSIN)	FY16-17 to FY18-19	
	GHG (t CO2eq)	% of total footprint (bold); % of customer footprint (plain)
Public Works and Government Services Canada	182'987	45.9%
5133C-Waterways, Harbours, Dams and Other Water Works	75'535	41.3%
5138C-Dredging Services - Floating Plant	17'845	9.8%
5132A-Bridges, Elevated Highways, Tunnels, Subways and Railroads	13'237	7.2%
5129B-Construction of Other Buildings	10'921	6.0%
C122A-Architectural & Engineering Services - Highways, Roads, Railways, Bridges and Dams	5'537	3.0%
<i>Other commodities</i>	59'912	32.7%
Department of National Defence	111'745	28.0%
K100A-Cleaning and Maintenance, Janitorial	7'236	6.5%
N8905-Meat, Poultry and Fish (replaced by gsin N8905Z)	7'147	6.4%
AD917700-Military (R&D)	7'064	6.3%
N8905Z-Meat, Poultry and Fish	5'096	4.6%
U099C-Educational Services, N.E.S.	4'825	4.3%
<i>Other commodities</i>	80'377	71.9%
Canada Border Services Agency	36'599	9.2%
V502BAB-Hotels Motels and Boarding Houses, as Detention Centres	23'010	62.9%
K105A-Commercial Security Guard and Related Services	11'159	30.5%
G009G-Health and Welfare Services	1'307	3.6%
G001B-Hospital Care Services	885	2.4%
K105AB-Armoured Car Service	97	0.3%
<i>Other commodities</i>	141	0.4%
Environment Canada	27'921	7.0%
N5840202-Weather Radar Equipment, Except Airborne	15'998	57.3%
N6660-Meteorological Instruments and Apparatus	4'526	16.2%
M181A-Operation and Maintenance Services of a Technical/Scientific Facility	904	3.2%
N6625WU-DATA LOGGERS	719	2.6%
N6660B-BALLOON, METEOROLOGICAL	560	2.0%
<i>Other commodities</i>	5'215	18.7%
Correctional Service of Canada	17'273	4.3%
N8905Z-Meat, Poultry and Fish	5'256	30.4%
N7110-Office Furniture	1'437	8.3%
N8910-Dairy Foods and Eggs (replaced by gsin N8910Z)	1'377	8.0%
V401I-Transportation Services, Not Elsewhere Specified	1'011	5.9%
N8920ZC-Groceries, Miscellaneous	995	5.8%
<i>Other commodities</i>	7'198	41.7%
Fisheries and Oceans Canada	10'137	2.5%
5133C-Waterways, Harbours, Dams and Other Water Works	7'539	74.4%
N7030-ADP Software	502	5.0%
N9150GFD-LUBRICATING OIL, ENGINE, NAVAL, DIESEL, SEVERE CONDITIONS	475	4.7%
N8010-Paints, Dopes, Varnishes and Related Products	299	3.0%
N5845214-Echo Sounder Equipment	247	2.4%
<i>Other commodities</i>	1'075	10.6%
Other customers	12'238	3.1%
Grand Total	398'901	100.0%

4.2.4 PACIFIC region

Depending of year, PSPC is associated with 54% to 72% of the carbon footprint, whereas Fisheries and Oceans Canada cause 17% to 28%, and the Department of National Defence 5% to 13% (Table 4-18).

Over the three years, construction works (first for roads, then for buildings, and then for waterways and harbour, among others), mostly for PSPC (Table 4-19), account for 30% of the carbon footprint. Construction of ships and vessels, marine engines, and fishery resources management are the key contributing procurement and activities associated with Fisheries and Oceans Canada.

Food products and catering services are an important source of the footprint both for PSPC and for the Department of National Defence.

For PSPC-PACIFIC, the average intensity over the three years studied is 0.284 kg CO₂eq/\$ (see Figure in Appendix E.4).

Table 4-18 : carbon footprint (t CO₂eq) and GHG emission intensity of PSPC-PACIFIC procurement, per customer (sorted on FY17-18 amounts)

PACIFIC CUSTOMER NAME	FY16-17			FY17-18			FY18-19		
	GHG (t CO ₂ eq)	% Total	kg CO ₂ eq/\$	GHG (t CO ₂ eq)	% Total	kg CO ₂ eq/\$	GHG (t CO ₂ eq)	% Total	kg CO ₂ eq/\$
Public Works and Government Services Canada	55'919	53.4%	0.249	104'803	71.8%	0.285	57'343	55.7%	0.286
Fisheries and Oceans Canada	29'851	28.5%	0.379	25'166	17.2%	0.319	26'125	25.4%	0.355
Department of National Defence	11'661	11.1%	0.283	7'493	5.1%	0.219	13'588	13.2%	0.203
Parks Canada	1'046	1.0%	0.239	2'167	1.5%	0.349	650	0.6%	0.396
Royal Canadian Mounted Police	1'697	1.6%	0.372	1'918	1.3%	0.423	2'121	2.1%	0.300
Canadian Food Inspection Agency	59	0.1%	0.230	1'538	1.1%	0.266	151	0.1%	0.262
Environment Canada	349	0.3%	0.281	1'000	0.7%	0.271	316	0.3%	0.208
Transport Canada	296	0.3%	0.196	667	0.5%	0.300	1'811	1.8%	0.212
National Research Council Canada	1'190	1.1%	0.229	607	0.4%	0.193	148	0.1%	0.222
Natural Resources Canada	250	0.2%	0.234	230	0.2%	0.152	115	0.1%	0.177
Correctional Service of Canada	800	0.8%	0.277	166	0.1%	0.238	53	0.1%	0.298
Agriculture and Agri-Food Canada	175	0.2%	0.257	114	0.1%	0.274	127	0.1%	0.260
Library and Archives Canada	47	0.0%	0.141	23	0.0%	0.135	4	0.0%	0.131
Department of Justice Canada		0.0%		22	0.0%	0.121	42	0.0%	0.136
Canadian Grain Commission	15	0.0%	0.287	15	0.0%	0.275	7	0.0%	0.268
Statistics Canada		0.0%		10	0.0%	0.133	2	0.0%	0.129
Canada Border Services Agency	616	0.6%	0.178	6	0.0%	0.135	256	0.2%	0.364
Communications Security Establishment	428	0.4%	0.438		0.0%			0.0%	
Veterans Affairs Canada	11	0.0%	0.122		0.0%			0.0%	
Employment and Social Development Canada		0.0%			0.0%		5	0.0%	0.131
Treasury Board of Canada		0.0%			0.0%		9	0.0%	0.129
Health Canada		0.0%			0.0%		96	0.1%	0.278
Citizenship and Immigration Canada	335	0.3%	0.396		0.0%		66	0.1%	0.131
Government of the Northwest Territories	18	0.0%	0.375		0.0%			0.0%	
Grand Total	104'761	100.0%	0.281	145'946	100.0%	0.287	103'035	100.0%	0.283

Table 4-19 : Top-5 commodities (GSIN) of every of the top-6 most contributing customers over the three years; PSPC-PACIFIC.

PACIFIC CUSTOMER NAME Commodity (GSIN)	FY16-17 to FY18-19	
	GHG (t CO2eq)	% of total footprint (bold); % of customer footprint (plain)
Public Works and Government Services Canada	218'065	61.6%
5131C-Highways, Roads, Railways, Airfield Runways	51'869	23.8%
5129B-Construction of Other Buildings	37'618	17.3%
E199D-Environmental Services	30'392	13.9%
N8905-Meat, Poultry and Fish (replaced by gsin N8905Z)	17'341	8.0%
N6830M-GAS, PROPANE	12'301	5.6%
<i>Other commodities</i>	<i>68'544</i>	<i>31.4%</i>
Fisheries and Oceans Canada	81'141	22.9%
JX1990A-Ships and Vessels (large) - Repair, Refits and Conversions (including Dry Docking)	14'492	17.9%
N2815-Diesel Engines and Components	6'298	7.8%
F030A-Fisheries Resources Management Services	6'102	7.5%
5133C-Waterways, Harbours, Dams and Other Water Works	4'585	5.7%
V101AA-Vessel Charter	4'451	5.5%
<i>Other commodities</i>	<i>45'212</i>	<i>55.7%</i>
Department of National Defence	32'742	9.3%
K102B-Food Catering Services	4'130	12.6%
R114A-Logistics Support Services Military Aerospace Related	3'942	12.0%
K100A-Cleaning and Maintenance, Janitorial	3'017	9.2%
5164A-Electrical Installations and Major Repairs	1'973	6.0%
J019A-Maintenance, Repair, Modification, Rebuilding & Installation of Equipment related to Ships	1'361	4.2%
<i>Other commodities</i>	<i>18'319</i>	<i>55.9%</i>
Royal Canadian Mounted Police	5'736	1.6%
JX2310-Passenger Motor Vehicles - Repair	1'370	23.9%
N1940G-Boats, Small, Aluminum	824	14.4%
N1940DA-Boats - Inflatable - Rigid Hull	698	12.2%
E108CA-Hazardous Chemical Waste Disposal Services	631	11.0%
N9140A-Fuel Oil, Heating	600	10.5%
<i>Other commodities</i>	<i>1'613</i>	<i>28.1%</i>
Parks Canada	3'864	1.1%
JX1990B-Ships, and Vessels (small) - Repair, Refits and Conversions (including Dry Docks)	1'903	49.3%
F059A-Other Natural Resource and Conservation Services	334	8.6%
JX1955-Dredges - Repair	318	8.2%
R199L-Facilities Operations Service	273	7.1%
N1940DA-Boats - Inflatable - Rigid Hull	182	4.7%
<i>Other commodities</i>	<i>854</i>	<i>22.1%</i>
Transport Canada	2'774	0.8%
AT919500-Transportation (R&D)	676	24.4%
B219A-Other Engineering Studies	604	21.8%
R019AB-Professional Services / Program Advisory Services	373	13.5%
V204G-Aerial Control Services	185	6.7%
N1940G-Boats, Small, Aluminum	151	5.4%
<i>Other commodities</i>	<i>784</i>	<i>28.3%</i>
Other customers	9'421	2.7%
Grand Total	353'742	100.0%

4.2.5 WESTERN region

Except for FY16-17, PSPC accounts for over 51% to 58% of the carbon footprint, while the Department of National Defence adds 18% to 29% (Table 4-20). The Correctional Service of Canada, the Royal Canadian Mounted Police, and Health Canada can together add about 15% to the footprint.

The special environmental services (GSIN E108F-Northern Contaminated Site Environmental Clean-up Work/Services) bought by PSPC every year is causing a large part of the GHG impact (18.5% of the footprint over the three years). All construction works and architectural and engineering services (mostly for buildings, but also for road and rail transportation infrastructures) and associated services for repair and maintenance are the second source of the footprint (except for FY16-17).

Food is the main source of the footprint for the Department of National Defence and the Correctional Service of Canada (Table 4-21).

As pointed out in the economic analysis, FY16-17 is a kind of special due to the very large procurement of electricity services. That year, PSPC-WESTERN's carbon footprint is more than twice higher than in FY17-18 and FY18-19. This electricity service bought by PSPC and supplied from Alberta has been modelled as the provision of electricity from the Alberta gridmix which is highly carbon intensive. This single procurement accounts for 55% of the region total footprint in FY16-17. This explains the pattern of the contributions in FY16-17 in Table 4-20 and the high carbon intensity kg CO₂eq/\$, as well as the pattern in Figure 4-8. It should be noted that if the actual procurement was electricity from a different and cleaner source (e.g. from renewable energy) or not electricity (e.g. work of maintenance of the electricity distribution lines), the results could be significantly affected.

For PSPC-WESTERN, the average intensity over the three years studied is 0.470 kg CO₂eq/\$ (see Figure in Appendix E.5), with yearly average of 0.656, 0.360 and 0.395 kg CO₂eq/\$ in FY16-17, FY17-18 and FY18-19, respectively.

Table 4-20 : carbon footprint (t CO₂eq) and GHG emission intensity of PSPC-WESTERN procurement, per customer (sorted on FY17-18 amounts)

WESTERN CUSTOMER NAME	FY16-17			FY17-18			FY18-19		
	GHG (t CO ₂ eq)	% Total	kg CO ₂ eq/\$	GHG (t CO ₂ eq)	% Total	kg CO ₂ eq/\$	GHG (t CO ₂ eq)	% Total	kg CO ₂ eq/\$
Public Works and Government Services Canada	355'546	80.4%	0.831	110'271	56.6%	0.355	112'905	51.3%	0.376
Department of National Defence	42'457	9.6%	0.324	34'060	17.5%	0.337	63'263	28.7%	0.506
Correctional Service of Canada	8'939	2.0%	0.658	18'032	9.3%	0.568	9'091	4.1%	0.681
Parks Canada	4'377	1.0%	0.729	10'123	5.2%	0.526	2'593	1.2%	0.466
Public Health Agency of Canada	1'610	0.4%	0.291	7'370	3.8%	0.261	2'935	1.3%	0.273
Health Canada	11'223	2.5%	0.308	5'518	2.8%	0.341	6'220	2.8%	0.389
Royal Canadian Mounted Police	3'983	0.9%	0.247	2'214	1.1%	0.251	17'600	8.0%	0.281
Agriculture and Agri-Food Canada	3'164	0.7%	0.249	1'963	1.0%	0.303	1'463	0.7%	0.246
Environment Canada	799	0.2%	0.179	1'421	0.7%	0.267	1'317	0.6%	0.260
Fisheries and Oceans Canada	852	0.2%	0.275	1'179	0.6%	0.237	1'127	0.5%	0.194
Natural Resources Canada	1'313	0.3%	0.431	962	0.5%	0.579	371	0.2%	0.256
Canadian Grain Commission	245	0.1%	0.294	746	0.4%	0.231	164	0.1%	0.224
Indigenous and Northern Affairs Canada	197	0.0%	0.082	407	0.2%	0.297	145	0.1%	0.131
Canadian Food Inspection Agency	5'495	1.2%	0.786	215	0.1%	0.295	237	0.1%	0.272
National Research Council Canada	488	0.1%	0.368	151	0.1%	0.204	494	0.2%	0.314
Employment and Social Development Canada	49	0.0%	0.125	63	0.0%	0.273	0	0.0%	
Western Economic Diversification Canada	9	0.0%	0.230	56	0.0%	0.131	44	0.0%	0.133
National Energy Board	23	0.0%	0.072	4	0.0%	0.072	101	0.0%	0.190
Polar Knowledge Canada		0.0%		4	0.0%	0.161	52	0.0%	0.327
Transport Canada	91	0.0%	0.254	3	0.0%	0.161	24	0.0%	0.171
Innov, Sci and Econ Devt Can	13	0.0%	0.167		0.0%			0.0%	
Shared Services Canada	1'159	0.3%	1.756		0.0%			0.0%	
Department of Justice Canada		0.0%			0.0%		48	0.0%	0.117
Citizenship and Immigration Canada	432	0.1%	0.405		0.0%			0.0%	
Canada Border Services Agency	1	0.0%	0.131		0.0%			0.0%	
Grand Total	442'466	100.0%	0.656	194'765	100.0%	0.360	220'193	100.0%	0.395

Table 4-21 : Top-5 commodities (GSIN) of every of the top-6 most contributing customers over the three years; PSPC-WESTERN.

WESTERN CUSTOMER NAME Commodity (GSIN)	FY16-17 to FY18-19	
	GHG (t CO2eq)	% of total footprint (bold); % of customer footprint (plain)
Public Works and Government Services Canada	578'723	67.5%
S001A-Electricity Services	247'860	42.8%
E108F-Northern Contaminated Site Environmental Clean-up Work/Services	158'247	27.3%
5139A-Construction Services, Not Elsewhere Specified	24'290	4.2%
5129B-Construction of Other Buildings	18'960	3.3%
C119A-Architectural Services - Buildings	13'364	2.3%
<i>Other commodities</i>	<i>116'002</i>	<i>20.0%</i>
Department of National Defence	139'780	16.3%
WR4510AA-PORTABLE TOILETS, RENTAL	10'231	7.3%
N8920C-Groceries, Miscellaneous (replaced by gsin N8920ZC)	8'103	5.8%
N8540-Toiletry Paper Products	5'761	4.1%
N8905Z-Meat, Poultry and Fish	5'497	3.9%
5179FB-General Contractor Services, Not Elsewhere Specified	5'333	3.8%
<i>Other commodities</i>	<i>104'856</i>	<i>75.0%</i>
Correctional Service of Canada	36'063	4.2%
N8920C-Groceries, Miscellaneous (replaced by gsin N8920ZC)	10'655	29.5%
N9540C-EXTRUSION ALUMINUM	4'598	12.7%
N5640JB-Wallboard, Laminates (Arborite and Formica)	3'378	9.4%
N8920ZC-Groceries, Miscellaneous	3'124	8.7%
5139A-Construction Services, Not Elsewhere Specified	2'631	7.3%
<i>Other commodities</i>	<i>11'677</i>	<i>32.4%</i>
Royal Canadian Mounted Police	23'796	2.8%
5129B-Construction of Other Buildings	14'642	61.5%
N1005A-Small Arms and Accessories (Law Enforcement)	2'588	10.9%
N5510-Lumber and Related Basic Wood Material	933	3.9%
N6650-Optical Instruments, Test Equipment, Components and Accessories	807	3.4%
N8910-Dairy Foods and Eggs (replaced by gsin N8910Z)	535	2.2%
<i>Other commodities</i>	<i>4'291</i>	<i>18.0%</i>
Health Canada	22'961	2.7%
V202A-Passenger Service	8'969	39.1%
V204J-Air Ambulance Services	2'404	10.5%
V203A-Aircraft and Glider Dry Leases	1'854	8.1%
G009D-Health and Allied Services, Not Elsewhere Specified	1'636	7.1%
G009K-Substance Abuse Counselling	944	4.1%
<i>Other commodities</i>	<i>7'154</i>	<i>31.2%</i>
Parks Canada	17'093	2.0%
N6850BBT-DEICING COMPOUND, SALT AND SAND MIXTURE FOR ROAD SURFACES	3'280	19.2%
N9110C-Wood, Heating Purposes	2'737	16.0%
5131C-Highways, Roads, Railways, Airfield Runways	2'438	14.3%
N6830M-GAS, PROPANE	1'871	10.9%
K104A-Trash/Garbage Collection Services	1'427	8.3%
<i>Other commodities</i>	<i>5'340</i>	<i>31.2%</i>
Other customers	39'007	4.5%
Grand Total	857'424	100.0%

4.2.6 Carbon footprint per category of commodity

As depicted in Figure 4-8, construction-related procurement (GSIN codes beginning with 51) account for usually about 30-40% of the total footprint. However, the portrait can be affected due to large specific infrastructure projects that increase this share (e.g. ONTARIO in FY17-18, ATLANTIC in FY16-17, WESTERN in FY17-18) or owing to other types of procurement that dominates the profile and decrease this share (e.g. WESTERN in FY16-17). The NCR appears to have very few construction-related procurements over the three-year period under study (2 to 4% of its carbon footprint) compared to goods (50 to 72% of the footprint) and services.

A rather limited number of commodities (over the 3 700 different ones involved) contribute to most of the carbon footprint. In fact, when regions and years are aggregated, 86 commodities contribute to 80% and only 17 contribute to half of the total footprint (Table in Appendix F). From this list, 23 unique GSIN commodities can be identified, that contribute to close to 58% of the total footprint over all regions (Table 4-22). They can be sorted according the following groups of procurement:

- Vehicles, ships, aircraft and related equipment;
- Energy carriers;
- Buildings related services (including relocation services);
- Construction (51);
- Office related services;
- Technology equipment and chemicals (Drugs and biologicals, more specifically);
- Environmental Services.

Table 4-22 : 23 unique GSIN commodities and groupings contributing to 58% of total carbon footprint of the five regions, from FY16-17 to FY18-19, and corresponding UNSPSC codes

All regions	FY16-17 to FY18-19				
Unique GSIN	GHG (t CO ₂ eq)	% Carbon footprint	Grouping	% Carbon footprint	UNSPSC
V502A-Relocation Services	656 049	5.6%	Buildings related services	6.8%	78101804
M190A-Property and Facilities Management - Buildings	131 779	1.1%	Buildings related services		80131801
5129B-Construction of Other Buildings	211 870	1.8%	Construction (51)	4.1%	72130000
5133C-Waterways, Harbours, Dams and Other Water Works	145 332	1.2%	Construction (51)		70171702
5124B-Construction of Commercial Buildings	121 368	1.0%	Construction (51)		72131600
N9130-Liquid Propellants and Fuels, Petroleum Base	742 915	6.4%	Energy	15.7%	15101500
N9140-Middle Distillate Fuels	577 527	5.0%	Energy		15101500
N9130E-Aviation Fuel	257 415	2.2%	Energy		15101504
S001A-Electricity Services	247 860	2.1%	Energy		83101800
E108F-Northern Contaminated Site Environmental Clean-up Work/Services	159 003	1.4%	Environmental Services	1.4%	76121903
D302A-Informatics Professional Services	289 595	2.5%	Office related services	4.3%	81110000
R019BF-Human Resource Services, Business Consulting/Change Management	206 689	1.8%	Office related services		80160000
N650S-Drugs and Biologicals	389 434	3.3%	Technol. equipment and chemicals	22.1%	51000000
N1510-Aircraft, Fixed Wing	437 891	3.8%	Vehicles, ships, aircraft and equipments		25131504
N1990-Vessels, Miscellaneous	360 826	3.1%	Vehicles, ships, aircraft and equipments		25111500
J019A-Maintenance, Repair, Modification, Rebuilding & Installation of Equip	335 020	2.9%	Vehicles, ships, aircraft and equipments		25111900
N2355-Combat, Assault and Tactical Vehicles, Wheeled	313 566	2.7%	Vehicles, ships, aircraft and equipments		25102002
JX1990A-Ships and Vessels (large) - Repair, Refits and Conversions (including Dry Docking)	286 339	2.5%	Vehicles, ships, aircraft and equipments		25111500
N1905C-Submarines	279 996	2.4%	Vehicles, ships, aircraft and equipments		25111701
C216BA-Marine Systems and Engineering	175 907	1.5%	Vehicles, ships, aircraft and equipments		81102100
N2320-Trucks and Truck Tractors, Wheeled	146 848	1.3%	Vehicles, ships, aircraft and equipments		25102100
JX1510A-Aircraft, Fixed Wing - Repair and Overhaul (Military)	121 559	1.0%	Vehicles, ships, aircraft and equipments		25131700
N2310-Passenger Motor Vehicles	114 690	1.0%	Vehicles, ships, aircraft and equipments		25101500
Total	6 709 478	57.5%			

Noteworthy, when the regional detail is kept, food commodities, transportation infrastructure construction, as well as technological equipment can rank in the top-6 contributing procurement (see Table in Appendix F). Food services, meals and catering services were also pointed out in the Quebec carbon footprint study (CIRAIG, 2018).

4.2.7 Main sources of life cycle GHG at the category level for PSPC procurements

The results presented so far show which particular categories of procurement contribute to the partial carbon footprint of PSPC acquisitions. The life cycle EEIO methodology can also be used to analyze the source of the GHG **upstream** in the supply chain. The approach allows identifying which products purchased by PSPC's suppliers generate the most GHG emissions.

The Figure 4-9 and Figure 4-10 compile contribution profiles corresponding to the 23 key commodities identified previously. A profile allows visualization of the top five goods or services which contribute the most in the supply chain of the supplier of that commodity. Any large contributors identified are those for which PSPC should ask its suppliers to pay attention.

To avoid multiplying the profiles for every province, a Canadian production context has been used for the commodity. In the contribution profile, direct emissions represent GHGs emitted directly by the supplier of PSPC (i.e. the product manufacturer or the service provider). For example, direct emissions from the "Non-residential building construction" are the GHGs primarily emitted when fuel is burned by the machinery used on the construction site. The direct emissions for "Aircraft and aircraft engines" are the GHGs emitted at the engine manufacturing plant.

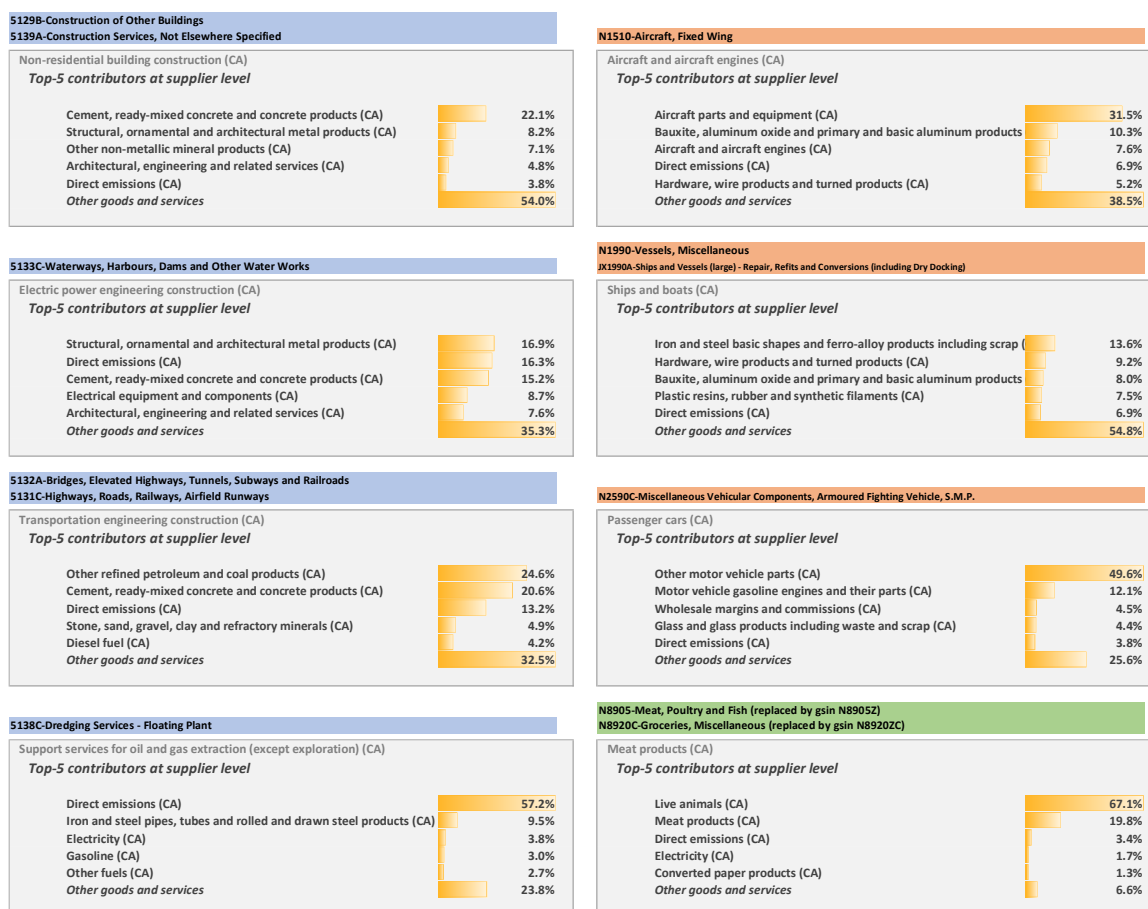


Figure 4-9 : Carbon footprint contributors at the category level : groupings for Construction (blue), Vehicles, ships, aircraft and equipment (orange) and Food (green).

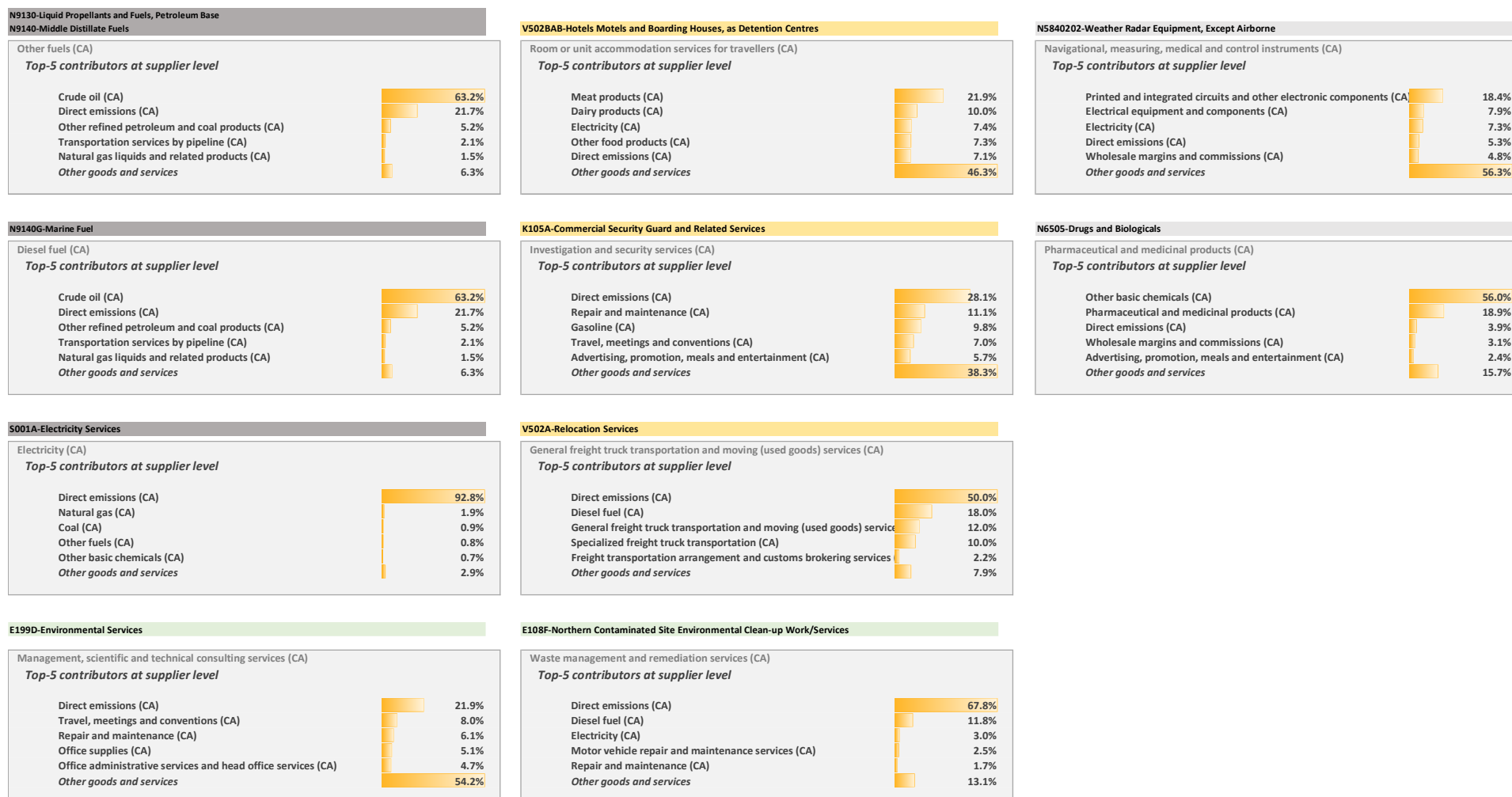


Figure 4-10 : Carbon footprint contributors at the category level : groupings for Energy (dark grey), Buildings related services (gold), Technol. equipment and chemicals (light grey) and Environmental Services (light green).

4.3 Recommendations by category of commodity

4.3.1 Construction works and related services

A large part of the GHGs embodied in procurement comes from the construction and repair of buildings and transportation infrastructure.

As shown on the previous figures, these works and services cause direct emissions of GHGs at the construction site and/or for the transportation of heavy materials by fuel consumption (purchased by the service provider). In this context PSPC can include additional criteria of fuel consumption, emission control of vehicles and machine tools, etc.

→ *guidelines and recommendations exist for energy efficiency, eco-driving of vehicles and machinery (see Natural Resources Canada's Office of Energy Efficiency, , etc.).*

The execution of construction work and related services involves the production of materials that are the main contributors to the footprint of the procurements. These are cement and concrete, asphalt and bituminous products, metal materials, stones, etc. bought by the contractors to provide the service (see Figure 4-9 and Figure 4-10). Environmental gains can be achieved by requiring the service provider to focus on these supplies (for example, it can reduce its cement and concrete consumption by adding cementitious aggregates) and PSPC can also play a role in its contractual requirements. It may be requested for a building construction contract that the contractor demonstrate that its cement and concrete supplier guarantees clean technology towards a "low carbon concrete" or has completed an Environmental Product Declaration (EPD).

4.3.2 Military equipment and associated fuel procurement (National Capital Region focus)

A huge part of the carbon footprint is associated with procurements managed by PSPC-NRC for the Department of National Defence. It remains difficult to make recommendations for such procurements at our high-level of analysis, given the constraints and/or quality requirements for 1) the manufacturing of high technology equipment, 2) their mandatory repair according to same requirements, 3) the fuels consumed for military and national security purposes. However, it would be relevant to carry out finer evaluations of the carbon footprint of specific products or activities of the Department using a more precise life cycle-based methodology and physical data instead of monetary data. Such studies have been conducted abroad, e.g. by the U.S. Department of Defense.

4.3.3 Food products

Though not a major procurement, food can be a relatively important contributor to the carbon footprint of some regions under study. At the same time, it is often broadly described in the procurements data compiled by PSPC, which hinders a fair estimate of its GHG profile, considering the carbon footprint varies a lot between food products. These procurements should be listed, if possible, using more detailed GSIN codes (or UNSPSC in the future) than "Food and Beverages" or "Groceries" to distinguish between the categories of food products available in the openIO-Canada environmental analysis model (see Appendix A.2) such as meat products, dairy products, fruits and vegetables, beverages, bakery products, etc. These food categories have significantly different GHG intensities and the analysis would therefore gain in precision. In addition, PSPC could i) implement more accurate annual monitoring; ii) develop recommendations or incentives

from its customers that would aim to reduce GHG intensive foods such as meat and dairy products towards lower footprint foods, promote vegetarian menus, etc.

4.3.4 Ex-post analysis of procurements' contracts

Using a cross-analysis by commodity and by customer, PSPC could identify important procurements of the same type that are recurrently required by different customers. For those procurements that have been identified here as the most contributing to the carbon footprint, PSPC could set up a protocol for an ex-post analysis of contracts details and/or service proposals to identify the suppliers who would have demonstrated proactivity with respect to reducing their GHGs or having made an environmental assessment of their activity or product. In this case, PSPC could work with these suppliers to define criteria that could be requested as mandatory for all suppliers in the same category of goods or services.

4.3.5 Monitoring

Reiterating over several years the carbon footprint analysis carried out with the help of a calculation tool can reveal the increase over time of certain categories of high-contributing (and possibly carbon intensive) commodities to which it has been recommended to pay attention. Similarly, an individual follow-up with customers should be possible, at least for those with a high volume of procurements with significant diversity. PSPC can then engage in more focused and personalized discussions with its customers. The feedback from PSPC-QC which possesses such a calculation tool as for the feasibility of such a monitoring approach is recommended.

4.4 Other recommendations

Several other recommendations can be formulated that relate to the data compiled by PSPC and afterwards used into the environmental analysis model, as well as ways to improve the openIO-Canada model for more relevant and representative assessments of the carbon footprint in the future.

4.4.1 PSPC procurement data

In order to facilitate and to improve the robustness of the carbon footprint estimates, it is recommended that PSPC:

- Enter contract value as tax excluded;
- Avoid coding the contract with an approximate classification code. Especially, avoid using the following G SIN that make it impossible to map the commodity with an UNSPSC or IOCC relevant for the environmental analysis:
 - N9999 – Miscellaneous items
- Go into deeper details in contract's description for contracts of very large value, in order to code it as precisely as possible according to the G SIN or (better) the UNSPSC classification (the latter offers much more granularity). That would reduce the subsequent risk of improperly estimating the environmental impacts of procurements that are likely to contribute significantly to the carbon footprint.

The recommendation also applies to future UNSPSC codes where aggregated levels (i.e. segment or family) should be avoided.

It is also recommended to complete the development of a mapping table between the G SIN and the UNSPSC classification. During this study, many unmapped G SIN have been associated to an UNSPSC automatically, which introduce bias or uncertainty to the final carbon footprint results.

4.4.2 Outlook for openIO-Canada model improvement and improved carbon footprint assessment

4.4.2.1 Update of open IO-Canada model

The results of this study are based on data from the open IO-Canada model. The model can be improved in several ways to increase the representativeness and robustness of the results obtained for the carbon footprint.

Economic model

The underlying Input-Output economic model is for 2009. More up to date (2017) tables exist, published by Statistics Canada. This would increase significantly the temporal representativeness of intersectoral economic exchanges in the Canadian economy.

Environmental extensions

Statistics Canada's Environmental Accounts Division now publishes GHG emission tables synchronized with the latest economic data (2017). Such an update would significantly increase the technological representativeness of the open IO-Canada model and reflect the progress of Canadian industries in reducing GHG emissions in the past 8 years.

Regionalization

This study allowed to develop a contextualized version of openIO-Canada in order to simulate the economy of every Canadian Provinces with duplicates of the national economy with provincial electricity gridmixes and their associated GHG.

A true Canadian regionalization would be a multi-provincial model, including both the economic input-output tables of each province and the interprovincial economic exchanges (Statistics Canada interprovincial input-output tables) as well as the environmental data of industries in each province. Developing such a model would require considerable R&D; it also faces the challenge of the increased aggregation of data made publicly available by Statistics Canada for these tables, and therefore to a lower granularity of the analysis model that will result (of the order of a hundred commodities instead of 240).

Another regionalization perspective is a global multiregional model, where each country is a region. Such Input-Output models for environmental analysis exist (e.g. Exiobase and Eora which detail more than a hundred countries). They make it possible to consider trade between countries, so to take into account, for example, that electronic and computer products purchased in Canada are actually manufactured in Asian countries. In return, they have the drawbacks of the granularity of goods and services (a hundred, typically) and the impossibility, without a significant effort of R&D, to distinguish regions within a country, such as the Canadian provinces.

5 Limitations of the study

Before concluding, it is important to recall here the key limitations associated to this high-level, “hot-spot” analysis, carbon footprint study.

1) The carbon footprint does not cover all procurements purchased by PSPC.

It focuses on the goods and services purchased by PSPC through a purchase order #9200 - Requisition for Goods and Services and Construction. The following procurements, particularly, are not addressed:

- Purchases such as low value contracts, standing offers and supply arrangement;
- Purchases made as part of business travel (transportation, accommodation, meal, etc.);
- Purchases made by government employees related to activities such as commuting to and from work, and daily meals are not addressed as well.

2) The carbon footprint does not systematically cover the whole life cycle of the commodities purchased. Therefore, it is called a partial carbon footprint.

The analysis is “cradle-to-gate” (gate of the manufacturing plant) for goods. Thus, the footprint does not cover the whole life cycle of a good with respect to the GHG associated with its distribution, use during lifetime and end-of-life management. However, for services, the carbon footprint includes the delivery/provision of the service to the user. Owing to certain services purchased, the end-of-life of some goods acquired may be partly accounted for. This is the case for services such as, for instance, waste management services and repair and maintenance services (e.g. of buildings, of various infrastructures for transportation, for energy supply, for telecommunications) that may include the decommissioning of the infrastructure and the management of the resulting waste.

3) Contracts are not assessed individually. Rather, the partial carbon footprint is estimated per category of procurements according to the GSIN classification, as entered by PSPC when contracts are filed. Hence, the subsequent carbon footprint modelling is limited by:

- The intrinsic level of precision of the GSIN classification (i.e. its granularity) and the accuracy of the GSIN code that has been attributed;
- Then, by the accuracy of the two crosswalk tables used to go, first, from GSIN to UNSPSC codes and then from UNSPSC to IOCC codes in order to map the GSIN to the carbon footprint assessment model which is based on the IOCC classification (which has also its own lack of granularity).

The expected replacement of the GSIN classification by the UNSPSC classification by PSPC will alleviate the limitation. The lack of accuracy of the IOCC classification will remain.

4) The carbon footprint model is representative of the year 2009.

The carbon footprint is assessed with a customized version of *openIO-Canada*, a model for environmentally extended input-output analysis (EEIO), which input is the dollar value of procurements. It is an appropriate tool to evaluate thousands of goods and services that are very different from each other, and for which neither accurate description nor physical data is readily available. In return, the custom version of *openIO-Canada* has the following key limitations:

- The underlying Input-Output economic model and the associated GHG emission dataset are representative of the Canadian economy and its GHG emissions level for 2009, hence

the temporal representativeness is weak. Major changes within the economy and any progress of Canadian industries in reducing GHG emissions in the past 8-10 years are not reflected;

5) The regionalization of *openIO-Canada*, the carbon footprint assessment model, is simulated and simplistic.

For this study, a contextualized version of *openIO-Canada* has been developed in order to simulate the economy of every Canadian Provinces. The provinces only differ with respect to the electricity production sector and its associated GHG. This aside, every province is a duplicate of the national economy as for the economic flows and GHG.

6) The carbon footprint considers imported commodities as produced domestically.

openIO-Canada, the carbon footprint assessment model, is representative of Canada's domestic economic activities only and does not consider interactions with foreign countries. Any good or service that would be imported is modeled with the tool as if it were produced in Canada, with a Canadian average electricity gridmix.

Considering these limitations, the carbon footprint numbers estimated should be considered with caution. However, the relative positioning of categories of procurement can be estimated as robust. The “hot spots” categories identified as the largest contributors to the carbon footprint of procurement may then deserve a further and deeper assessment, e.g. with other life cycle assessment tools, to identify key procurement criteria related to the commodity itself or to its supplier.

6 Conclusion

For all its customers in the five regions under study (PACIFIC, WESTERN, ONTARIO, NCR, and ATLANTIC), PSPC manages annually about 26 000 procurements for about \$ 13 to 16 billion, depending on the year. NCR alone represents about 82 to 85% of this amount. The partial carbon footprint of over 99% of all procurements has been assessed, from cradle to the gate of the manufacturing plant (for goods) or up to the delivery to the customer (for service), for the last three fiscal years (FY16-17 to FY18-19). The carbon footprint is assessed from every contracts' value, for every customer, region, and year, using an input-output assessment model. When the commodity is produced locally in Canada, the model takes into consideration the province of origin of the procurements and accounts for the specific carbon footprint of the electricity consumed by the provider in that province. Otherwise, if the commodity is most likely produced anywhere in Canada or abroad, it is modelled as Canadian-produced (i.e. with Canada average gridmix impact for the electricity). Annual average of the carbon footprint and the resulting GHG intensity per dollar purchased are as follows:

Annual average (FY16-17 to FY18-19)	ATLANTIC	NCR	ONTARIO	PACIFIC	WESTERN
GHG intensity (kg CO ₂ eq/\$) (Min – Max)	0.329 (0.32 – 0.34)	0.292 (0.26 – 0.31)	0.248 (0.23 – 0.29)	0.284 (0.28 – 0.29)	0.470 (0.36 – 0.66)
Carbon footprint (t CO ₂ eq)	204 541	3 145 563	133 505	118 371	286 920

Inter annual variability of the carbon footprint can be relatively high within a region (especially WESTERN and, to a lesser extent, NCR and ONTARIO), e.g. when a large specific project is engaged or due to an “unusual” large procurement one year. In line with the share of procurements value across customers, most of the carbon footprint in every region is associated to PSPC first, and then to the Department of National Defence, except for NCR where the Department of National Defence represents causes 52% to 66% of the footprint, and PACIFIC where Fisheries and Oceans Canada is the second contributor after PSPC. The top-3 commodities contributing to the carbon footprint of each region are:

Commodity (GSIN)	Region	FY16-17 to FY18-19			
		Value, tax excl. (\$)	GHG (t CO ₂ eq)	% Carbon footprint of the region	GHG intensity (kg CO ₂ eq/\$)
5129B-Construction of Other Buildings	ATLANTIC	\$ 156 293 801	45 520	7.4%	0.291
5133C-Waterways, Harbours, Dams and Other Water Works	ATLANTIC	\$ 204 123 289	43 799	7.1%	0.215
JX1990A-Ships and Vessels (large) - Repair, Refits and Conversions (including Dry Docking)	ATLANTIC	\$ 80 541 070	33 808	5.5%	0.420
N9130-Liquid Propellants and Fuels, Petroleum Base	NCR	\$ 463 715 015	742 915	7.9%	1.602
V502A-Relocation Services	NCR	\$ 767 675 699	655 937	7.0%	0.854
N9140-Middle Distillate Fuels	NCR	\$ 405 675 168	577 341	6.1%	1.423
5133C-Waterways, Harbours, Dams and Other Water Works	ONTARIO	\$ 389 228 869	83 074	20.8%	0.213
V502BAB-Hotels Motels and Boarding Houses, as Detention Centres	ONTARIO	\$ 77 902 235	23 010	5.8%	0.295
5138C-Dredging Services - Floating Plant	ONTARIO	\$ 33 069 625	17 845	4.5%	0.540
5131C-Highways, Roads, Railways, Airfield Runways	PACIFIC	\$ 120 997 972	51 869	14.7%	0.429
5129B-Construction of Other Buildings	PACIFIC	\$ 145 087 203	41 636	11.8%	0.287
E199D-Environmental Services	PACIFIC	\$ 199 848 362	30 392	8.6%	0.152
S001A-Electricity Services	WESTERN	\$ 122 284 973	247 860	28.9%	2.027
E108F-Northern Contaminated Site Environmental Clean-up Work/Services	WESTERN	\$ 313 431 576	158 956	18.5%	0.507
5129B-Construction of Other Buildings	WESTERN	\$ 118 736 862	34 045	4.0%	0.287

This study is a high-level assessment, for pointing out the “hot-spots” from the carbon footprint of tens of thousands of very different procurements. These carbon footprint numbers are: i) estimates, ii) for partial life cycle, and iii) should therefore not be used outside of the context of this study. Most important is the capacity of the analysis to spot the commodities that contribute the most to the total footprint, so as to identify where priorities and efforts should be put on in order to contribute efficiently to the reduction of the environmental footprint of government

procurement. Thus, 23 different key commodities have been identified, with their associated customers and regions (i.e. the focus was not put on NCR only). Wherever possible, efforts should first be made to reduce or rationalize the volumes of these procurements. This is not always possible, especially if major construction projects must be implemented or when strong constraints prevent flexibility (e.g. National Defence procurement). This is probably easier for more regular procurement over time and across departments, such as building and civil infrastructure construction and maintenance (road, waterways and rail), ships and vessels construction and maintenance, food and catering services. Actions at this level should help reduce spending and the total annual carbon footprint.

Another area of action for PSPC and the Government of Canada is to develop specific environmental criteria/requirements for these key categories of procurement in its call for tenders. The short quantitative factsheets (Figure 4-9 and Figure 4-10) developed for the 23 categories can help to point out the issues that should be addressed by these requirements before seeking for more detailed and specific criteria from other sources of information or more refined life cycle assessment studies.

For this study, a hot-spot analysis model has been adapted to the context of PSPC procurements across several regions in Canada. It is still limited on several aspects, including its intrinsic lack of granularity and the simplification for imported goods (modelled as produced domestically).

Finally, it should be kept in mind that the carbon footprint calculated in this study represents potential GHG emissions and not actual impacts and does not include systematically the use and the end-of-life stages of purchased commodities. The environmental picture of procurements is therefore partial, particularly for goods of long lifetime that consume energy during their useful life. A continuation of the study could address this aspect in the future.

7 References

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Appendix A.1: Environmentally Extended Input-Output analysis (EEIO)

La méthodologie proposée pour l'étude repose sur **l'analyse environnementale Entrées-Sorties (ES-E)** dérivée de l'analyse économique Entrées-Sorties (ES). L'analyse ES-E est couramment utilisée pour réaliser des analyses environnementales dans des situations où l'ACV traditionnelle¹² est peu -ou moins- adaptée. C'est particulièrement le cas lorsque le système à l'étude implique de très nombreux produits et services et que réaliser l'ACV de chacun d'eux pour modéliser le système n'est finalement pas possible (données individuelles non disponibles ou difficilement accessibles, fardeau de travail trop élevé). Typiquement, l'analyse ES-E est utilisée pour évaluer les impacts de toute une nation (Hertwich & Peters 2009; Huppes et al. 2006), d'une région (Erickson et al. 2010; Larsen & Hertwich 2011) ou d'une ville (Larsen & Hertwich 2010; Wiedmann et al. 2015), y inclus les échanges commerciaux entre ces économies (Norman et al. 2007 ; Hertwich & Peters 2009; Wiedmann et al. 2015; Kanemoto et al. 2016). Elle est aussi adaptée à l'évaluation des multiples activités et approvisionnements d'organisations telles que les corporations (p.ex. Huang et al. 2009), les universités (Baboulet & Lenzen 2010; Thurston & Eckelman 2011; Larsen et al. 2013; Townsend & Barrett 2015; Gómez et al. 2016) ou les services publics et les gouvernements (Minx et al. 2009 ; Wiedmann & Barrett 2011; Larsen & Hertwich 2011; Alvarez & Rubio 2015 ; Kjaer et al. 2015). L'analyse ES-E est aussi utilisée conjointement à l'ACV traditionnelle, en phase d'analyse préliminaire car, tout comme l'ACV traditionnelle, elle permet d'identifier les sources d'impact le long des chaînes d'approvisionnement et aussi de discerner les responsabilités entre fournisseurs et consommateurs. Aussi, la taille des systèmes qu'elle permet d'analyser rend la méthode adaptée pour supporter les politiques publiques liées à la consommation, par exemple lorsqu'il s'agit d'identifier des priorités d'actions par catégories de produits et services (voir Minx et al. 2009; Tukker 2006; Huppes et al. 2006).

Les paragraphes qui suivent introduisent brièvement les principes généraux de l'analyse ES et de son extension à l'analyse environnementale ES-E. Puis, le modèle d'analyse développé pour l'étude est présenté.

L'analyse Entrées/Sorties économique

Les analyses ES considèrent l'entière de l'économie comme un ensemble d'acteurs regroupés en industries (ou secteurs) qui s'achètent et se vendent des biens et services (« produits »). Des tableaux ES monétaires sont construits à partir des données des agences de statistiques nationales. Ces tableaux ES sont des inventaires comptables nationaux, et se réfèrent à une année. La consommation «finale» de produits par les ménages et les gouvernements, ainsi que les imports et exports sont représentés dans des tableaux à part. Tout autre flux qui ne peut être considéré comme un échange de produits est représenté dans des extensions; pour une analyse économique, cela se résume typiquement à la valeur ajoutée, notamment le paiement des salaires et les profits

¹² Par la suite, il est entendu par « ACV » la méthode traditionnelle d'analyse du cycle de vie utilisant des processus unitaires dont l'inventaire est exclusivement en données physiques. L'inventaire est généralement tronqué par l'application d'un seuil de coupure (p.ex. les intrants représentant moins de 1% en masse du total des entrants du processus sont exclus de l'inventaire partant du principe que leur contribution ne sera pas significative à l'impact) ou par l'exclusion de certaines activités (p.ex. le transport des employés sur leur lieu de travail). *Ecoinvent* est un exemple reconnu de base de données de type « ACV ».

Les tableaux ES sont généralement construits symétriques de façon à décrire quels produits servent à la production de quels produits (**Z**, voir Figure 7-1). Autrement dit, on élimine les industries de la représentation de l'économie, et on se concentre sur l'interdépendance entre les différents produits.

Un tableau ES est ensuite normalisé par rapport à la production totale de chaque produit. Chaque colonne constitue donc une sorte de « recette de cuisine » pour produire 1\$ d'un produit (Leontief, 1970). La matrice des flux **Z** devient alors la matrice des coefficients techniques (**A**). Cette dernière est utilisée ensuite dans les modèles d'analyse ES à l'aide de la matrice de Leontief ($L=(I-A)^{-1}$) qui introduit l'approche **cycle de vie**. En multipliant un vecteur de demande finale de produits (p.ex. la demande des ménages) par **L**, on calcule la production totale **du «berceau au consommateur»** requise pour chaque produit afin de satisfaire la demande. Ce modèle dit « des quantités » se retrouve au cœur de toute analyse ES et aussi de l'ACV traditionnelle. L'analyse ES et l'ACV partagent donc les mêmes fondements mathématiques et bon nombre de présuppositions.

[€]		Produits manufacturés	Électricité	Services	Ménages	total
Prod. manufacturés	Z :	0	20	45	h :	x :
Électricité		30	0	30		
Services		0	80	0		
Valeur ajoutée	va :	70	100	75		
total	x' :	100	200	150		

Figure 7-1 : Tableau non normalisé d'entrées-sorties (exemple fictif simplifié de 3 produits).

*La colonne «Électricité» compile les flux des différents produits (**Z**) et la valeur ajoutée (**va**) dédiés à la production d'électricité dans l'économie ; la rangée «Électricité» dénombre la consommation d'électricité dans la production des différentes commodités (**Z**) et par les consommateurs finaux (**h**). Les sommes des rangées et des colonnes se doivent d'être égales ($x=x'$).*

Analyse ES multirégionale : En combinant les tableaux de tous les pays disponibles, et en réconciliant leurs déclarations d'importations et d'exportations, on peut développer un tableau global du monde entier où chaque pays est représenté explicitement, et chaque industrie utilise des intrants domestiques et importés. La compilation de tableaux ES multirégionaux est une tâche passablement ardue, réalisée par des experts du monde académique, mais leur utilisation n'est pas plus compliquée ensuite que celle d'un tableau ES national. De tels tableaux ouvrent la voie à des analyses où la provenance des produits peut être considérée.

Les tableaux ES sont typiquement publiés tous les 5 ans par les agences statistiques nationales, et avec un délai de quelques années. L'analyste doit donc gérer cet aspect de la temporalité à l'aide d'indices de prix pour corriger au besoin l'inflation ou la déflation (voir annexe A.4).

L'analyse Entrées/Sorties environnementale (ES-E)

L'analyse ES calcule en \$ la production totale (du « berceau au consommateur ») requise pour une consommation finale donnée. Une des principales applications de l'analyse ES-E est plutôt de calculer **les émissions totales pour une consommation donnée**. Pour ce faire, on ajoute des extensions environnementales aux données d'inventaire de l'économie. Mathématiquement, on compile et on traite les extensions environnementales de la même manière que la valeur ajoutée présentée plus haut à la Figure 7-1. Les tableaux ES-E sont donc les tableaux ES enrichis d'une matrice de flux environnementaux exprimés en unités physiques, comme des émissions à l'air de kg CO₂ ou de kg SO₂, des prélèvements de m³ d'eau, de kg de pétrole brut, etc. Chaque colonne, c'est-à-dire chaque processus de production et activité de services (cf. Figure 7-1) possède donc l'inventaire de ses intrants de l'environnement (ressources naturelles prélevées) et ses émissions directes à l'environnement (polluants émis à l'air, l'eau ou au sol). Certains tableaux ES-E fournissent également les émissions de la phase d'utilisation des produits, sous forme d'émissions directes des ménages par \$ d'achat de chaque produit (p. ex., CO₂ émis par \$ d'achat d'essence automobile).

Les extensions environnementales peuvent être ajoutées aux tables économiques par les agences statistiques elles-mêmes, mais elles sont alors souvent limitées aux GES et à quelques ressources. Les modèles les plus complets sont plutôt développés par le monde académique. Les ressources impliquées sont très importantes, autant pour collecter les données disponibles que pour le travail d'estimation des données manquantes, de mise à l'échelle, et de contrôle qualité (identification de biais, cohérence des totaux, etc.). Ceci explique la disponibilité somme toute réduite de bases de données pour l'analyse ES-E (i.e. tableaux ES-E), nationales comme multirégionales. Il est très important de noter que, bien qu'une analyse ES-E assure la prise en compte exhaustive des activités économiques impliquées, la couverture des enjeux environnementaux n'est que partielle si l'inventaire contenu dans les tableaux est incomplet. Un modèle d'analyse ES-E, s'il est jugé comme suffisamment détaillé et complet, peut être utilisé conjointement à une ACV pour guider la collecte de données et la modélisation dans une phase exploratoire préliminaire à l'ACV traditionnelle (Bretz & Frankhauser 1996; Huang et al. 2009).

Le modèle open IO Canada (adapté)

Open IO-Canada est un modèle ES-E canadien développé par le CIRAIG¹³ en 2014. Ses principales caractéristiques sont (Lesage 2014) :

- Couverture et année de référence : Canada, 2009.
- Tables économiques au niveau de désagrégation "L61" publiées par Statistique Canada : 112 industries et 243 commodités (biens et services) (voir annexe A.2).
- Données environnementales : **émission de GES** et **utilisation d'eau** (prélèvements directs de l'environnement et acquisition des services publics d'approvisionnement) selon les Comptes de l'environnement de Statistique Canada et **émission de polluants toxiques à l'air, à l'eau et au sol** selon l'Inventaire national des rejets de polluants d'Environnement Canada (INRP). Il n'inclut pas, dans sa version v1.0, l'occupation des sols, les prélèvements de ressources fossiles et minérales. 238 différentes substances échangées avec l'environnement sont répertoriées.
- Type du modèle développé (v.1.0) : matrice normalisée de dimension 112 selon une approche « *Industrie-Industrie* », avec allocation des co-produits basée sur l'hypothèse

¹³ http://www.ciraig.org/en/open_io_canada/

qu'une industrie donnée produit de la même façon tous ses co-produits (hypothèse dite « *Industrie-Technologie* »).

Open IO-Canada est un modèle « ouvert » (*open source*) et un outil en ligne a été créé à partir du modèle. Il possède des limitations directement reliées à la complétude, la transparence et la qualité des données primaires sur lesquelles il se base. Les principales limitations sont listées à l'annexe A.3.

Open IO-Canada est un modèle qui représente l'économie du Canada dans son ensemble, sans offrir de détail au niveau provincial. Aussi, il considère le Canada comme une économie isolée du reste du monde puisque les échanges d'imports/exports n'y sont pas inclus. Ces deux limitations réduisent l'intérêt du modèle pour évaluer des produits achetés et utilisés dans une province quand on sait que beaucoup d'entre eux peuvent être fabriqués et importés de l'étranger, ou fabriqués et utilisés sur place dans une province donnée en profitant d'une électricité au profil environnemental sensiblement différent de celui de l'électricité Canadienne « moyenne » (p.ex. hydro-électricité Québécoise ou du Manitoba à faible empreinte carbone vs. électricité très carbonée de l'Alberta). De plus, la version v1.0 de open IO-Canada n'inclut pas les émissions de l'étape d'utilisation des produits (p.ex. le CO₂ émis lors de la combustion du gaz naturel acheté pour le chauffage), ni de leur fin de vie. Pour cette étude, le modèle utilisé est une adaptation qui concerne l'aspect suivant.

- a) Modification du modèle pour y intégrer la production d'électricité dans les 10 provinces Canadiennes.

a) Modification du modèle open IO-Canada pour y intégrer la production d'électricité

Tout d'abord, afin d'augmenter la performance du modèle et d'en faciliter son développement continu, open IO-Canada est intégré à un environnement de programmation Python. Le modèle est ensuite modifié selon les étapes suivantes :

- Les tables initiales sont redéfinies avec l'ajout de la dimension géographique (en l'occurrence CA, pour Canada) afin que puissent être ajoutées ultérieurement des industries et des produits propres à la géographie des autres provinces (BC, AB, etc.).
- Des produits exprimés en unité physiques sont ajoutés aux tables, notamment la production d'électricité québécoise (exprimée en kWh).
- Pour la production d'électricité, les émissions à l'environnement sont des émissions « cycle de vie », tenant compte par exemple de la construction des barrages hydroélectriques, du transport et de la distribution, et des imports d'électricité. Les émissions sont basées sur une étude réalisée par le CIRAIG pour Hydro-Québec et sont extraites de la base de données d'inventaire de cycle de vie ecoinvent v3.2 (2016).
- Par la suite, des biens et services canadiens des tables initiales peuvent être dupliqués dans les tables ES-E élargies, et virtuellement « délocalisés » dans chaque province (i.e. alimentés par une électricité de BC, de AB, etc.) s'il s'avère que de tels biens ou services produits dans ces provinces sont effectivement achetés par le gouvernement et devraient être modélisés comme tel. Cette **recontextualisation** est réalisée pour l'ensemble des 243 biens et services des tables ES-E, de sorte que le modèle d'analyse contient 10 versions, une Canadienne et une pour chaque province, de chacun des biens et service. C'est lors de l'analyse que sera décidé quelle version est utilisée pour chaque commodité.
- Pour cette recontextualisation, il a été nécessaire de convertir le montant d'électricité achetée pour chaque produit des tables ES-E en quantité physique (kWh) d'électricité. Deux prix d'électricité ont été considérés pour tenir compte des « grands

consommateurs » qui bénéficient d'un **tarif industriel** (0.0479\$/kWh) plus faible que les petits consommateurs auquel on a attribué le **tarif résidentiel** (0,0678\$/kWh) d'Hydro-Québec. À achat d'électricité par unité de produit égal, plus le prix supposé est faible, plus les émissions associées à la production d'électricité par unité de produit sont grandes.

Limitations du modèle d'analyse

- Le modèle open IO-Canada considère la structure de l'économie Canadienne ainsi que les émissions à l'environnement de chacun de ses secteurs tel qu'en 2009, alors que nous cherchons à évaluer des impacts potentiels pour des années de 2014 à 2017. Tout changement structurel de l'économie, tout progrès technologique qui a permis de réduire les émissions à l'environnement, mais aussi toute dégradation des performances environnementales des activités industrielles qui a pu survenir depuis 2009 n'est pas pris en compte. Toutefois, selon notre expérience, un délai de 5 à 8 ans est très acceptable dans le cadre d'une analyse exploratoire dont l'objectif est d'identifier les principaux contributeurs aux impacts.
- L'adaptation du modèle au contexte de chaque province n'est que partielle puisqu'elle ne concerne que la production de l'électricité.
- Intrinsèquement, l'analyse ES-E est granulaire en raison du nombre limité de catégories de produits et services considéré par le modèle. Le niveau d'agrégation réduit la possibilité de distinguer des acquisitions relativement similaires, comme par exemple celle regroupées dans la catégorie des ordinateurs et périphériques informatiques.
- Les extensions environnementales de open IO-Canada ne sont pas exhaustives et ne permettent pas la caractérisation de certains impacts, dont l'appauvrissement en ressources primaires fossiles et minérales, et les dommages sur la biodiversité (au travers de l'occupation des terres).
- Les extensions environnementales ne sont pas parfaitement alignées avec les méthodes d'évaluation des impacts du cycle de vie disponibles. Par exemple, les émissions de métaux et de métalloïdes sont souvent exprimées dans l'inventaire national des rejets de polluants (INRP) (source première des émissions de polluants du modèle open IO) comme « composés métalliques » ou simplement comme « métal », alors que les facteurs de caractérisation pour les métaux de la méthode Impact 2002+ sont donnés pour des métaux sous forme ionique, ce qui surestime les impacts écotoxiques et, conséquemment, le score de dommages sur la Qualité des écosystèmes.
- Enfin, l'INRP ne fournit des émissions que pour des sites dont l'importance est supérieure à un seuil, ce qui omet certaines petites sources d'émissions.

L'ensemble des limites associées au modèle open IO sont décrites à l'annexe A.3.

Appendix A.2: Input-Output Commodity Classification (IOCC), 2009, level link 1961, used in open IO-Canada

Source : Statistics Canada.

The last column shows the price chosen for the electricity consumed for the production of the goods or services (CIRAIG).

The appendix is included in file «**CIRAIG_SPAC_CarbonFootprint_Appendix.xlsx**» provided with the final report. Tab « Support mapping », tables « IOCC_noms » et « IOCC_region ».

Appendix A.3:

Limitations of open IO-Canada (v1.0)

See also : http://www.ciraig.org/en/open_io_canada/known_limitation.html described below, the 2009 environmental data for GHG emissions were updated in 2017 by Statistics Canada.

- the following excerpt also addresses the assessment of impacts other than GHG by the openIO-Canada model. These were not relevant to the present carbon footprint study.

A) ECONOMIC DATA

Missing elements in the original Input and Output tables

For confidentiality reasons, Statistics Canada wilfully excluded some elements from the Supply and Use tables. Some of these elements were estimated by CIRAIG in version 1.0 of OpenIO-Canada. Missing elements ultimately lead to an underestimation of impacts and potential errors in contribution analyses.

Imports, exports, investments, etc.

Imports, exports and any other issue not directly covered in the Supply and Use table were ignored in the model.

B) ENVIRONMENTAL DATA

Greenhouse gases coverage (2017 update of 2009 data)

The data from Statistics Canada on GHG emissions used in this model only covers three gases: CO₂, CH₄ and N₂O. What is more, the emissions data is only made available as an aggregate Carbon dioxide equivalent (CO₂e) and use global warming potentials (GWP) of 25 and 298 for CH₄ and N₂O, respectively (IPCC 2007, 100-year time horizon). The 2017 update of 2009 emission data covers the following sources: “combustion of fossil fuels and biomass; non-combustion uses of fossil fuels; industrial processes; agricultural soils; livestock manure and enteric fermentation”.

Incomplete data on emissions due to excluded facilities in NPRI

Emission data for non-GHG substances comes from the NPRI, a pollutant release inventory managed by Environment Canada. It collects data from Canadian industries on their emissions of over 300 substances or grouped substances. However, not all facilities are required to report to the NPRI. For example, facilities where less than 20 000 employee-hours are worked in a given year are not, under certain conditions, required to report. See <https://www.ec.gc.ca/inrp-npri/> for all requirements. This necessarily leads to an underestimation of emissions.

VOC emissions

VOC emission data comes from the NPRI. The sum of speciated VOC emissions was subtracted from total VOC emissions to avoid double counting. This resulted in negative emissions for 4 industries (GS91300-Other municipal government services, BS541D0-Computer systems design and other professional, scientific and technical services, BS31B00-Clothing and leather and allied product manufacturing and BS31110-Animal food manufacturing). The cause for these negative values is unknown. The sum of unspciated VOC emissions from these sectors was set to 0.

Total reduced sulphur

Total reduced sulphur emission data comes from the NPRI. As explained on their website, emissions of Total reduced sulphur (TRS) are actually the sum of six emissions, three of which (hydrogen sulphide [H₂S], carbon disulphide [CS₂] and carbonyl sulfide [COS]) are also reported

separately. In order to avoid double counting, the sum emission of these three substances, expressed in H₂S equivalents, was removed from the reported Total reduced sulphur emission. This was done separately for Air, Water and Soil emissions. This resulted in negative TRS emissions for some industries. The cause for these negative values is unknown. The TRS values for these industries was set to 0. This happened in the following cases:

- Air: BS21220, BS21300, BS22110, BS327A0, BS33100 and BS56200.
- Water: BS221A0
- Soil: BS21100, BS221A0

Particulate matter emissions

Particulate matter emission data comes from the NPRI. The particulate matter emissions, reported as Total PM, PM₁₀ and PM_{2.5}, are converted to the elementary flow names (and corresponding values) used in ecoinvent and most LCIA methods, i.e. "Particulates, > 10 µm" (PM-PM₁₀), "Particulates, > 2.5 µm, and < 10µm" (PM₁₀-PM_{2.5}) and Particulates, < 2.5 µm (PM_{2.5}). This resulted in negative emissions of "Particulates, > 10 µm" in 31 cases and negative emissions of "Particulates, > 2.5 µm, and < 10µm" in one case: these were set to 0. Contrary to TRS and VOC emissions, the cause of these negative calculated emissions is known and is unavoidable with the current data.

Compounds reported as elements

In the NPRI, some substances are reported as elements and their compounds/salts. This necessarily overestimates the weight of the actual elements, and hence leads to an overestimation of their impacts once characterized. The substances are: Acrylic acid (and its salts); Aniline (and its salts); Antimony (and its compounds); Arsenic (and its compounds); Cadmium (and its compounds); Chromium (and its compounds); Cobalt (and its compounds); Copper (and its compounds); Hexavalent chromium (and its compounds); Lead (and its compounds); Manganese (and its compounds); Mercury (and its compounds); Nickel (and its compounds); Nonylphenol and its ethoxylates; Selenium (and its compounds); Silver (and its compounds); Zinc (and its compounds).

Grouped emissions: isomers

In the NPRI, some substances are reported as "molecules and their isomers". Isomers will likely not have the same characterization factors, and hence this leads to a misrepresentation of impacts (uncertainty). The molecules are "HCFC-123 and all isomers" and "Xylene (all isomers)".

Water use (2017 update of 2009 data)

Physical flows of water use from Statistics Canada' environmental accounts are used in this model. The original dataset is modified to match the IOIC L-61 classification since it is provided with some more aggregated sectors, particularly for the manufacturing sectors. The account provides water use volume for every IOIC sector of the economy which is the sum of water withdrawn directly from the environment by the sector plus the tap water intake supplied to it by public/municipal systems.

Appendix A.4 : Sectoral inflation rates to be used with IOCC commodities used in open IO-Canada

Source : Statistics Canada.

Price indices:

- IPPI: Industrial producer price index
- CPI: Consumer price index
- WPI: Wholesale price index
- RPI: Retail Price Index

The appendix is included in file «**CIRAIG_SPAC_CarbonFootprint_Appendix.xlsx**» provided with the final report.

Appendix B: GSIN – UNSPSC mapping table

The appendix is included in file «**CIRAIG_SPAC_CarbonFootprint_Appendix.xlsx**» provided with the final report. Tab « nibs-gsin_unspsc »

Appendix C: UNSPSC – IOCC L61 mapping

The appendix is included in file «**CIRAIG_SPAC_CarbonFootprint_Appendix.xlsx**» provided with the final report. Tab « UNSPSC-IOCC-13_08_2019 »

Appendix D.1: Economic results - ATLANTIC

Additional tables are available in the appendix file
«CIRAIG_SPAC_CarbonFootprint_Appendix.xlsx» provided with the final report.

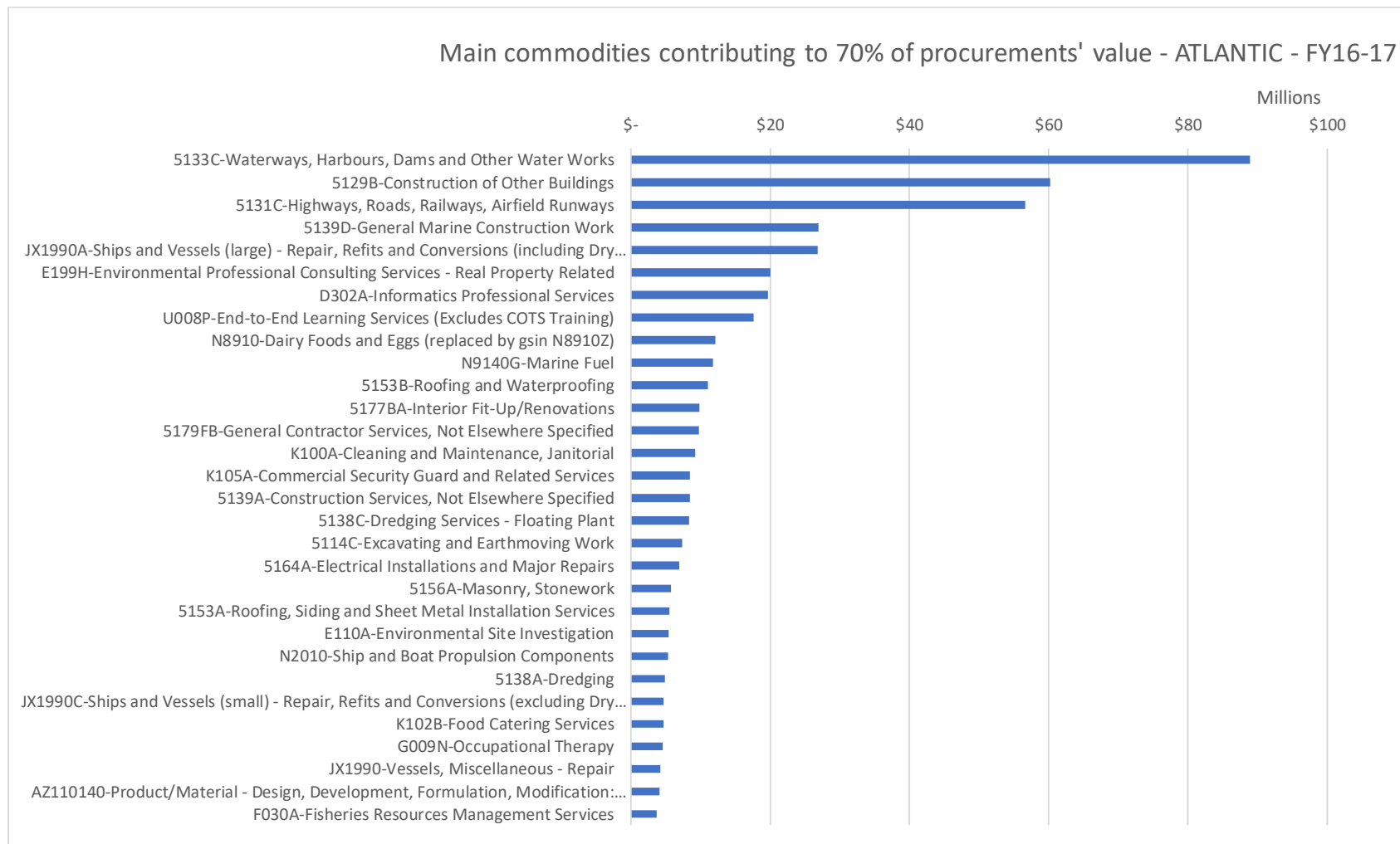


Figure 7-2 : Main goods and services, according GSIN classification, contributing to 70% of annual PSPC-ATLANTIC procurement, by value (tax excluded) in FY16-17.

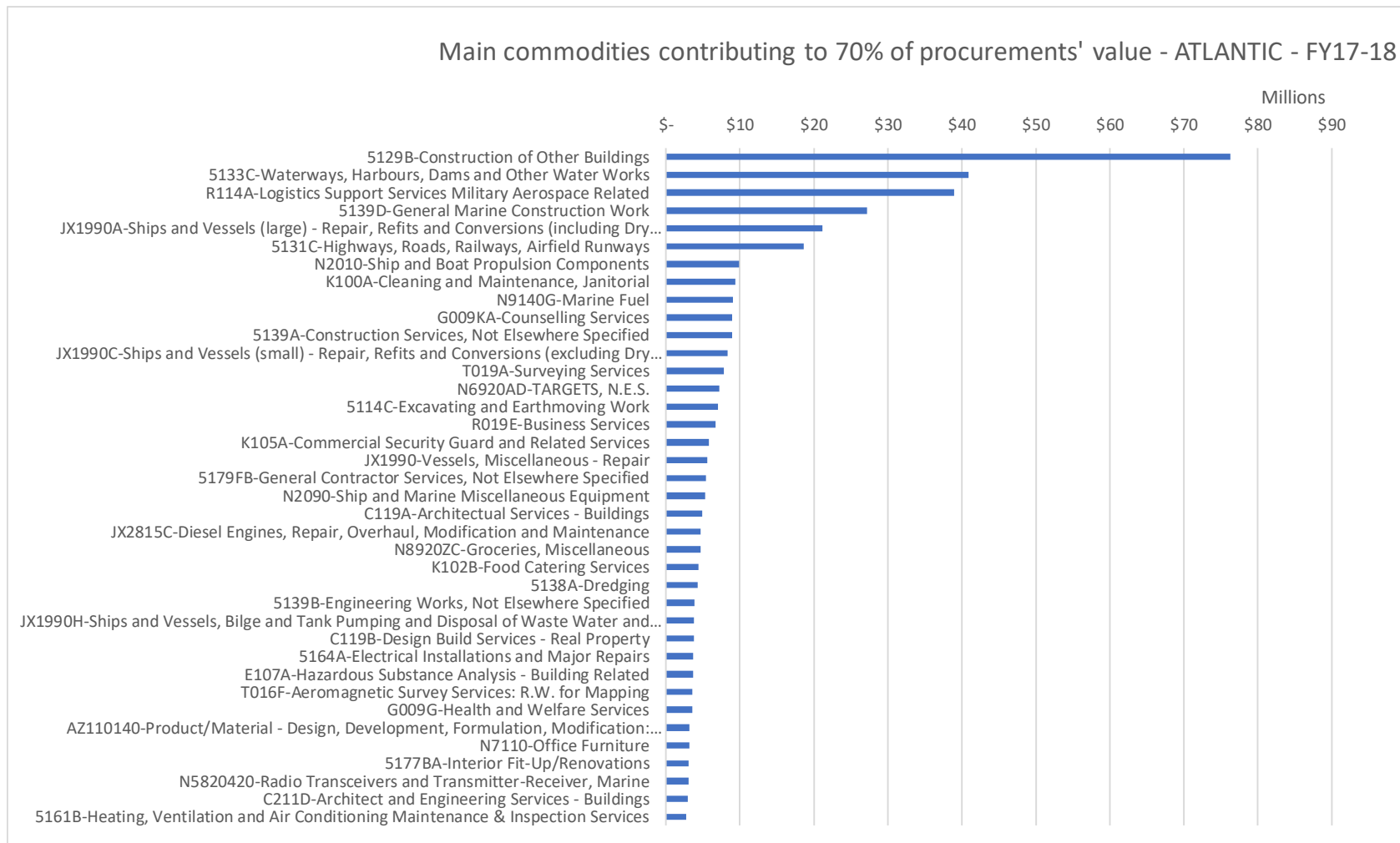


Figure 7-3 : Main goods and services, according GSIN classification, contributing to 70% of annual PSPC-ATLANTIC procurement, by value (tax excluded) in FY17-18.



Figure 7-4 : Main goods and services, according GSN classification, contributing to 70% of annual PSPC-ATLANTIC procurement, by value (tax excluded) in FY18-19.

Appendix D.2: Economic results - NCR

Additional tables are available in the appendix file
«CIRAIG_SPAC_CarbonFootprint_Appendix.xlsx» provided with the final report.

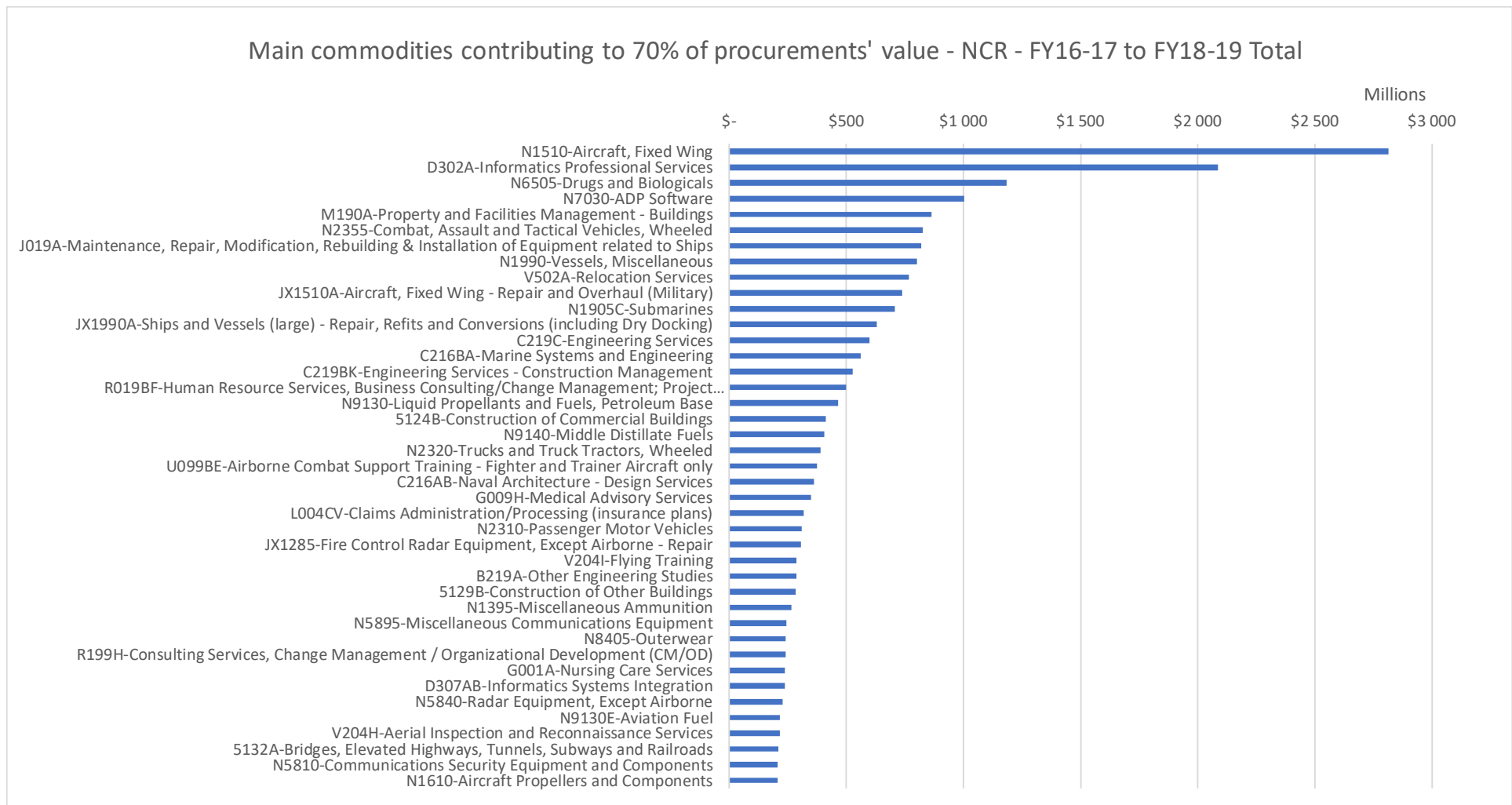


Figure 7-5 : Main goods and services, according G SIN classification, contributing to 70% of annual PSPC-NCR procurement, by value (tax excluded) over FY16-17 to FY18-19.

Appendix D.3: Economic results - ONTARIO

Additional tables are available in the appendix file
«CIRAIG_SPAC_CarbonFootprint_Appendix.xlsx» provided with the final report.

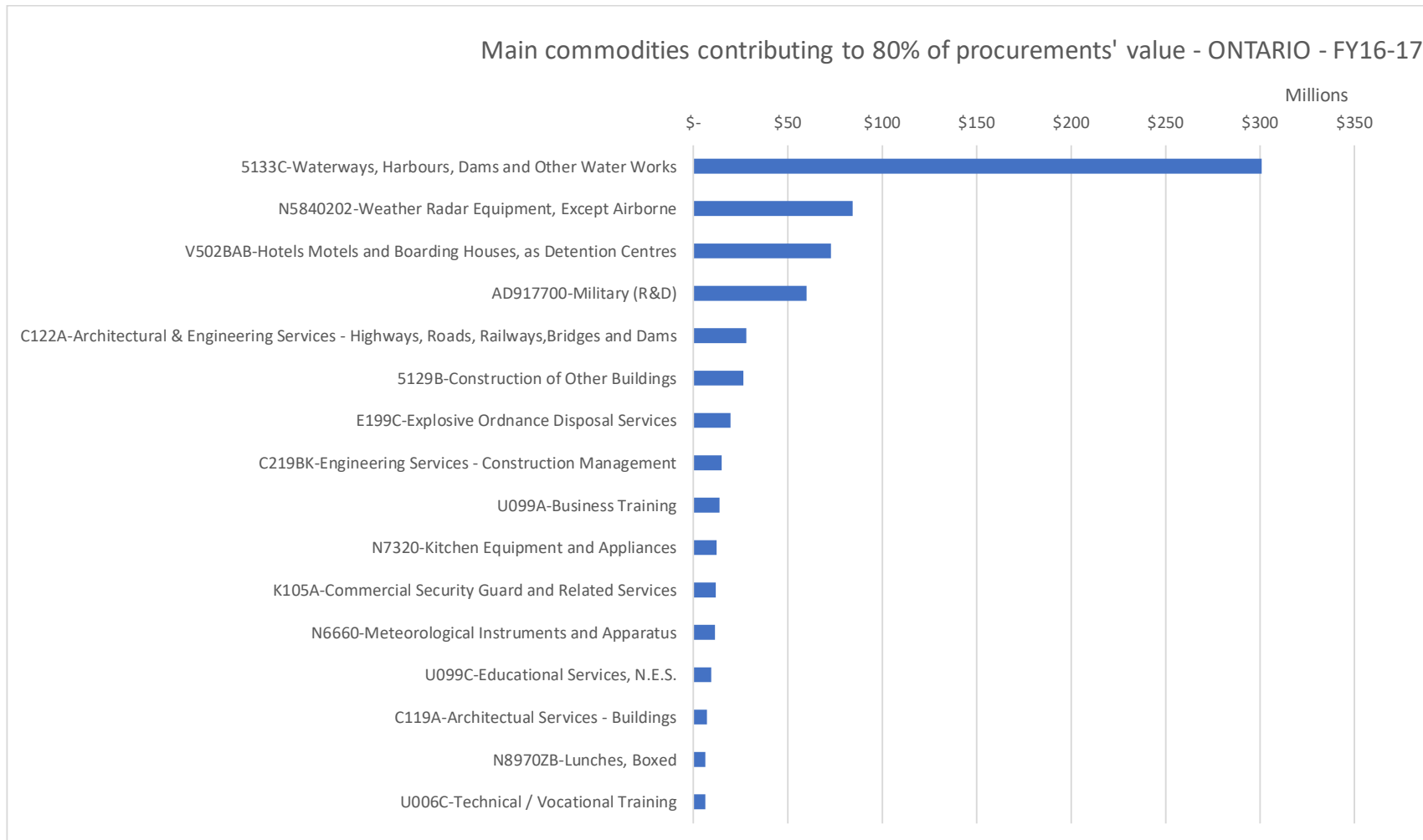


Figure 7-6 : Main goods and services, according GSN classification, contributing to 80% of annual PSPC-ONTARIO procurement, by value (tax excluded) in FY16-17.

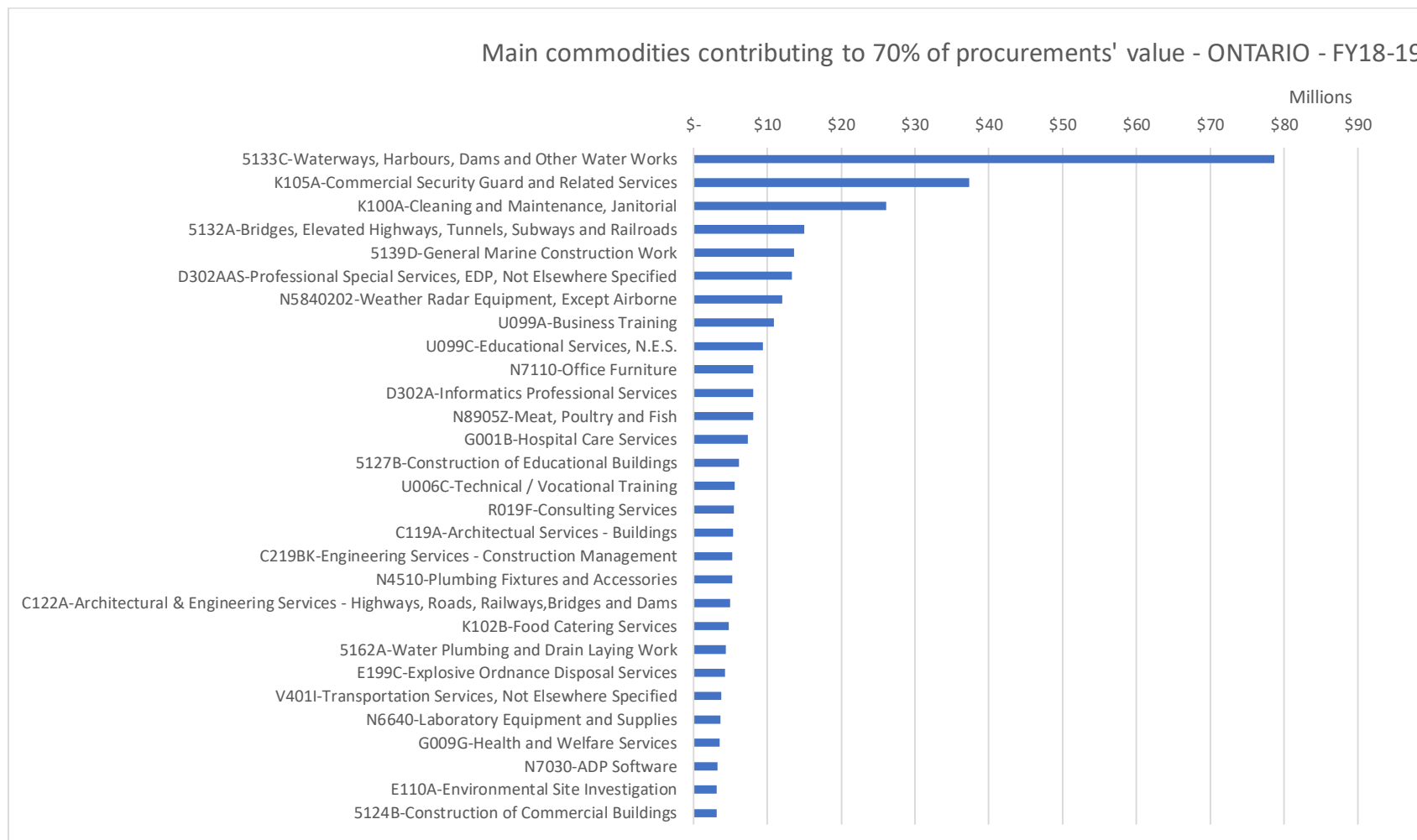


Figure 7-7 : Main goods and services, according G SIN classification, contributing to 70% of annual PSPC- ONTARIO procurement, by value (tax excluded) in FY18-19.

Appendix D.4: Economic results - PACIFIC

Additional tables are available in the appendix file
«CIRAIG_SPAC_CarbonFootprint_Appendix.xlsx» provided with the final report.

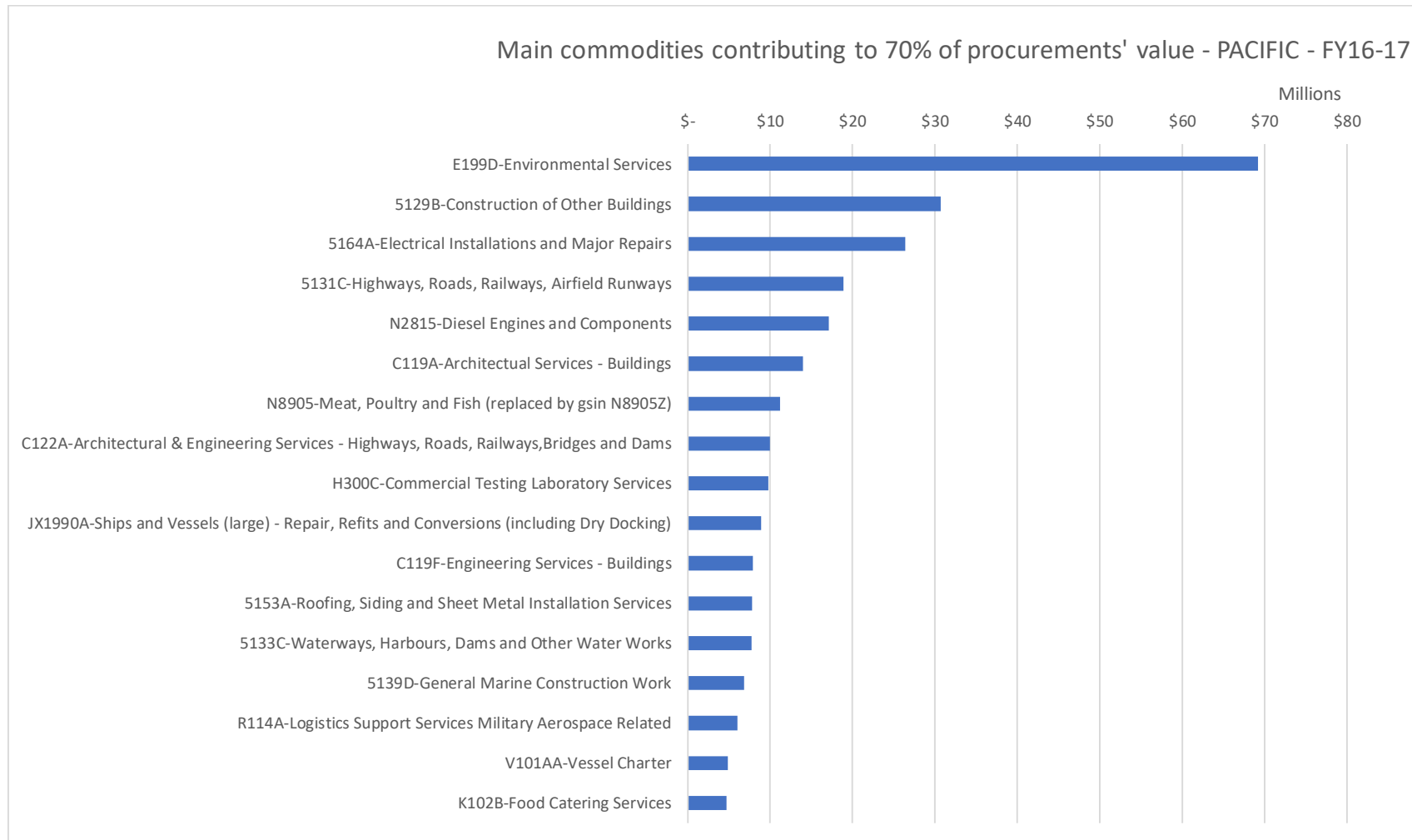


Figure 7-8 : Main goods and services, according GSIN classification, contributing to 70% of annual PSPC-PACIFIC procurement, by value (tax excluded) in FY16-17.

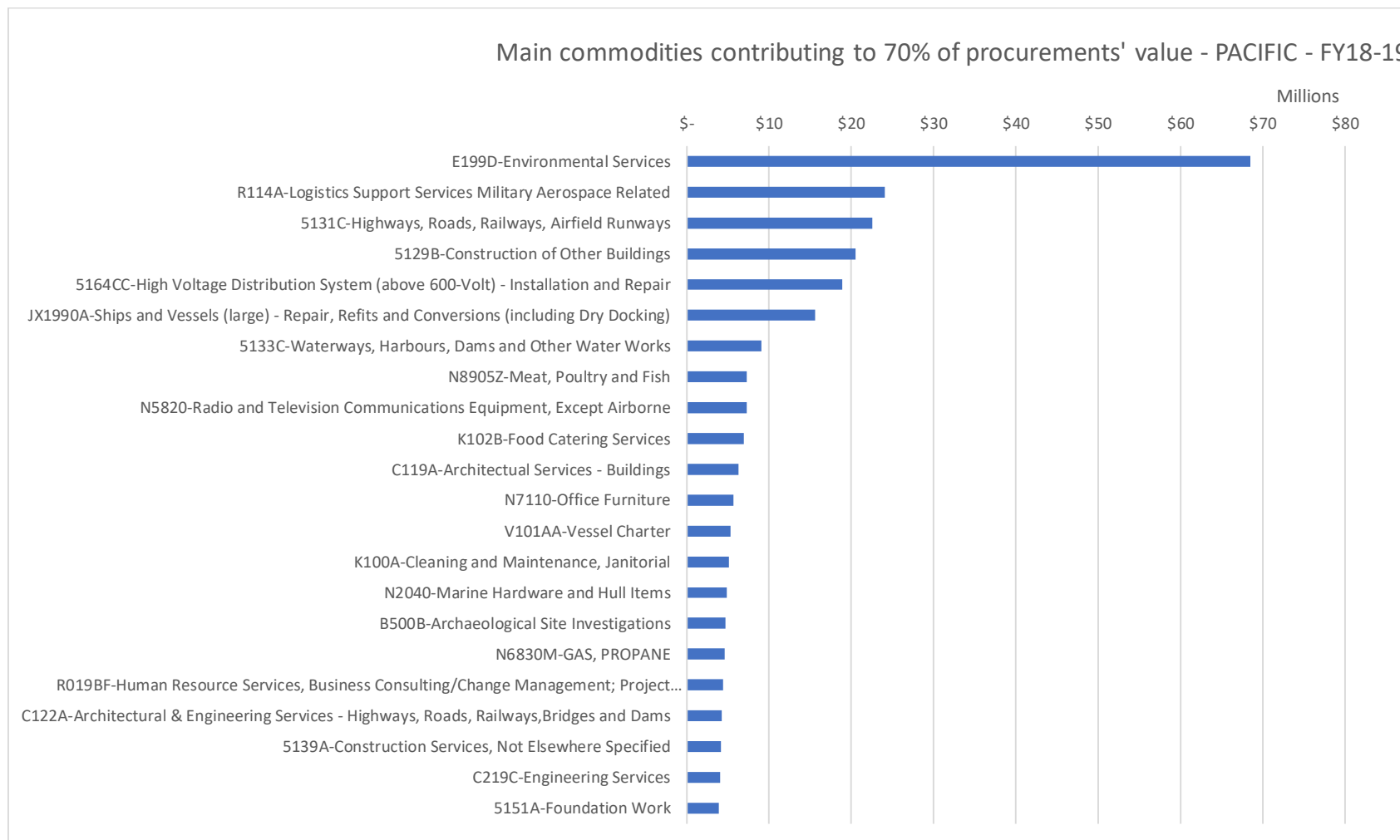


Figure 7-9 : Main goods and services, according GSIN classification, contributing to 70% of annual PSPC-PACIFIC procurement, by value (tax excluded) in FY18-19.

Appendix D.5: Economic results - WESTERN

Additional tables are available in the appendix file
«CIRAIG_SPAC_CarbonFootprint_Appendix.xlsx» provided with the final report.

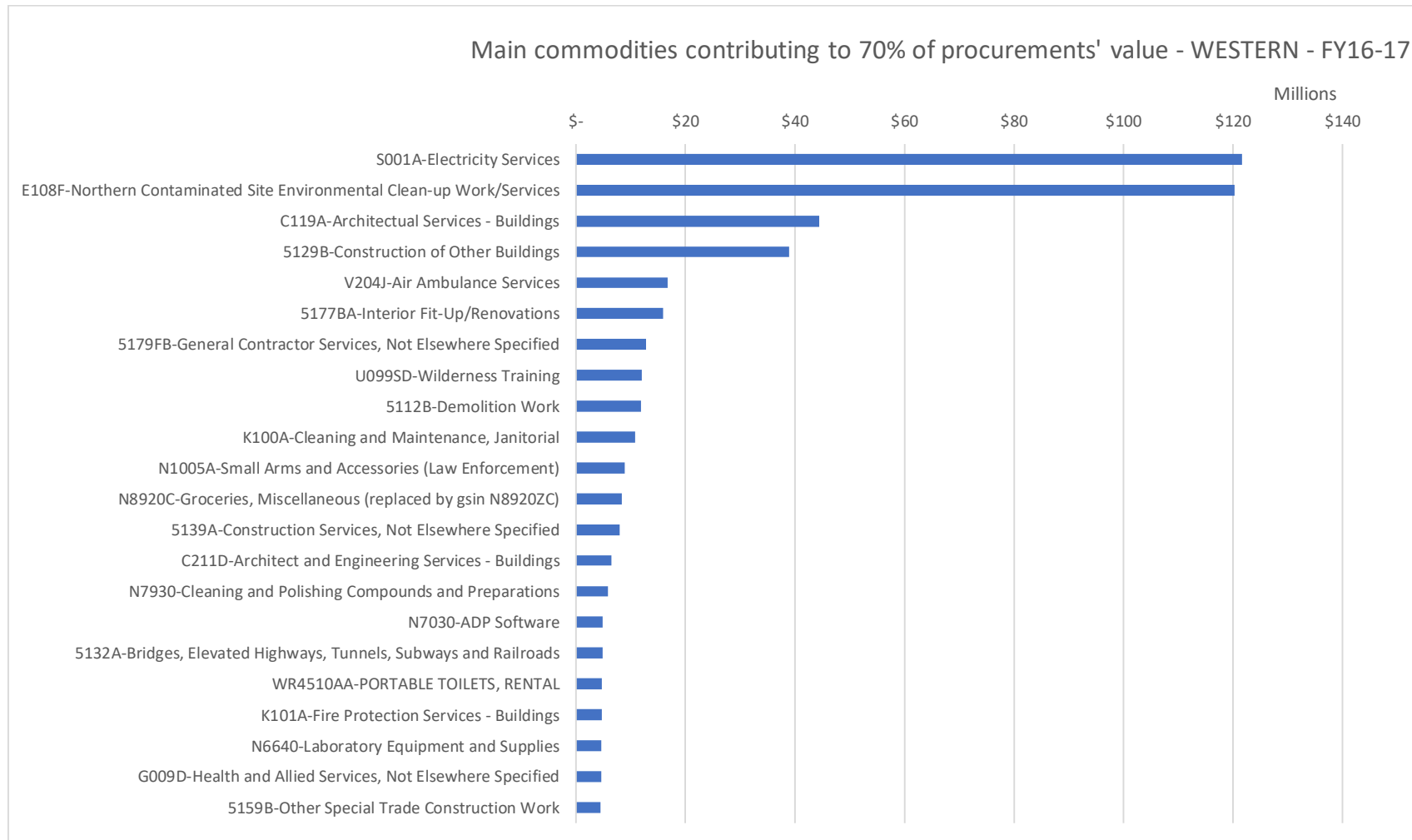


Figure 7-10 : Main goods and services, according GSIN classification, contributing to 70% of annual PSPC-WESTERN procurement, by value (tax excluded) in FY16-17.

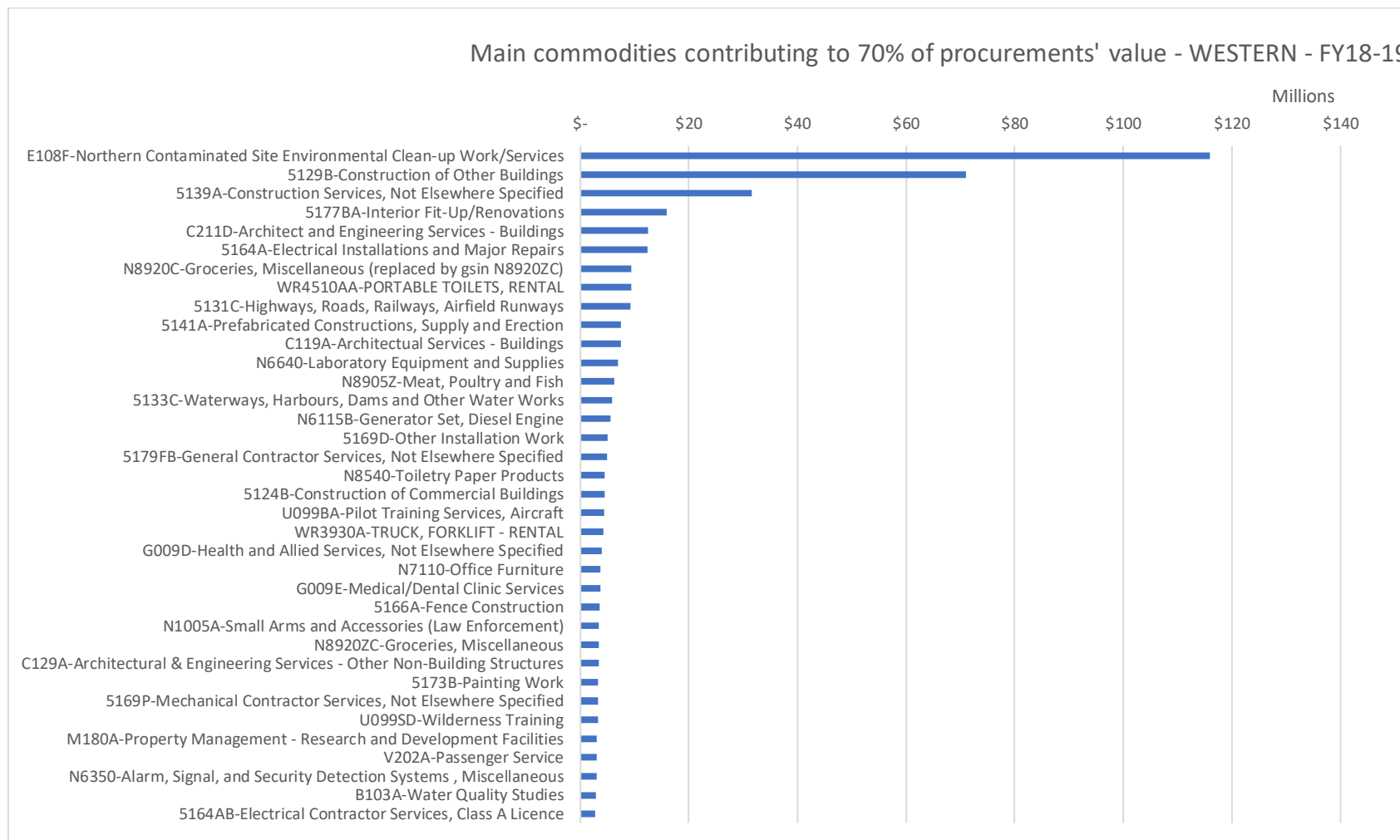


Figure 7-11 : Main goods and services, according GSIN classification, contributing to 70% of annual PSPC-WESTERN procurement, by value (tax excluded) in FY18-19.

Appendix E.1: Carbon footprint results - ATLANTIC

Additional tables are available in the appendix file
«CIRAIG_SPAC_CarbonFootprint_Appendix.xlsx» provided with the final report.

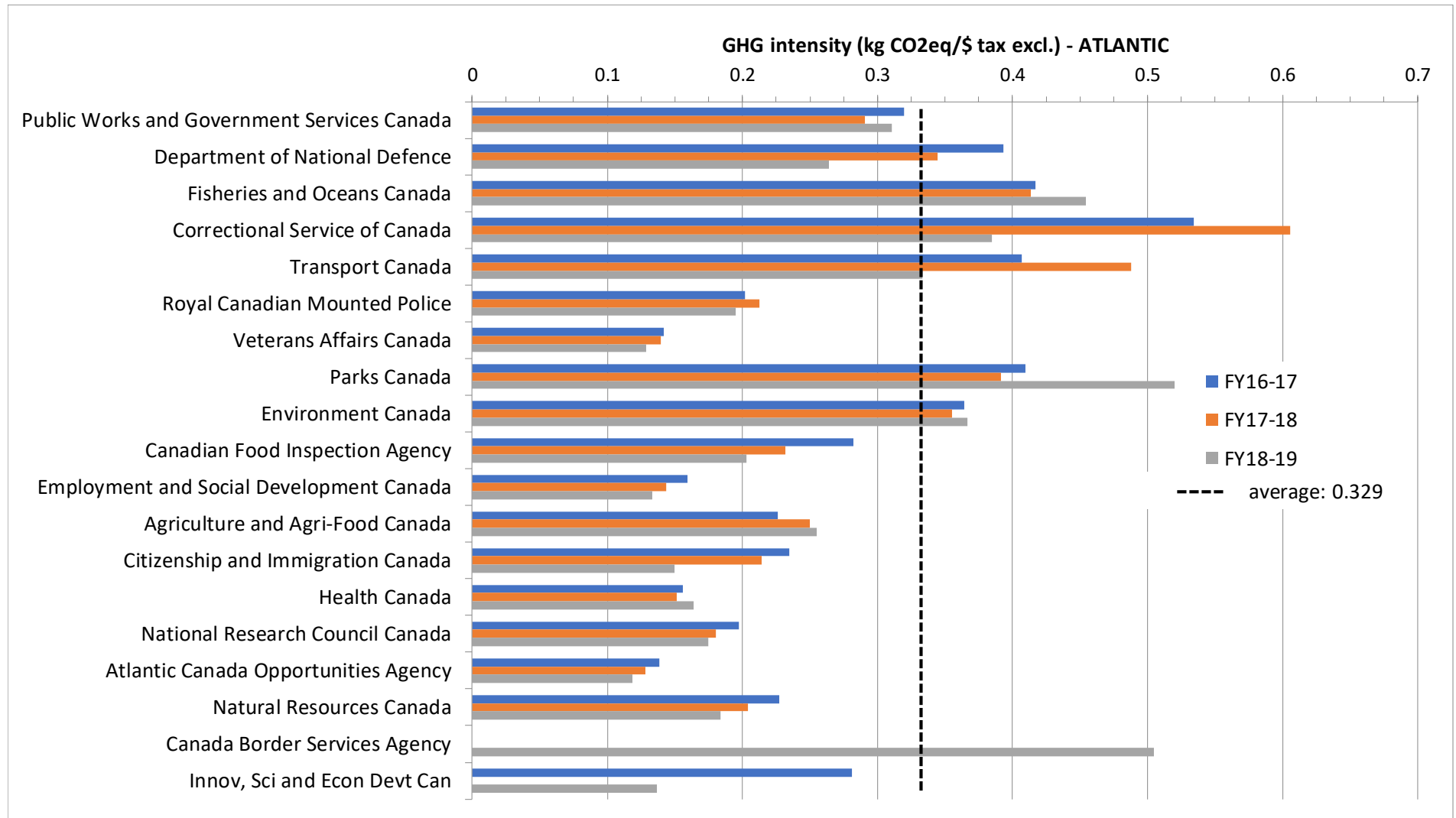


Figure 7-12 : Annual variation of the GHG intensity by customers in ATLANTIC and FY16-17 to FY18-19 average (tonnes CO₂eq/\$ tax excluded).

Appendix E.2: Carbon footprint results - NCR

Additional tables are available in the appendix file
«CIRAIG_SPAC_CarbonFootprint_Appendix.xlsx» provided with the final report.

Table 7-1 : carbon footprint (t CO₂eq) and GHG emission intensity of PSPC-NCR procurement, per customer (sorted on FY17-18 amounts); no cut-off.

NCR CUSTOMER NAME	FY16-17			FY17-18			FY18-19		
	GHG (t CO ₂ eq)	% Total	kg CO ₂ eq/\$	GHG (t CO ₂ eq)	% Total	kg CO ₂ eq/\$	GHG (t CO ₂ eq)	% Total	kg CO ₂ eq/\$
Department of National Defence	2 042 338	66.3%	0.262	1 561 425	51.8%	0.298	1 934 636	57.9%	0.313
Public Works and Government Services Canada	715 478	23.2%	0.272	850 846	28.2%	0.330	628 390	18.8%	0.320
Fisheries and Oceans Canada	56 740	1.8%	0.387	191 025	6.3%	0.773	364 429	10.9%	0.340
Foreign Affairs, Trade and Development (Department of Employment and Social Development Canada)	28 933	0.9%	0.336	128 690	4.3%	0.708	27 443	0.8%	0.291
Citizenship and Immigration Canada	43 336	1.4%	0.295	44 222	1.5%	0.232	64 180	1.9%	0.213
Royal Canadian Mounted Police	16 387	0.5%	0.150	43 022	1.4%	0.183	40 584	1.2%	0.220
Health Canada	17 047	0.6%	0.138	36 740	1.2%	0.171	25 252	0.8%	0.184
Correctional Service of Canada	10 291	0.3%	0.151	26 042	0.9%	0.111	30 748	0.9%	0.130
Canada Border Services Agency	11 278	0.4%	0.298	23 777	0.8%	0.316	11 296	0.3%	0.206
Transport Canada	8 355	0.3%	0.155	17 096	0.6%	0.206	22 926	0.7%	0.156
Natural Resources Canada	5 353	0.2%	0.420	13 911	0.5%	0.171	6 368	0.2%	0.185
Treasury Board of Canada	17 510	0.6%	0.511	11 459	0.4%	0.556	13 804	0.4%	0.604
Parks Canada	47 470	1.5%	0.309	8 899	0.3%	0.096	10 351	0.3%	0.130
Agriculture and Agri-Food Canada	6 825	0.2%	0.284	7 493	0.2%	0.287	6 569	0.2%	0.405
Innov. Sci and Econ Devt Can	2 892	0.1%	0.158	7 007	0.2%	0.335	8 578	0.3%	0.308
National Research Council Canada	3 311	0.1%	0.176	4 833	0.2%	0.110	3 380	0.1%	0.166
Environment Canada	7 158	0.2%	0.310	4 118	0.1%	0.264	5 431	0.2%	0.295
Veterans Affairs Canada	3 538	0.1%	0.291	3 696	0.1%	0.264	4 003	0.1%	0.270
Privy Council Office	2 127	0.1%	0.152	3 691	0.1%	0.136	2 895	0.1%	0.139
Statistics Canada	1 413	0.0%	0.171	3 039	0.1%	0.151	2 394	0.1%	0.147
Department of Justice Canada	1 989	0.1%	0.161	2 741	0.1%	0.244	9 028	0.3%	0.428
Canadian Heritage	1 934	0.1%	0.163	2 203	0.1%	0.180	1 832	0.1%	0.153
Courts Administration Service	2 093	0.1%	0.160	2 156	0.1%	0.165	1 036	0.0%	0.193
Canadian Food Inspection Agency	352	0.0%	0.273	2 096	0.1%	0.220	135	0.0%	0.169
Public Health Agency of Canada	3 380	0.1%	0.160	1 985	0.1%	0.158	814	0.0%	0.184
Canadian Space Agency	4 502	0.1%	0.265	1 613	0.1%	0.190	12 802	0.4%	0.377
Office of Infrastructure of Canada	1 946	0.1%	0.286	1 025	0.0%	0.233	946	0.0%	0.354
Public Safety and Emergency Preparedness Canada	1 495	0.0%	0.156	993	0.0%	0.167	87 270	2.6%	0.410
Office of the Chief Electoral Officer	566	0.0%	0.149	870	0.0%	0.155	1 619	0.0%	0.136
Indigenous and Northern Affairs Canada	4 963	0.2%	0.136	838	0.0%	0.126	3 545	0.1%	0.131
Department of Finance	5 428	0.2%	0.143	751	0.0%	0.116	-2 107	-0.1%	0.111
Canada Revenue Agency	892	0.0%	0.214	709	0.0%	0.243	731	0.0%	0.232
Public Prosecution Service of Canada	1 479	0.0%	0.180	486	0.0%	0.140	1 941	0.1%	0.142
Library and Archives Canada	406	0.0%	0.228	466	0.0%	0.399	229	0.0%	0.227
Shared Services Canada	933	0.0%	0.105	442	0.0%	0.140	631	0.0%	0.113
Administrative Tribunals Support Service of Canada	306	0.0%	0.140	434	0.0%	0.141	434	0.0%	0.133
Canada School of Public Service	127	0.0%	0.202	307	0.0%	0.268	313	0.0%	0.201
Canadian Nuclear Safety Commission	386	0.0%	0.223	305	0.0%	0.213	474	0.0%	0.247
Immigration and Refugee Board	297	0.0%	0.184	292	0.0%	0.194	495	0.0%	0.228
Communications Security Establishment	81	0.0%	0.318	261	0.0%	0.675	153	0.0%	0.379
Canadian Grain Commission	22	0.0%	0.216	246	0.0%	0.120	97	0.0%	0.135
Financial Consumer Agency of Canada	44	0.0%	0.179	226	0.0%	0.297	365	0.0%	1.727
Canadian Radio Television and Telecommunications Commission	82	0.0%	0.153	173	0.0%	0.159	244	0.0%	0.158
Polar Knowledge Canada	150	0.0%	0.205	155	0.0%	0.167	157	0.0%	0.166
National Energy Board	6	0.0%	0.332	102	0.0%	0.353	14	0.0%	0.244
Office of the Superintendent of Financial Institutions	64	0.0%	0.226	84	0.0%	0.240	10	0.0%	0.104
Office of the Commissioner for Federal Judicial Affairs	48	0.0%	0.085	79	0.0%	0.092	1 510	0.0%	0.130
Natural Sciences and Engineering Research Council of Canada	25	0.0%	0.498	74	0.0%	0.384	5	0.0%	0.146
Status of Women Canada	139	0.0%	0.130	72	0.0%	0.123	153	0.0%	0.133
National Capital Commission	26	0.0%	0.193	59	0.0%	0.261	41	0.0%	0.145
Government of the Northwest Territories	19	0.0%	0.382	58	0.0%	0.373	42	0.0%	0.363
Public Service Commission of Canada				55	0.0%	0.390			
Atlantic Canada Opportunities Agency	49	0.0%	0.083	47	0.0%	0.086	459	0.0%	0.221
Business Development Bank of Canada	11	0.0%	0.239	35	0.0%	0.310	18	0.0%	0.238
Governor General	28	0.0%	0.130	35	0.0%	0.147	25	0.0%	0.127
National Parole Board	26	0.0%	0.197	33	0.0%	0.241	54	0.0%	0.260
National Battlefields Commission	8	0.0%	0.244	28	0.0%	0.166	6	0.0%	0.261
Economic Development Agency of Canada for the Region	33	0.0%	0.382	26	0.0%	0.372			
Supreme Court of Canada	35	0.0%	0.197	26	0.0%	0.154	20	0.0%	0.153
Royal Canadian Mint	44	0.0%	0.174	21	0.0%	0.148	85	0.0%	0.287
Financial Transactions and Reports Analysis Center of Canada				18	0.0%	0.135			
Canadian Transportation Agency	20	0.0%	0.120	17	0.0%	0.114	25	0.0%	0.118
Canadian Institutes of Health Research	35	0.0%	0.158	16	0.0%	0.145	30	0.0%	0.139
Auditor General of Canada, Office of the	12	0.0%	0.129	14	0.0%	0.141	24	0.0%	0.188
National Film Board	14	0.0%	0.166	13	0.0%	0.133	12	0.0%	0.072
Social Sciences and Humanities Research Council	5	0.0%	0.151	11	0.0%	0.143			
Western Economic Diversification Canada	22	0.0%	0.184	10	0.0%	0.163			
Canadian Human Rights Commission	8	0.0%	0.072	9	0.0%	0.073	19	0.0%	0.099
Canadian International Trade Tribunal	9	0.0%	0.202	8	0.0%	0.083	2	0.0%	0.072
Canadian Tourism Commission	8	0.0%	0.119	8	0.0%	0.118	3	0.0%	0.117
Offices of the Information and Privacy Commissioners of	0.2	0.0%	0.248	8	0.0%	0.246	5	0.0%	0.244
FedDev Ontario	16	0.0%	0.151	8	0.0%	0.148	8	0.0%	0.145
Canadian Security Intelligence Service	7	0.0%	0.214	8	0.0%	0.266			
Transportation Safety Board of Canada	111	0.0%	0.396	7	0.0%	0.148	-107	0.0%	0.383
Canadian Centre for Occupational Health and Safety	32	0.0%	0.259	5	0.0%	0.104	21	0.0%	0.158
Security Intelligence Review Committee	1	0.0%	0.148	4	0.0%	0.117	4	0.0%	0.116
Library of Parliament				3	0.0%	0.072			
Canadian Northern Economic Development Agency	7	0.0%	0.234	2	0.0%	0.072	22	0.0%	0.190
Canadian Air Transport Security Authority	2	0.0%	0.248	2	0.0%	0.246			
Patented Medicine Prices Review Board	2	0.0%	0.072	1	0.0%	0.072	1	0.0%	0.072
Military Police Complaints Commission	0.2	0.0%	0.248						
Canadian International Development Agency	0.02	0.0%	0.248						
Canadian Museum for Human Rights	37	0.0%	0.274						
House of Commons	1	0.0%	0.230						
Copyright Board	85	0.0%	0.382						
Public Service Labour Relations Board	6	0.0%	0.151						
Canada Mortgage and Housing Corporation	96	0.0%	0.248				8	0.0%	0.244
Office of the Commissioner of Lobbying of Canada							6	0.0%	0.199
RCMP Public Complaints Commission	25	0.0%	0.248				19	0.0%	0.192
Office of the Commissioner of Official Languages	7	0.0%	0.266						
Canadian Museum of Immigration at Pier 21	0.2	0.0%	0.230						
Competition Tribunal									
Registry of the Public Servants Disclosure Protection Tribunal									
Canadian Museum of History	0.2	0.0%	0.230						
Grand Total	3 082 758	100.0%	0.263	3 013 812	100.0%	0.309	3 339 387	100.0%	0.303

Table 7-2 : Top-65 G SIN commodities of concern for PSPC-NCR contributing to 84% of the carbon footprint (t CO₂eq), over the three years and GHG emission intensity

NCR	FY16-17 to FY18-19			
CMDTY CODE- DESCRIPTION	Value (Tax excl.)	GHG (t CO2eq)	% Total GHG	GHG intensity (kg CO2eq/\$ tx excl.)
N9130-Liquid Propellants and Fuels, Petroleum Base	\$ 463 715 015	742 915	7.9%	1.602
V502A-Relocation Services	\$ 767 675 699	655 937	7.0%	0.854
N9140-Middle Distillate Fuels	\$ 405 675 168	577 341	6.1%	1.423
N1510-Aircraft, Fixed Wing	\$ 2 812 839 600	437 891	4.6%	0.156
N6505-Drugs and Biologicals	\$ 1 183 602 481	389 290	4.1%	0.329
N1990-Vessels, Miscellaneous	\$ 801 447 300	360 690	3.8%	0.450
J019A-Maintenance, Repair, Modification, Rebuilding & Installation	\$ 821 027 167	333 659	3.5%	0.406
N2355-Combat, Assault and Tactical Vehicles, Wheeled	\$ 825 291 873	313 566	3.3%	0.380
D302A-Informatics Professional Services	\$ 2 086 853 199	281 609	3.0%	0.135
N1905C-Submarines	\$ 708 889 455	279 996	3.0%	0.395
N9130E-Aviation Fuel	\$ 216 824 013	257 415	2.7%	1.187
JX1990A-Ships and Vessels (large) - Repair, Refits and Conversions	\$ 631 142 509	238 039	2.5%	0.377
R019BF-Human Resource Services, Business Consulting/Change Management	\$ 500 648 173	201 504	2.1%	0.402
C216BA-Marine Systems and Engineering	\$ 561 892 486	175 888	1.9%	0.313
N2320-Trucks and Truck Tractors, Wheeled	\$ 390 637 953	145 475	1.5%	0.372
M190A-Property and Facilities Management - Buildings	\$ 862 948 832	131 315	1.4%	0.152
JX1510A-Aircraft, Fixed Wing - Repair and Overhaul (Military)	\$ 738 811 127	121 522	1.3%	0.164
5124B-Construction of Commercial Buildings	\$ 411 713 352	117 554	1.2%	0.286
N2310-Passenger Motor Vehicles	\$ 308 321 841	114 690	1.2%	0.372
R199H-Consulting Services, Change Management / Organizational	\$ 240 204 152	96 750	1.0%	0.403
N9140C-Diesel Fuel, Automotive	\$ 58 849 069	91 779	1.0%	1.560
5132A-Bridges, Elevated Highways, Tunnels, Subways and Railroads	\$ 208 831 901	86 703	0.9%	0.415
5129B-Construction of Other Buildings	\$ 284 614 453	79 747	0.8%	0.280
T014D1-Security Printing, Paper Documents (including bonds)	\$ 140 276 718	78 912	0.8%	0.563
C219C-Engineering Services	\$ 599 717 582	76 101	0.8%	0.127
V204I-Flying Training	\$ 288 391 230	73 533	0.8%	0.255
N7030-ADP Software	\$ 1 004 542 186	72 544	0.8%	0.072
C219BK-Engineering Services - Construction Management	\$ 525 954 300	68 187	0.7%	0.130
N2840-Gas Turbines and Jet Engines, Aircraft, Prime Moving and Components	\$ 194 860 055	67 268	0.7%	0.345
JX1285-Fire Control Radar Equipment, Except Airborne - Repair	\$ 305 604 372	66 024	0.7%	0.216
N1395-Miscellaneous Ammunition	\$ 265 893 983	53 459	0.6%	0.201
C216AB-Naval Architecture - Design Services	\$ 361 208 949	52 648	0.6%	0.146
N2010-Ship and Boat Propulsion Components	\$ 120 182 977	50 614	0.5%	0.421
N1905-Combat Ships and Landing Vessels	\$ 88 588 342	47 344	0.5%	0.534
N8405-Outerwear	\$ 240 343 562	46 575	0.5%	0.194
N6640-Laboratory Equipment and Supplies	\$ 141 974 549	43 309	0.5%	0.305
G009H-Medical Advisory Services	\$ 348 339 874	42 187	0.4%	0.121
N8340-Tents and Tarpaulins	\$ 190 657 754	41 748	0.4%	0.219
N6920999-ARMAMENT TRAINING DEVICES, ELECTRONIC, ACCESSORIES	\$ 190 187 994	40 904	0.4%	0.215
N1940-Small Craft	\$ 100 718 653	40 389	0.4%	0.401
N7110-Office Furniture	\$ 101 549 829	39 787	0.4%	0.392
N5840-Radar Equipment, Except Airborne	\$ 228 293 846	36 927	0.4%	0.162
B219A-Other Engineering Studies	\$ 287 654 658	35 958	0.4%	0.125
D307AB-Informatics Systems Integration	\$ 236 482 032	35 071	0.4%	0.148
N5810-Communications Security Equipment and Components	\$ 206 627 764	34 440	0.4%	0.167
U099BE-Airborne Combat Support Training - Fighter and Trainer / Support	\$ 376 205 060	32 611	0.3%	0.087
N5895-Miscellaneous Communications Equipment	\$ 243 149 171	32 358	0.3%	0.133
V204H-Aerial Inspection and Reconnaissance Services	\$ 215 899 989	30 103	0.3%	0.139
N1610-Aircraft Propellers and Components	\$ 206 474 423	30 074	0.3%	0.146
N5820-Radio and Television Communications Equipment, Except	\$ 178 435 036	29 922	0.3%	0.168
N8970-Composite Food Packages	\$ 57 942 359	28 212	0.3%	0.487
V201A-Fixed Wing Aircraft - Airplane Charter	\$ 21 366 151	27 974	0.3%	1.309
G001A-Nursing Care Services	\$ 239 025 240	27 734	0.3%	0.116
N2090-Ship and Marine Miscellaneous Equipment	\$ 67 267 907	27 719	0.3%	0.412
R109D-Translation Services	\$ 112 619 175	27 690	0.3%	0.246
V101AA-Vessel Charter	\$ 59 097 597	27 539	0.3%	0.466
N2590-Vehicular Components, Miscellaneous	\$ 66 148 101	27 066	0.3%	0.409
R199B-Miscellaneous Business Services	\$ 65 493 009	26 694	0.3%	0.408
L004CV-Claims Administration/Processing (insurance plans)	\$ 317 163 691	26 526	0.3%	0.084
V201B-Rotary Wing Aircraft - Helicopter Charter	\$ 19 312 646	25 189	0.3%	1.304
D317E-Information Products	\$ 109 571 436	25 044	0.3%	0.229
N2510-Vehicular Cab, Body and Frame Structural Components	\$ 69 016 992	24 723	0.3%	0.358
T014A-Publications	\$ 43 866 878	24 489	0.3%	0.558
N1336-Guided Missile Warheads and Explosive Components	\$ 169 087 663	24 347	0.3%	0.144
JX1650-Aircraft Hydraulic, Vacuum and De-icing System Components	\$ 177 930 199	23 901	0.3%	0.134

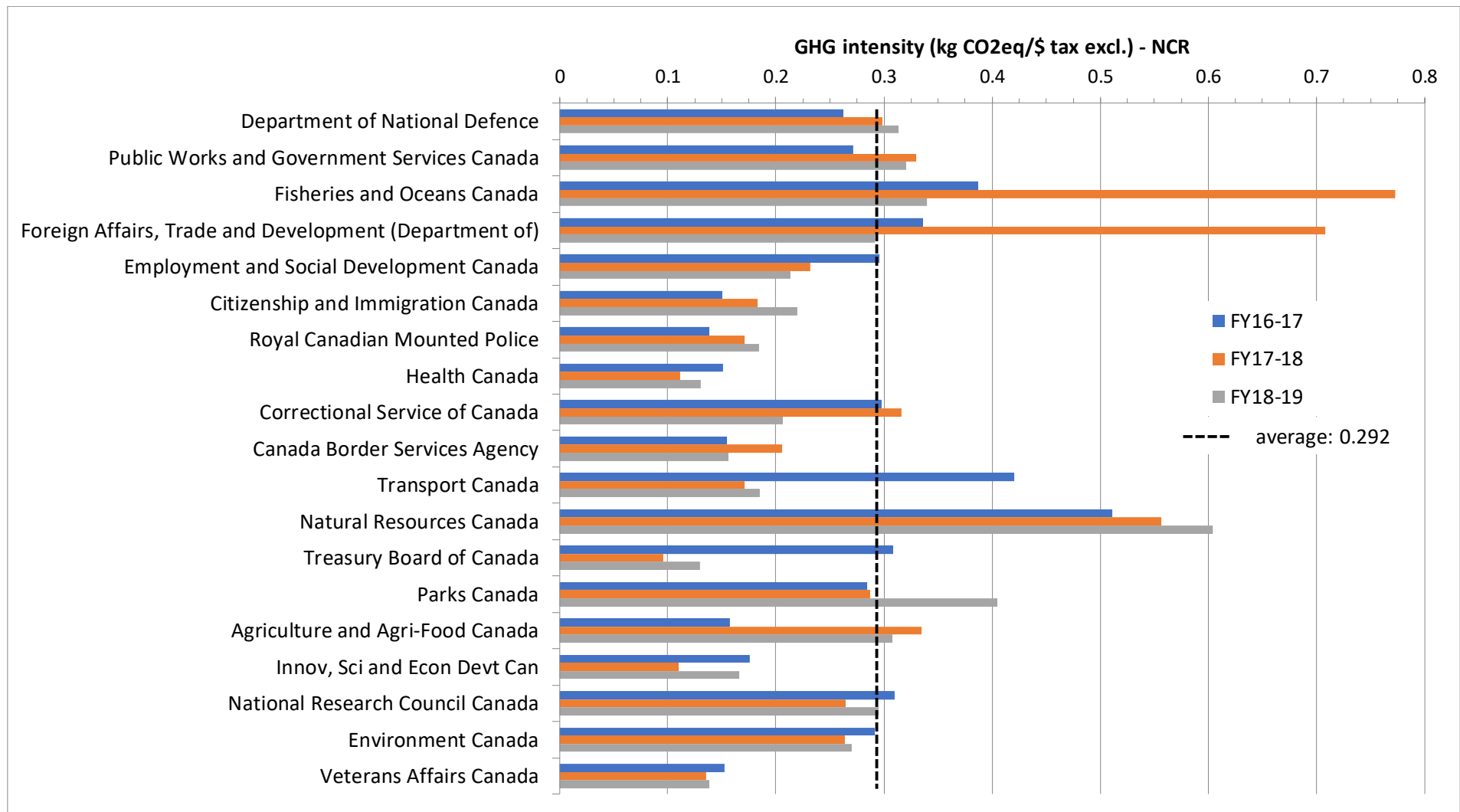


Figure 7-13 : Annual variation of the GHG intensity by customers in NCR and FY16-17 to FY18-19 average (tonnes CO₂eq/\$ tax excluded). (cut-off of customers : only the most contributing ones in FY17-18, by decreasing order up to 90.1% of the total footprint)

Appendix E.3:

Carbon footprint results - ONTARIO

Additional tables are available in the appendix file
«CIRAIG_SPAC_CarbonFootprint_Appendix.xlsx» provided with the final report.

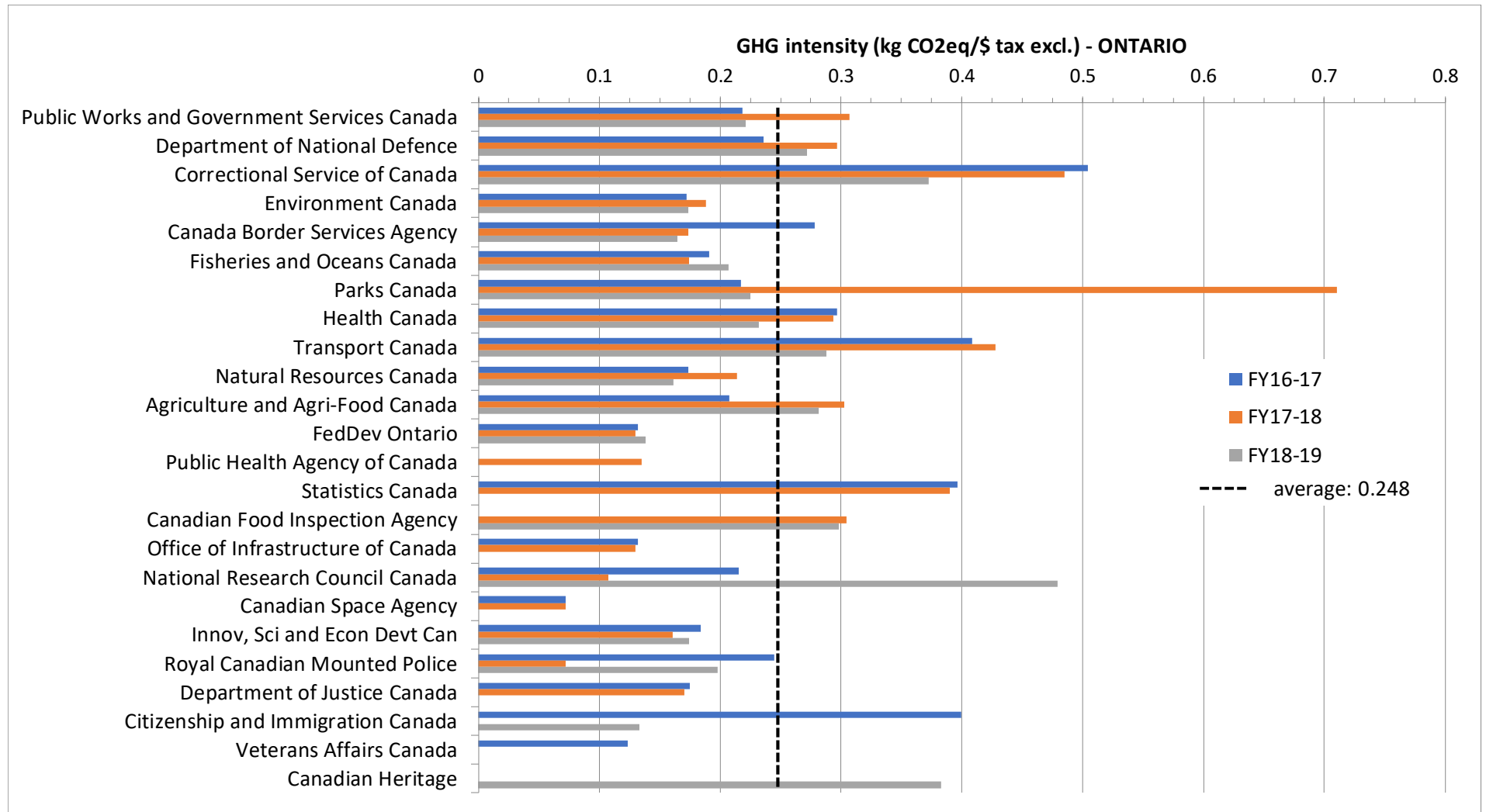


Figure 7-14 : Annual variation of the GHG intensity by customers for ONTARIO and FY16-17 to FY18-19 average (tonnes CO₂eq/\$ tax excluded).

Appendix E.4: Carbon footprint results - PACIFIC

Additional tables are available in the appendix file
«CIRAIG_SPAC_CarbonFootprint_Appendix.xlsx» provided with the final report.

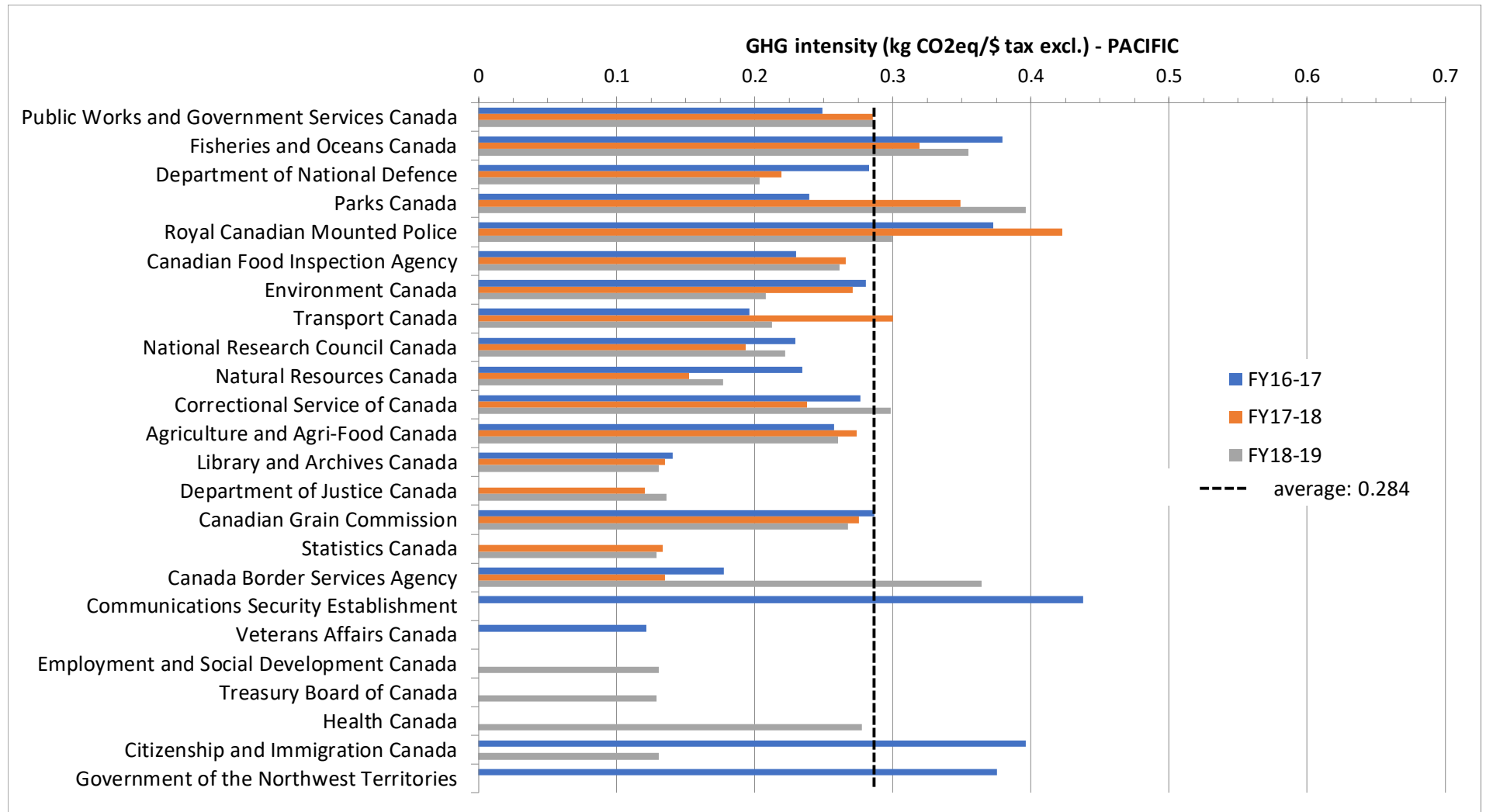


Figure 7-15 : Annual variation of the GHG intensity by customers for PACIFIC and FY16-17 to FY18-19 average (tonnes CO₂eq/\$ tax excluded.

Appendix E.5: Carbon footprint results - WESTERN

Additional tables are available in the appendix file
«CIRAIG_SPAC_CarbonFootprint_Appendix.xlsx» provided with the final report.

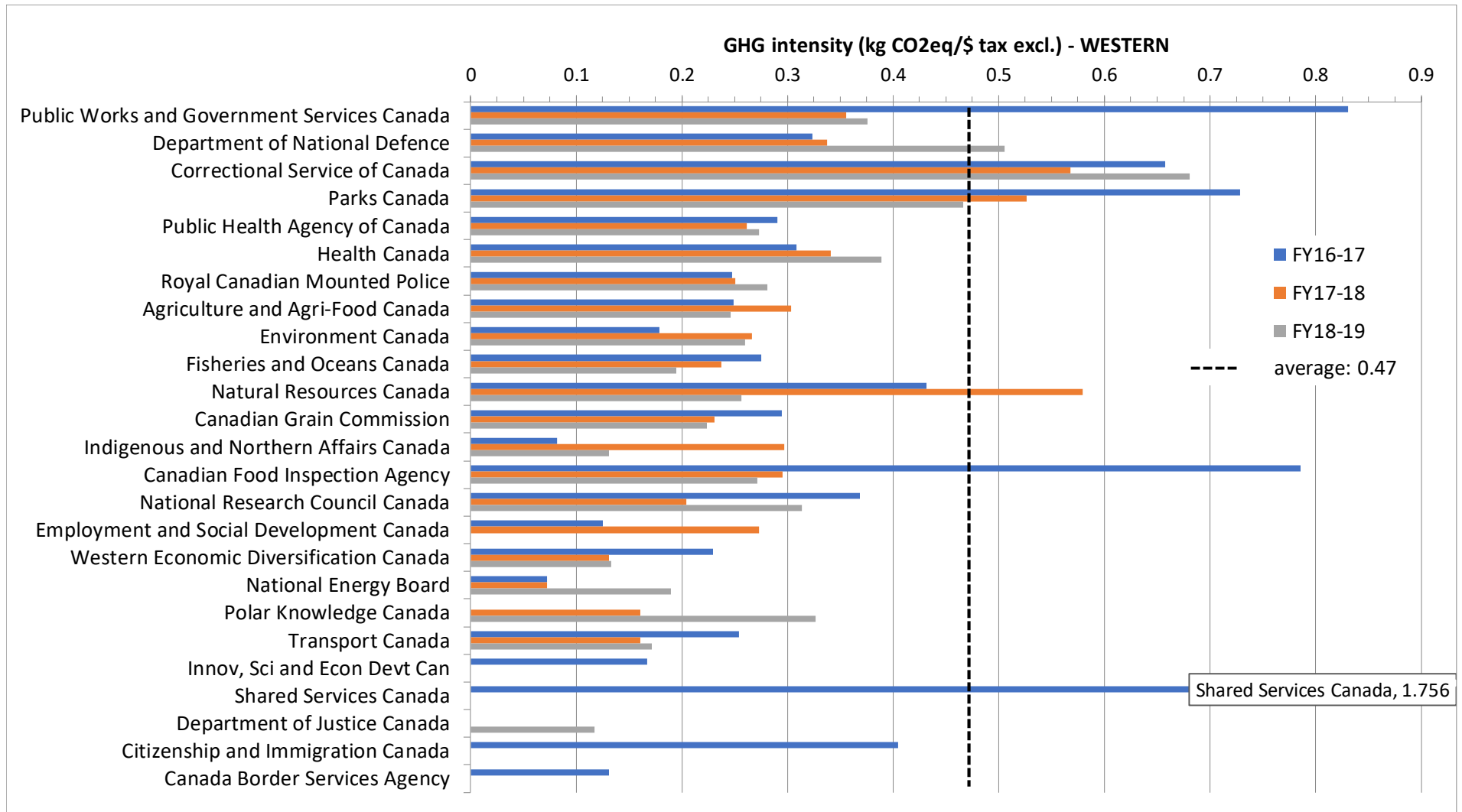


Figure 7-16 : Annual variation of the GHG intensity by customers for WESTERN and FY16-17 to FY18-19 average (tonnes CO₂eq/\$ tax excluded).

Appendix F:

Carbon footprint results - Other

- 1) 86 most contributing commodities (GSIN) over FY16-17 to FY18-19, with GHG intensity.
- 2) Top 5-7 contributing commodities in each region over FY16-17 to FY18-19.

Additional tables are available in the appendix file
«CIRAIG_SPAC_CarbonFootprint_Appendix.xlsx» provided with the final report

Table 7-3 : 86 first commodities contributing to 80% of the total carbon footprint (FY16-17 to FY18-19)

All regions		FY16-17 to FY18-19			
CMDTY CODE- DESCRIPTION	Value (Tax excl.)	C Footprint (t CO2eq)	% C Footprint	GHG intensity (kg CO2eq/\$ tx excl.)	
N9130-Liquid Propellants and Fuels, Petroleum Base	\$ 463 715 015	742 915	6.4%	1.602	
V502A-Relocation Services	\$ 767 808 295	656 049	5.6%	0.854	
N9140-Middle Distillate Fuels	\$ 405 831 258	577 527	5.0%	1.423	
N1510-Aircraft, Fixed Wing	\$ 2 812 839 600	437 891	3.8%	0.156	
N6505-Drugs and Biologicals	\$ 1 184 034 567	389 434	3.3%	0.329	
N1990-Vessels, Miscellaneous	\$ 801 752 782	360 826	3.1%	0.450	
J019A-Maintenance, Repair, Modification, Rebuilding & Installatio	\$ 824 156 078	335 020	2.9%	0.407	
N2355-Combat, Assault and Tactical Vehicles, Wheeled	\$ 825 291 873	313 566	2.7%	0.380	
D302A-Informatics Professional Services	\$ 2 145 914 457	289 595	2.5%	0.135	
JX1990A-Ships and Vessels (large) - Repair, Refits and Conversions	\$ 747 258 582	286 339	2.5%	0.383	
N1905C-Submarines	\$ 708 889 455	279 996	2.4%	0.395	
N9130E-Aviation Fuel	\$ 216 824 013	257 415	2.2%	1.187	
S001A-Electricity Services	\$ 122 284 973	247 860	2.1%	2.027	
S129B-Construction of Other Buildings	\$ 742 110 034	211 870	1.8%	0.285	
R019BF-Human Resource Services, Business Consulting/Change M	\$ 512 906 812	206 689	1.8%	0.403	
C216BA-Marine Systems and Engineering	\$ 561 951 920	175 907	1.5%	0.313	
E108F-Northern Contaminated Site Environmental Clean-up Work	\$ 313 534 563	159 003	1.4%	0.507	
N2320-Trucks and Truck Tractors, Wheeled	\$ 394 346 264	146 848	1.3%	0.372	
S133C-Waterways, Harbours, Dams and Other Water Works	\$ 681 412 326	145 332	1.2%	0.213	
M190A-Property and Facilities Management - Buildings	\$ 865 492 323	131 779	1.1%	0.152	
JX1510A-Aircraft, Fixed Wing - Repair and Overhaul (Military)	\$ 739 074 539	121 559	1.0%	0.164	
S124B-Construction of Commercial Buildings	\$ 425 144 374	121 368	1.0%	0.285	
N2310-Passenger Motor Vehicles	\$ 308 321 841	114 690	1.0%	0.372	
S132A-Bridges, Elevated Highways, Tunnels, Subways and Railroa	\$ 249 388 158	104 058	0.9%	0.417	
R199H-Consulting Services, Change Management / Organizational	\$ 240 621 652	96 918	0.8%	0.403	
S131C-Highways, Roads, Railways, Airfield Runways	\$ 219 988 654	95 173	0.8%	0.433	
N9140C-Diesel Fuel, Automotive	\$ 58 849 069	91 779	0.8%	1.560	
T014D1-Security Printing, Paper Documents (including bonds)	\$ 140 276 718	78 912	0.7%	0.563	
C219C-Engineering Services	\$ 610 916 132	77 627	0.7%	0.127	
N7030-ADP Software	\$ 1 033 465 880	74 633	0.6%	0.072	
V204I-Flying Training	\$ 293 624 169	74 433	0.6%	0.253	
C219BK-Engineering Services - Construction Management	\$ 550 050 038	71 465	0.6%	0.130	
N2840-Gas Turbines and Jet Engines, Aircraft, Prime Moving and	\$ 194 860 055	67 268	0.6%	0.345	
JX1285-Fire Control Radar Equipment, Except Airborne - Repair	\$ 305 604 372	66 024	0.6%	0.216	
N2010-Ship and Boat Propulsion Components	\$ 140 432 572	58 741	0.5%	0.418	
N7110-Office Furniture	\$ 147 335 634	57 554	0.5%	0.391	
N6640-Laboratory Equipment and Supplies	\$ 184 017 217	56 092	0.5%	0.305	
N1395-Miscellaneous Ammunition	\$ 265 893 983	53 459	0.5%	0.201	
C216AB-Naval Architecture - Design Services	\$ 361 235 725	52 652	0.5%	0.146	
N1905-Combat Ships and Landing Vessels	\$ 88 588 342	47 344	0.4%	0.534	
N8405-Outerwear	\$ 240 343 562	46 575	0.4%	0.194	
G009H-Medical Advisory Services	\$ 360 154 261	43 764	0.4%	0.122	
C119A-Architectural Services - Buildings	\$ 319 773 472	42 703	0.4%	0.134	
N8340-Tents and Tarpaulins	\$ 192 552 220	42 153	0.4%	0.219	
N692099-ARMAMENT TRAINING DEVICES, ELECTRONIC, ACCESS	\$ 191 265 834	41 135	0.4%	0.215	
N1940-Small Craft	\$ 101 897 822	40 896	0.4%	0.401	
E199D-Environmental Services	\$ 245 040 433	37 198	0.3%	0.152	
N5840-Radar Equipment, Except Airborne	\$ 228 664 262	36 987	0.3%	0.162	
B219A-Other Engineering Studies	\$ 293 416 089	36 728	0.3%	0.125	
S139A-Construction Services, Not Elsewhere Specified	\$ 125 517 807	36 125	0.3%	0.288	
D307AB-Informatics Systems Integration	\$ 236 482 032	35 071	0.3%	0.148	
N5810-Communications Security Equipment and Components	\$ 206 811 869	34 472	0.3%	0.167	
V101AA-Vessel Charter	\$ 72 508 766	33 128	0.3%	0.457	
U099BE-Airborne Combat Support Training - Fighter and Trainer /	\$ 376 306 920	32 621	0.3%	0.087	
N8905Z-Meat, Poultry and Fish	\$ 40 873 744	32 588	0.3%	0.797	
N5895-Miscellaneous Communications Equipment	\$ 244 681 670	32 567	0.3%	0.133	
N2090-Ship and Marine Miscellaneous Equipment	\$ 76 818 220	31 880	0.3%	0.415	
N5820-Radio and Television Communications Equipment, Except /	\$ 187 290 820	31 359	0.3%	0.167	
N8905-Meat, Poultry and Fish (replaced by gsin N8905Z)	\$ 38 531 895	31 219	0.3%	0.810	
V204H-Aerial Inspection and Reconnaissance Services	\$ 217 239 989	30 293	0.3%	0.139	
N1610-Aircraft Propellers and Components	\$ 206 885 805	30 138	0.3%	0.146	
N2815-Diesel Engines and Components	\$ 84 795 379	29 845	0.3%	0.352	
N8970-Composite Food Packages	\$ 60 669 359	29 760	0.3%	0.491	
S138C-Dredging Services - Floating Plant	\$ 52 031 361	28 856	0.2%	0.555	
V201A-Fixed Wing Aircraft - Airplane Charter	\$ 21 366 151	27 974	0.2%	1.309	
R109D-Translation Services	\$ 113 515 186	27 912	0.2%	0.246	
G001A-Nursing Care Services	\$ 239 619 475	27 822	0.2%	0.116	
N2590-Vehicular Components, Miscellaneous	\$ 66 671 508	27 324	0.2%	0.410	
R199B-Miscellaneous Business Services	\$ 65 610 061	26 752	0.2%	0.408	
L004CV-Claims Administration/Processing (insurance plans)	\$ 317 163 691	26 526	0.2%	0.084	
V201B-Rotary Wing Aircraft - Helicopter Charter	\$ 20 104 010	26 222	0.2%	1.304	
D317E-Information Products	\$ 112 398 097	25 713	0.2%	0.229	
T014A-Publications	\$ 45 886 951	25 681	0.2%	0.560	
N9140G-Marine Fuel	\$ 20 789 100	24 806	0.2%	1.193	
N2510-Vehicular Cab, Body and Frame Structural Components	\$ 69 096 019	24 749	0.2%	0.358	
F030A-Fisheries Resources Management Services	\$ 15 854 900	24 612	0.2%	1.552	
N1336-Guided Missile Warheads and Explosive Components	\$ 169 087 663	24 347	0.2%	0.144	
N8920C-Groceries, Miscellaneous (replaced by gsin N8920ZC)	\$ 28 641 491	24 277	0.2%	0.848	
U099BA-Pilot Training Services, Aircraft	\$ 147 553 827	24 023	0.2%	0.163	
JX1650-Aircraft Hydraulic, Vacuum and De-icing System Compone	\$ 177 930 199	23 901	0.2%	0.134	
N6830M-GAS, PROPANE	\$ 13 167 028	23 718	0.2%	1.801	
JX5985-Antennas, Waveguides and Related Equipment - Repair ar	\$ 149 684 338	23 546	0.2%	0.157	
K100A-Cleaning and Maintenance, Janitorial	\$ 128 178 844	23 241	0.2%	0.181	
V502BAB-Hotels Motels and Boarding Houses, as Detention Centr	\$ 77 902 235	23 010	0.2%	0.295	
S177BA-Interior Fit-Up/Renovations	\$ 82 874 991	22 306	0.2%	0.269	
N5845-Underwater Sound Equipment	\$ 132 859 400	22 041	0.2%	0.166	

Table 7-4 : Top 5-7 contributing commodities in each region over FY16-17 to FY18-19.

Commodity (GSIN)	Region	FY16-17 to FY18-19			
		Value, tax excl. (\$)	GHG (t CO2eq)	% Carbon footprint of the region	GHG intensity (kg CO2eq/\$)
5129B-Construction of Other Buildings	ATLANTIC	\$ 156 293 801	45 520	7.4%	0.291
5133C-Waterways, Harbours, Dams and Other Water Works	ATLANTIC	\$ 204 123 289	43 799	7.1%	0.215
JX1990A-Ships and Vessels (large) - Repair, Refits and Conversions (including Dry Docking)	ATLANTIC	\$ 80 541 070	33 808	5.5%	0.420
5131C-Highways, Roads, Railways, Airfield Runways	ATLANTIC	\$ 76 700 841	33 718	5.5%	0.440
N9140G-Marine Fuel	ATLANTIC	\$ 20 789 100	24 806	4.0%	1.193
N9130-Liquid Propellants and Fuels, Petroleum Base	NCR	\$ 463 715 015	742 915	7.9%	1.602
V502A-Relocation Services	NCR	\$ 767 675 699	655 937	7.0%	0.854
N9140-Middle Distillate Fuels	NCR	\$ 405 675 168	577 341	6.1%	1.423
N1510-Aircraft, Fixed Wing	NCR	\$ 2 812 839 600	437 891	4.6%	0.156
N6505-Drugs and Biologicals	NCR	\$ 1 183 602 481	389 290	4.1%	0.329
N1990-Vessels, Miscellaneous	NCR	\$ 801 447 300	360 690	3.8%	0.450
J019A-Maintenance, Repair, Modification, Rebuilding & Installation of Equipment related to Ships	NCR	\$ 821 027 167	333 659	3.5%	0.406
5133C-Waterways, Harbours, Dams and Other Water Works	ONTARIO	\$ 389 228 869	83 074	20.8%	0.213
V502BAB-Hotels Motels and Boarding Houses, as Detention Centres	ONTARIO	\$ 77 902 235	23 010	5.8%	0.295
5138C-Dredging Services - Floating Plant	ONTARIO	\$ 33 069 625	17 845	4.5%	0.540
N5840202-Weather Radar Equipment, Except Airborne	ONTARIO	\$ 96 474 697	15 998	4.0%	0.166
5132A-Bridges, Elevated Highways, Tunnels, Subways and Railroads	ONTARIO	\$ 31 130 974	13 237	3.3%	0.425
K105A-Commercial Security Guard and Related Services	ONTARIO	\$ 64 403 563	11 184	2.8%	0.174
5131C-Highways, Roads, Railways, Airfield Runways	PACIFIC	\$ 120 997 972	51 869	14.7%	0.429
5129B-Construction of Other Buildings	PACIFIC	\$ 145 087 203	41 636	11.8%	0.287
E199D-Environmental Services	PACIFIC	\$ 199 848 362	30 392	8.6%	0.152
N8905-Meat, Poultry and Fish (replaced by gsin N8905Z)	PACIFIC	\$ 21 523 154	17 341	4.9%	0.806
5133C-Waterways, Harbours, Dams and Other Water Works	PACIFIC	\$ 73 151 626	15 316	4.3%	0.209
JX1990A-Ships and Vessels (large) - Repair, Refits and Conversions (including Dry Docking)	PACIFIC	\$ 35 575 003	14 492	4.1%	0.407
S001A-Electricity Services	WESTERN	\$ 122 284 973	247 860	28.9%	2.027
E108F-Northern Contaminated Site Environmental Clean-up Work/Services	WESTERN	\$ 313 431 576	158 956	18.5%	0.507
5129B-Construction of Other Buildings	WESTERN	\$ 118 736 862	34 045	4.0%	0.287
5139A-Construction Services, Not Elsewhere Specified	WESTERN	\$ 93 677 273	26 963	3.1%	0.288
N8920C-Groceries, Miscellaneous (replaced by gsin N8920ZC)	WESTERN	\$ 24 988 453	21 394	2.5%	0.856