

For Session 4: Dimensions of Sustainable Tourism

Towards sustainable tourism indicators:

**Linking the Canadian Tourism Satellite Account 2012 with the Canadian System of
Environmental-Economic Accounts**

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Executive Summary

Statistics Canada first explored linking its tourism and environment satellite accounts to determine the feasibility of developing a set of measures to assess environmental impacts of tourism in Canada in 2008. Air transportation and the food and beverage services industries were considered the original exploratory study. This new study extends the work of the exploratory study to include all tourism industries as well as other industries that cater to tourism. The focus will be on energy use, water use and greenhouse gas emissions generated by tourism in Canada. The purpose of this undertaking is to determine and understand any challenges or issues associated with linking these two accounts.

The economic performance of the Canadian tourism industry is measured through the Canadian Tourism Satellite Account (CTSA) while the environmental impact on the Canadian economy is measured through the Canadian System of Environmental-Economic Accounts (CSEEA). Since the CTSA and the CSEEA follow the same industry classification used in the Canadian Supply and Use tables a link can be made between the two accounts.

In 2012, tourism activities in both tourism and non-tourism industries in Canada accounted for 6.2% of total greenhouse gas emissions and 3.5% of total energy use. To obtain the environmental measures of tourism, the tourism GVA ratio was applied to water use, energy use and greenhouse gas emission by industry to obtain tourism's share of each.

This exercise demonstrates that it is possible to link the CTSA with the CSEEA to obtain environmental measures of tourism although refinements may be needed. These refinements may include a closer look at the key assumptions, application of tourism GVA ratios, or some of the activities of visitors. Is it necessary to go beyond activities to behaviors and motivations? Do domestic and international visitors have different environment patterns?

Finally, any analysis of sustainable tourism or development of a statistical framework for sustainable tourism must consider positive effects of tourism on the environment such as conservation and preservation of historical sites, conservation, environmental protection, and creation of national parks or wildlife sanctuaries.

Introduction

Sustainable tourism and how to measure sustainability are not new questions, but they have proven difficult to answer given the lack of comparable measures of the “environmental impact” of tourism. In 2008, Statistics Canada explored linking its tourism and environment satellite accounts to determine the feasibility of developing a set of measures to assess environmental impacts of tourism in Canada. Air transportation and the food and beverage services industries were selected for this exploratory study.

This paper extends the work of the exploratory study to a full link between the Canadian Tourism Satellite Account for 2012 and the Canadian System of Environmental-Economic Accounts to determine if it is possible to develop a set of measures of environmental impacts of tourism in Canada. This includes all tourism industries as well as other industries that cater to tourism. The focus will be on energy use, water use and greenhouse gas emissions generated by tourism in Canada.

The purpose of this undertaking is to determine and understand any challenges or issues associated with linking these two accounts.

Tourism is considered in three of the UN Sustainable Development Goals (SDGs) (Target 8.9, 12.b and 14.7). Countries have been tasked to develop indicators with which to monitor progress on these SDGs. This need for monitoring information has prompted the development of a statistical framework for sustainable tourism by linking the Tourism Satellite Account (TSA) and System of Environmental-Economic Accounts (SEEA).¹

Both accounts are rooted in the System of National Accounts (SNA). This internationally recognized system is an integrated framework of statistics that allows for the measurement of a country’s economic production. It outlines the structure of the economy and the contribution of each industry. The TSA gives the relationship between tourism and the economy while the SEEA shows the one between environment and the economy. A linking of these accounts would provide measures of tourism and the environment which, given their roots in the SNA, are credible, consistent and internationally comparable.

The following indicators are proposed as measures to monitor progress on tourism sustainability goals:²

- Tourism direct GDP (as % of total GDP and in growth rate)
- Number of jobs in tourism industries (as % of total jobs and growth of jobs, by gender)
- Residual flows and natural inputs for tourism (absolute figure and % change)
- Residual flows generated as a result of tourism direct GDP
- Resources used and resource efficiency in the production of tourism products and services.

¹ United Nations World Tourism Organisation. Measuring sustainable tourism initiative.

² Proposed indicators for UN Sustainable Development Goals Target 8.9, 12.b and 14.7.

Theoretically it is possible to link these two accounts as they have the same classification systems. It is a mechanical process; however, interpreting the results that arise from this linkage will prove challenging.

The complete analysis of sustainable tourism requires the analysis and articulation of both positive and negative effects of tourism. Sustainable tourism must consider nature, culture and heritage conservation efforts. Tourism aids in the creation and maintenance of parks and managing the effects associated with their use, as well as the conservation and protection of natural habitats and wildlife. Tourists also pay fishing and hunting license fees and park and camp ground admissions, which can be used to offset any adverse effects of their activities. Many companies already undertake various conservation and environment protection spending.

First, the economic performance of the Canadian tourism industry is measured through the Canadian Tourism Satellite Account (CTSA), an extension of the Canadian SNA used to measure supply, demand, GDP and employment by industry. Second, the environmental impact on the Canadian economy is measured through the Canadian System of Environmental-Economic Accounts (CSEEA), specifically the physical flow accounts.

The paper will also explore the possibility of developing indicators that would track the environmental performance of the Canadian tourism industry. What information do we get through merging these two data sets and how can it be used? What will this new information say about sustainable tourism? Most importantly, does it move us along the road toward sustainable tourism indicators?

The first two sections will introduce the Canadian TSA and the Canadian SEEA. The next section describes the methods used in linking these two accounts and explores the results. This is followed by a discussion of various considerations and assumptions as well as lessons learned from this exercise. Last, a conclusion and next steps.

Canadian Tourism Satellite Account: Economic measures of tourism

The Canadian Tourism Satellite Account (CTSA) provides detailed information on the economic significance of tourism in Canada. It follows the international guidelines adopted by the United Nations Statistical Commission³ and is rooted in the Canadian System of National Accounts. The CTSA is developed and housed with the Canadian System of Macroeconomic Accounts (CSMA).

The CTSA provides a coherent framework for the integration and analysis of economic statistics relevant to tourism, both on the supply (i.e., industry) side and on the demand (i.e., tourist) side. It also defines tourism⁴ and what are considered to be the tourism commodities⁵ and the tourism industries.⁶ The CTSA follows the classifications and methods of Canadian Supply and Use Tables (SUT).

The CTSA measures the spending on various domestically produced goods and services by resident and non-resident visitors in Canada. Estimates of tourism (direct) gross value added and tourism (direct) employment by industry are also provided.

The CTSA brings together information from travel surveys, which provide a measure of tourism demand, with information from surveys of suppliers of tourism commodities. These two sets of information are integrated and reconciled within the CTSA framework.

Tourism industries are not explicitly identified as industries within the industrial classifications of the CSMA. They are activities found in several industries within its framework. Furthermore, visitors purchase goods and services from many different tourism and non-tourism industries, and the CTSA must identify and isolate the tourism components from each of them. For example, from the air transportation industry, passenger air transportation is considered a tourism output whereas freight services are excluded.

³ See *Tourism Satellite Account – Recommended Methodological Framework 2008*. Organisation for Economic Co-operation and Development, the Statistical Office of the European Community, the United Nations and the World Tourism Organisation, February 2008. Also *International Recommendations for Tourism Statistics 2008* (IRTS2008) United Nations and United Nations World Tourism Organisation, 2008.

⁴ Tourism is defined in the CTSA as the set of productive activities that cater mainly to visitors. Where a visitor is a traveller taking a trip to a main destination outside his/her usual environment for less than a year and for any main purpose (business, leisure or other personal purpose) other than to be employed by a resident entity in the country or place visited. Note that the concept of tourism here is broad, covering more than just “leisure travel”; it includes travel for business, leisure and other personal reasons, such as visiting friends and relatives, religious purposes and medical treatment. (IRTS2008 para 2.9)

⁵ A commodity (passenger air transportation, hotel accommodation, restaurant meals, etc.) is considered a “tourism commodity” if a significant portion of its demand comes directly from visitors. (IRTS2008 para 5.10)

⁶ An industry (air transportation, accommodation, food and beverage services) is a “tourism industry” if tourism commodities make up a significant part of its output. (IRTS2008 para 5.11)

In 2012, there were 343.7 million overnight trips in Canada. Of these about 93% were from Canadians travelling at home and 7% were non-residents, mainly Americans.⁷

Visitors spent more than \$80 billion in Canada in 2012. Of this tourism spending, 80% was from Canadians travelling at home. Tourism spending translated into \$33.6 billion of gross value added (at basic prices) or 2.0% of the Canadian economy. In 2012, about 677,000 jobs depended directly on tourism. This represented 3.8% of all jobs in Canada.⁸

⁷ CANSIM tables 426-0024 and 427-0001.

⁸ Canadian Tourism Satellite Account, 2012, Statistics Canada.

Canadian System of Environmental-Economic Accounts - Physical Flow Accounts (PFA)⁹

The Canadian System of Environmental-Economic Accounts (CSEEA) represents a comprehensive framework for relating the economy and the environment. It follows the United Nations System of Environmental-Economic Accounting 2012-Central Framework¹⁰ (SEEA-CF) recognised as the international standard for environmental-economic accounting. It provides internationally agreed-upon concepts and definitions for environmental-economic accounting.

CSEEA presents information on various accounts - Ecosystem Accounts, Asset accounts, Physical Flow Accounts, Environmental Activity Accounts and includes various applications and extensions. The Ecosystem Accounts currently measure the extent of ecosystem assets such as forests, wetlands, soil, urban areas, aquatic ecosystems etc. The Asset Accounts measure Canada's natural resource asset stocks and changes in these stocks. The Environmental Activity Accounts measure environmental transactions between economic units for the purpose of protecting the environment (pollution abatement and control and environmental protection expenditures).

The Physical Flow Accounts (PFA) are the accounts of interest for this exercise. The PFA consists of Natural Input Flow Accounts, Product Flow Accounts and Residual Flow Accounts. The PFA measures the supply and use of natural resources, products and residuals in physical units of measure. Accounts have been developed for water use, energy use and greenhouse gas emissions. These accounts follow the same classifications and methods of the macroeconomic accounts and can therefore be linked to monetary data in the supply and use table. Data in these accounts are compiled at a detailed industry level.

However, they are only published at a more aggregated, national level.

Water use by industry

The Natural Input Flow Accounts include the water use account. This account, produced by Statistics Canada, focuses on water intake: either self-supplied (i.e. direct abstraction from the environment) or supplied from municipal systems. The unit of measure is cubic metres.¹¹

The water use account does not include an estimate for the volume of water that passes through hydro-electric turbines, nor of the water that flows through agricultural crops and

⁹ Statistics Canada. 2016. *Methodological Guide: Canadian System of Environmental-Economic Accounting*. 16-509-X. <http://www.statcan.gc.ca/eng/nea/list/env>

¹⁰ *System of Environmental-Economic Accounting 2012— Central Framework*. United Nations, European Union, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development and the World Bank. United Nations, New York, 2014.

¹¹ Statistics Canada. Op.cit. <http://www.statcan.gc.ca/pub/16-509-x/16-509-x2016001-eng.htm>

cultivated forests as a result of the uptake of soil water by plants. These flows are both considered abstraction according to the SEEA-CF but they do not correspond to the general interpretation of water intake. The water use account is thus a combination of a physical flow account for natural inputs (self-supplied water) and a physical flow account for products (municipal water) but is placed under the Natural Input Flow Accounts since the bulk of the flows are self-supplied (i.e. the natural input).¹²

Estimates of water use are available by industry and household every two years beginning with reference year 2009 to 2013. For this exercise, reference year 2011 was used.

Energy use by industry

The Product Flow Accounts include the energy use account. This account, produced by Statistics Canada, focuses on consumption of energy products for energy purposes. This means it excludes non-energy uses of energy products such as the use of oil as a lubricant instead of as a fuel. The scope of the account is use-only, as opposed to the full cycle of the production, consumption, transformation and trade of energy products covered in the SEEA-CF physical supply and use tables.¹³

Estimates of energy use are available annually by industry and by household for the following energy sources: coal, natural gas, motor gasoline, diesel, aviation fuel, light fuel oil (including kerosene), heavy fuel oil, refinery fuel gas, coke oven gas, liquefied petroleum gases (including natural gas liquids), electricity, coke, steam, wood, and spent pulping liquor. The unit of measure is terajoules.¹⁴ Estimates are available annually beginning with reference year 2009 to 2014.

Greenhouse gas emissions by industry

The Residual Flow Accounts¹⁵ measure wastes as they move from the economy to the environment. The Residual Flow Accounts include the greenhouse gas emissions account. The greenhouse gas emissions account produced by Statistics Canada tabulates emissions to air of the three main greenhouse gases (namely, carbon dioxide, methane, and nitrous oxide). It includes releases from both combustion (e.g. the use of fossil fuels), and industrial processes (e.g. venting of natural gas by pipelines). The unit of measure is kilotonnes.¹⁶

Estimates of greenhouse gas emissions are available annually by industries and households beginning with reference year 2009 to 2014. All greenhouse gas emissions are reported as carbon dioxide equivalents.

¹² Statistics Canada. Op.cit. <http://www.statcan.gc.ca/pub/16-509-x/2016001/27-eng.htm>

¹³ Statistics Canada. Op.cit. <http://www.statcan.gc.ca/pub/16-509-x/2016001/28-eng.htm>

¹⁴ A joule is the International System of Units (SI) unit of energy. 1 joule corresponds to the work done to produce power of one watt continuously for one second. A Terajoule is one trillion joules.

¹⁵ Statistics Canada. Op.cit. <http://www.statcan.gc.ca/pub/16-509-x/2016001/19-eng.htm>

¹⁶ Statistics Canada. Op.cit. <http://www.statcan.gc.ca/pub/16-509-x/2016001/29-eng.htm>

Methodology: Linkage of the two satellite accounts

The CTSA and the CSEEA follow the same industry classification used in the Canadian SUT, so a link can be made between the two accounts. The result is the ability to match information from one account to another. The CTSA provides ratios that explain the share of tourism in each industry and each commodity. These ratios are used in the various CTSA extensions such as studies on government revenues attributable to tourism and the Human Resources Module of the CTSA. These ratios will also be applied in this study to obtain environmental measures of tourism.

On the industry side, tourism's share of each industry in the economy is measured by the tourism gross value added (GVA) ratio. This is tourism GVA for each industry divided by total GVA of the industry (including tourism and non-tourism activities).¹⁷ For example, in Canada, the tourism GVA ratio for air transportation is approximately 73%. This means that 73% of the air transportation industry is attributable to tourism. This ratio measures the percentage of an industry's GVA that comes from satisfying tourism demand.

To obtain the environmental measures of tourism for the tourism industries, the tourism GVA ratio was applied to water use, energy use and greenhouse gas emission by industry to obtain tourism's share of each. That is:

$$\text{Water use by industry Y} * \text{Tourism GVA ratio of industry Y}$$

Similarly for energy use and greenhouse gas emission.

In the CTSA, some goods and services purchased by visitors are produced by non-tourism industries. Some of these are tourism commodities, such as vehicle fuel, vehicle repairs and parts¹⁸ and pre-trip expenditures (tourism single-purpose consumer durables)¹⁹, while others are non-tourism commodities. These non-tourism commodities include tobacco, books, clothing, footwear, etc.²⁰ In 2012, these non-tourism industries accounted for 28% of tourism GVA and 21% of jobs attributable to tourism.

The next step is to identify or attribute environmental measures to these non-tourism industries. To determine the environmental measure from these industries, we began with the products purchased by tourists.

¹⁷ Tourism gross value added (GVA) for each industry from the CTSA divided by the total GVA (at basic prices) of an industry from the SUT.

¹⁸ Many Canadians use their own vehicles for tourism. In the CTSA, tourism spending on motor vehicle fuel and motor vehicle parts and repair is considered use of private vehicle.

¹⁹ Motor homes, travel and tent trailers, boats, luggage and travel sets, tents and camping equipment and sleeping bags.

²⁰ For more detailed list see Canadian Satellite Account Handbook, Table 18 <http://nead-dcen/reference-reference/publications/13-604/13-604-m2007052-eng.pdf>

On the product side, the tourism share of a commodity in the economy purchased by visitors is measured by the tourism commodity ratio. This is the ratio of tourism demand to total supply for a particular good or service in the economy.

The tourism spending on these goods and services is assigned to their producing industry. We assume that the tourism spending on a given commodity is in proportion to its supply across industries. The tourism spending is therefore converted to basic prices and then to the industry basis/space using industry shares of output for these commodities. The environmental measures attributable to a non-tourism industry was then derived as its total GVA multiplied by the ratio of the tourism spending on commodities produced by the industry and its gross output.

Results of linkage: Environmental measures of tourism

Table 1 below shows both the economic and environmental measures of tourism activities in Canada in 2012. The first two columns show the economic measures for tourism activities from the CTSA, specifically tourism GVA and the number of jobs attributable to tourism. The last three columns show the environment measures of tourism: water use, energy use and greenhouse gas emissions attributable to tourism. Note that water use data presented is for reference year 2011.

In 2011, tourism industries used 20.5 million cubic metres of water. Water use was the highest in accommodation and food and beverage industries. Tourism activities used 31.6 million cubic meters of water, accounting for 0.1% of water use by all industries.

In 2012, energy use by tourism industries reached 241,931 terajoules. Tourism industries emitted 31,286 KT of CO₂-equivalents.

Tourism activities accounted for 6.2% of total greenhouse gas emissions, 3.5% of total energy use in Canada. Energy use by tourism activities reached 302,778 terajoules. Tourism activities emitted 37,989 KT of CO₂-equivalents.

Tourism activities include GHG emissions and energy use from tourism and non-tourism commodities alike, which largely explains why environmental measures associated with tourism activities are larger than those associated with tourism industries.

Table 1 Economic and environmental measures of Tourism activities- Canada, 2012

Industry	Economic Measures of Tourism		Environmental Measures of Tourism ¹		
	Tourism GVA (millions of dollars)	Jobs attributable to tourism (thousands)	Energy use (terajoules)	GHG emissions ^{2,3} (Kt of CO2-e)	Water use ^{4,5,6} (thousands of cubic metres)
Total transportation	7,496	81	214,728	29,765	3,893
Air transportation	4,732	49	184,197	25,526	1,043
Rail transportation	1,085	4	13,208	1,967	1,188
Water transportation	124	1	6,187	915	179
Other transport	1,554	27	11,136	1,356	1,483
Accommodation and Food and Beverage	11,835	343	22,624	1,347	15,327
Recreation and entertainment	2,674	66	3,623	143	1,125
Travel Services	2,379	46	956	32	171
Total tourism industries	24,384	536	241,931	31,286	20,515
Other industries	9,262	142	60,847	6,703	11,104
Total tourism activities	33,646	677	302,778	37,989	31,619
Total non-tourism activities	1,672,390	17,087	8,447,723	570,049	31,980,080
Total economy	1,706,036	17,764	8,750,501	608,038	32,011,699
Tourism activities as share of total economy (%)	2.0	3.8	3.5	6.2	0.1

Note: Total economy is total of all industries and excludes households

Water use data is available every two years, data presented is for reference year 2011

1. Measures of energy and water used and greenhouse gas emitted to satisfy CTSA tourism demand. Calculated as energy use, water use, and GHG emissions from CSEEA by industry multiplied by the tourism proportion of these industries.
2. Carbon dioxide equivalent emissions are estimated using global warming potentials for methane and nitrous oxide of 25 and 298 respectively.
3. Emission sources included in these estimates: combustion of fossil fuels; non-combustion uses of fossil fuels; industrial processes; agricultural soils; livestock manure
4. Includes an estimate for water use and leakages by water treatment and distribution systems.
5. Includes an estimate for residential use of water produced by drinking water plants and for well water.
6. The estimate for water use does not include the use of water for hydro-electricity production.

Sources:

Canadian Tourism Satellite Account 2012

CANSIM Table 153-0113 - Physical flow account for energy use, annual (terajoules)

CANSIM Table 153-0114 - Physical flow account for greenhouse gas emissions, annual (kilotonnes)

CANSIM Table 153-0116 - Physical flow account for water use, every 2 years (cubic metres)

Assumptions and further considerations

Although linkage between the TSA and the SEEA is possible, the resulting framework may need to be fine-tuned. Below are some assumptions and considerations that arose from this linking exercise.

A key assumption is that the rate of use of water and energy as well as the rate of greenhouse gas emissions are the same in both the tourism and non-tourism activities of a given industry. For example:

- Passenger and freight services are assumed to use energy and emit greenhouse gases at the same rate in the transportation industries.
- Restaurants (a tourism activity) and Catering services (a non-tourism activity) within the food and beverage industry are assumed to have same energy use and greenhouse gas emissions. In reality, caterers who deliver their products may have more greenhouse gas emissions.

For this exercise the tourism share of industry GVA for total tourism demand was used. Tourism spending of Canadians at home is different from that of international visitors visiting Canada. The same analysis can be done using the tourism GVA ratio and commodity ratios attributed to domestic and export tourism spending.

In Canada, a main purpose of tourism is to see friends and relatives (about 45% of all domestic trips). This results in staying with friends and relatives, i.e., non-market production of accommodation services. Any accommodation expenditures associated with staying at the “home of friends and relatives” are reallocated to spending on groceries and alcohol from stores, the logic being that although visitors do not pay for “accommodation” they contribute to the household expenses to cover some expenses their hosts incur during their visit. The environmental effects associated with these products are included in the Table 1 under “Other industries.” This treatment, however, leads to an important question: Is the incremental change to environmental effects of household – that is, increased water or energy use as more people are in household being captured?

Many Canadians use their private vehicle for tourism. These environmental effects are included in Table 1 under “Other industries.” Another approach could be to apply the tourism commodity ratio of motor vehicle fuel and motor vehicle parts and repair to household energy use and greenhouse gas emissions for motor fuel.

The SNA production boundary may be difficult to apply to greenhouse gas emissions. For instance, consider air transportation: the economic and environmental data from the CTSA and the CSEEA relate only to domestically produced air transportation (produced by Canadian carriers). Estimates of energy use and greenhouse gas emissions involving flights of domestic carriers regardless of the destination or point of origin which may be international or domestic. Emissions produced by a foreign carrier flying to/from Canada is not included in the CTSA or CSEEA.

7. Conclusions and potential avenues

This exercise demonstrates that it is possible to link the CTSA with the CSEEA to obtain environmental measures of tourism. Further refinements are needed to obtain a complete statistical framework for sustainable tourism.

A closer look at the activities in which visitors engage may be necessary. Some environmental impacts are not covered by looking at tourism spending only. One would have to consider the actual activities of the various visitors. For example, sport hunting and fishing on depleting fish stocks or affecting natural habitats, ski operations on land development, water pollution by recreational watercraft on lakes or other bodies of water. Is it necessary to go beyond activities to behaviors and motivations? Do domestic and international visitors have different environment patterns?

Some tourism development may affect natural habitats or specific regions differently, as some environmental effects are more “local”. Consider some countries where locals have a water ban but hotels are exempt from such bans.

It may also be interesting to investigate a way to refine the tourism GVA ratios applied to CSEEA for “efficiency”. For example, energy use or greenhouse gas emissions of long haul vs. short haul flights or greenhouse gas emissions from a new versus old motor vehicles when used for tourism.

The CTSA only considers direct effects of tourism and therefore this exercise only considered the direct effects of tourism and the environment. This exercise may be extended to include indirect effects as well to obtain a complete picture of environmental effects. For example, the use of new electric car for tourism means less greenhouse gas emissions than the use of an old combustion car. What of energy use and the consequence of providing the electricity?

Finally, any analysis of sustainable tourism or development of a statistical framework for sustainable tourism must consider positive effects of tourism on the environment such as conservation and preservation of historical sites, conservation, environmental protection, and creation of national parks or wildlife sanctuaries.

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