Tourism Environmental Footprint in Sweden

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** This paper is built on the final report on methods for linking TSA and SEEA (The Tourism Satellite Account and the Environment, MIR 2018:2), developed by Statistics Sweden for the Swedish Agency for Economic and Regional Growth.*

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1 Executive summary

This report uses a new method for developing statistics on the environmental impact of tourism. It is based on a common work by the Swedish Agency for Economic and Regional Growth in cooperation with Statistics Sweden on linking the Tourism Satellite Account (TSA) and the Environmental Accounts (SEEA). A big advantage of linking TSA-SEEA is that it is based on already existing frameworks and on existing data sources. The study calculates both direct and indirect effects by using an input-output analysis.

This study measures environmental impact in terms of greenhouse gas emissions, but the method can also be used to measure other environmental aspects that are not covered by this paper.

Greenhouse gas emissions due to tourism have decreased by 14 percent in Sweden over the period 2008–2015. It is mainly the environmental impact of resident visitors and businesses that has decreased. For non-resident visitors the CO_2 emissions remain largely at the same level over the seven-year period due to increased inbound tourism.

This study shows that travel and transport is the primary contributor to CO_2 emissions. Both in terms of the direct effects of the visitors' journeys, and the indirect effect where transport constitutes for two thirds of greenhouse gas emission in tourism consumption.

For non-resident visitors the greenhouse gas emissions per consumption unit is twice as high as the reference group of Swedish households, and domestic tourism has approximately 50 percent higher CO_2 than average private consumption.

The important link between tourism and greenhouse gas emissions must not be neglected. The trend of increased travel and tourism nationally and internationally need climate neutral transports. Transports need to bear their full social costs for air pollution. It is important that the trend of increased travel and transport can be kept at a sustainable level based on all aspects – economic, environmental and social.

Upcoming studies of tourism environmental footprint should consider analysis other environmental aspects, more than greenhouse gas emissions analysed in this study. Environmental aspects need to be combined with social and economic aspects to build knowledge of the tourism effects and if possible optimizing the size of the tourism industry.

2 Introduction

International tourism and travelling are a cornerstone for cross-cultural exchange and to create greater understanding and lasting connections among global citizens.

Travel and trade, among people and business, build and foster economic growth as well as a more democratic, secure and prosperous world. A constantly increasing tourism sector creates economic values, but it's however a challenge in terms of social and environmental aspects. As in many other countries, large part of Sweden's tourism capital is built on nature and cultural experiences, while at the same time posing a risk of overuse. The tourism industry, and tourism policymakers, need good tools to follow the development to make better decisions for the future.

But how do we measure sustainable tourism? One possible way of doing it is by using existing national data produced in satellite accounts[1] for tourism and environment as part of the national accounts - and link them all together. The outcome sets numbers on the tourism environmental footprint (flows) on a national level in terms of carbon emission, energy consumption, waste water, solid waste, etc. Sweden has a long tradition in both tourism and environmental satellite accounts. Tourism Satellite Accounts (TSA) have been produced yearly since 2000 and System of Environmental and Economic Account (SEEA) since 1993.

Several countries have developed indicators that measure the environmental impact of tourism via the Environmental Accounts. In Italy (Anzalone 2014) and in Canada (Kotsovos 2016), examples have been produced of how statistics can be calculated and visualised. In 2010, Statistics Sweden also presented indicators on the environmental impact of tourism via the TSA and the Environmental Accounts (Statistics Sweden 2010). In these projects, the approach was to start with supply, that is, the size of the share of industries' economic contributions and environmental impact that can be attributable to tourism.

This paper is disposed as follows:

Chapter 3 describes the possibilities of linking tourism and the environment. In chapter 4 the input-output analysis method developed is described in more detail. Chapter 5 shows the results of the TSA-SEEA linking in Sweden, including tables, figures, methodology and analysis of the result. Finally, the conclusions in chapter 6.

The results presented in this report are indicative and the most recently available data has been used. This means that the results may differ somewhat compared to the latest published data on TSA and emissions to air.

[1] OECD definition: Satellite accounts provide a framework linked to the central accounts and which enables attention to be focussed on a certain field or aspect of economic and social life in the context of national accounts; common examples are satellite accounts for the environment, or tourism, or unpaid household work.

3 Swedish Tourism Satellite Account and Environmental Economic Account – Linking possibilities

There is a major international interest in linking the Tourism Satellite Account to Environmental Accounts to measure the environmental impact of tourism. It´s possible since both areas of statistics are satellite accounts in the National Accounts.

The System of Environmental Economic Accounts (SEEA) constitute a satellite system to the National Accounts that look at the environmental impact of the economy, such as concerning emissions to air.

Tourism is measured in a national Tourism Satellite Account (TSA) also as part of the National Accounts. The Tourism Satellite Account describes the direct impact on the economy, exports and employment, created in Sweden by tourism. The Tourism Satellite Account measure the value of resident and non-resident visitors' direct consumption of Swedish goods and services.[2]

The TSA-SEEA linking statistics has been developed at an international level over the past ten years. The primarily focus has been on the calculation of the share of tourism's direct contribution to different types of environmental impact, such as greenhouse gases, water use and waste.

This study uses the TSA-SEEA linking possibilities but is built on a more sophisticated method by using input-output analysis.

4 Development of an input-output method[3]

The Input-Output Analysis (IOA) is an approach commonly used in environmental accounts.[4] A brief chapter in the international guidance (Obst 2017) describes input-output analysis in relation to tourism's demand for goods and services

In short, the IOA is based on the National Accounts' symmetrical input-output tables, which in turn, is based on yearly supply and use tables. These tables describe supply of products that are used either as intermediate goods at enterprises and organisations, or in final use in the form of private or public consumption, investments, changes in inventory and export. IOA is therefore based on a product's final use, but all stages of production prior to consumption are included. It is worth noting that, in the final use in IOA, exports

[2] The TSA measures visitors' impact on the Swedish economy on the demand side. The starting point is visitors' estimated consumption on different products or groups of products. Visitor spending is translated by several steps into a share of the corresponding sectors' production volumes. These shares are then translated to estimate tourism's contribution to the economy, such as value added and employment.

[3] This chapter is an extract from Statistics Sweden (2018)

[4] Unlike air emission accounts in the environmental accounts, that are based on the production side, the input-output analysis links demand to production in the various parts of the economy.

are reported as a lump sum, balanced by an equally large negative lump sum in private consumption.[5]

Adding environmental factors, such as carbon dioxide emissions, to the IOA, makes it possible estimate the environmental impact from direct and indirect emissions, linked to various types of final use. This is often described as consumption-based emissions, as they are based on final consumption.

This analysis uses IOA to examine the impact of tourism on the economy, employment and emissions of greenhouse gases. Here, the TSA and Environmental Accounts are linked via the IOA to measure the environmental impact of tourism on final use. Final use refers to the various parts of demand for products produced in Sweden. This report only includes domestic outcome of tourist consumption in Sweden. Domestic production chains included in the Swedish IO model extend, via import and export, to the global economy. However, this is not addressed in the calculations.

Figures on final use show consumption of products produced by domestic producers. Domestic producers also sell their products to other domestic producers as intermediate goods. Total production of domestically produced products should include final and intermediate goods. This is illustrated by hotel and restaurant services.

The hotel and restaurant services sector in Sweden (SNI[6] I55–I56) employed 184 000 persons in 2015. The main sector activity, hotel and restaurant services, employed 95 percent of the total number of persons employed in this sector. In addition, the hotel and restaurant services sector also produce other services, such as conference services and food for other sectors. These persons were employed to produce various products in this sector, where hotel and restaurant services accounted for 95 percent. Sectors other than SNI I55–I56, in turn, also produce hotel and restaurant services. This means that there were, in fact, 192 400 persons employed to produce hotel and restaurant services, of which 176 000 are employed in the hotel and restaurant services sector (see Figure 4.1).

[5] However, the sum should contain consumption per product in Sweden regarding non-resident tourism. This means that non-resident tourism consumption is itemised under domestic private consumption, which leads to an overestimation of Swedish households' consumption. However, correspondingly, Swedish households' consumption abroad outside direct imports. TSA results on non-resident tourism consumption in Sweden and Swedish tourism consumption abroad could be used to adjust these items.

[6] Swedish Standard Industrial Classification (SNI) is based on the EU's recommended standards, NACE Rev.2.

Figure 4.1:

Example of employed persons in hotel and restaurant services with the IOA – on the production side

Among the 192 400 persons employed to produce hotel and restaurant services, 122 000 persons, or 63 percent, are employed to produce products for the final users who consume hotel and restaurant services. However, there are 157 000 persons in total employed with a focus on final use of hotel and restaurant services. Among these, 77 percent are employed in the hotel and restaurant services sector, while the remaining 35 000 are employed in the production of intermediate goods for the hotel and restaurant services sector (see Figure 4.2).

Figure 4.2

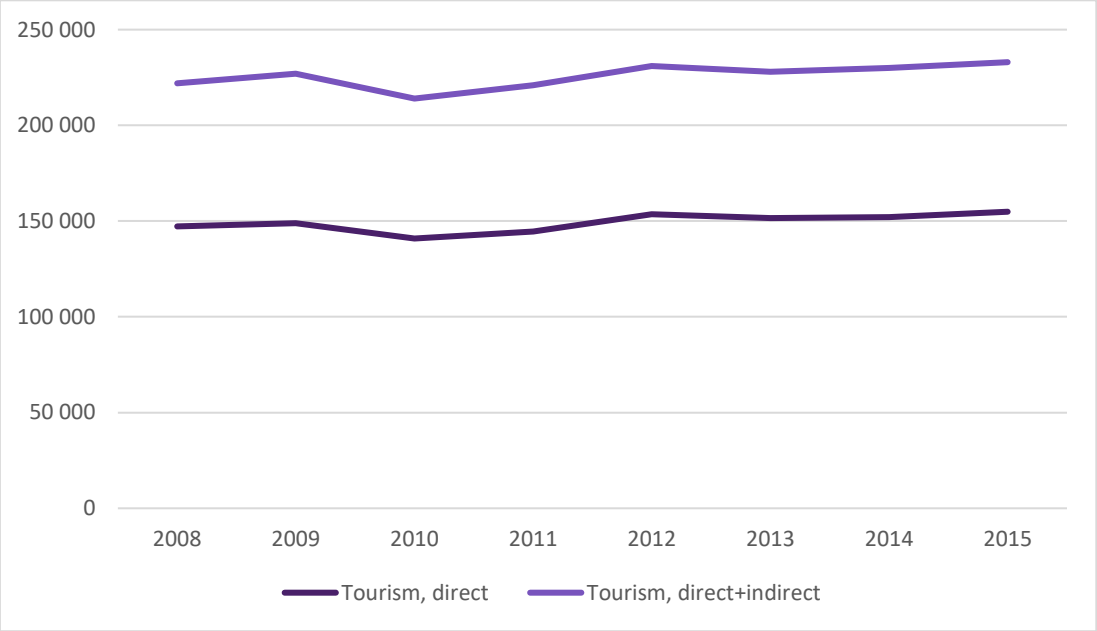
Example of employed persons in hotel and restaurant services with the IOA - on the final use side

5 TSA-SEEA Results (Tables and Figures)

The results are presented as key figures for 2015, latest year available, as well as a time series for the period 2008-2015 on tourism employment, tourism value added and tourism greenhouse gases from a consumption perspective on the demand side via the input-output analysis.

Figure 5.1

Tourism employment in Sweden, direct and indirect



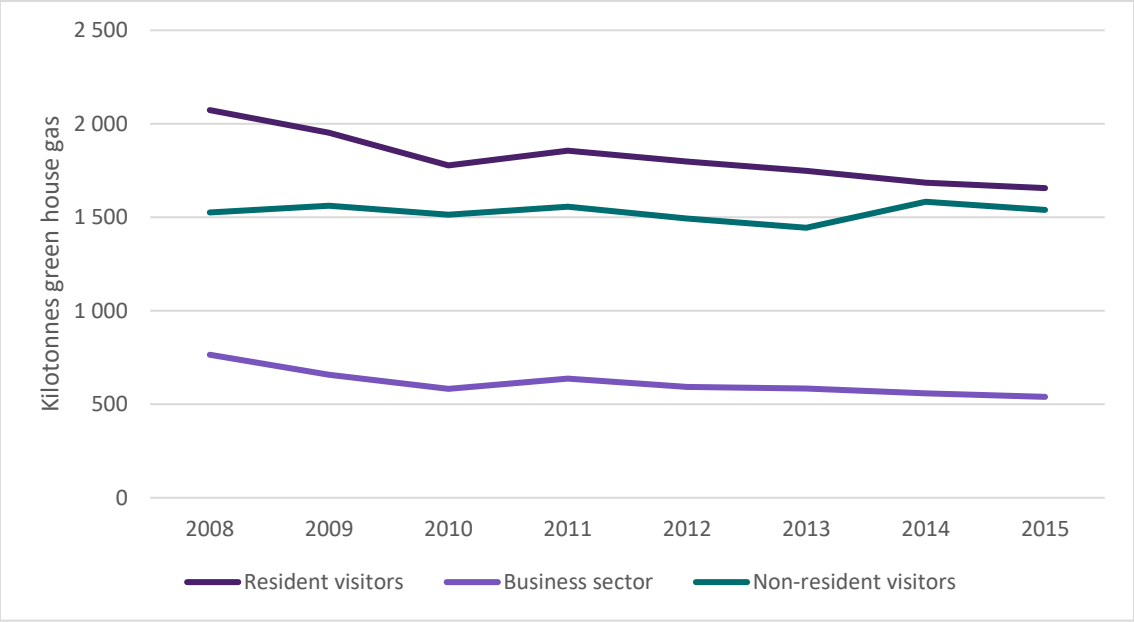
Source: National Accounts and Tourism Satellite Accounts, Statistics Sweden (SCB) and Swedish Agency for Economic and Regional Growth (Tillväxtverket)

5.1 Indirect effects as a complement to tourism direct effects

The primarily focus in the tourism statistics is on direct effects of tourism. However, Figure 5.1 show the direct and indirect effects on tourism employment for the years 2008-2015. The indirect effects adding about 50 percent extra employment to the tourism sector, with a multiplier of 1.5. The tourism multiplier is higher for tourism employment compare to the multiplier for tourism value added. The Swedish tourism to GDP ratio (direct) will increase from 2.7 to 3.7 if including indirect tourism effects. In figure 5.1 we can see that the effects are quite stable over time.

Figure 5.2

Greenhouse gas emissions in tourism consumption 2008-2015, by user, green gases in kilo tonnes



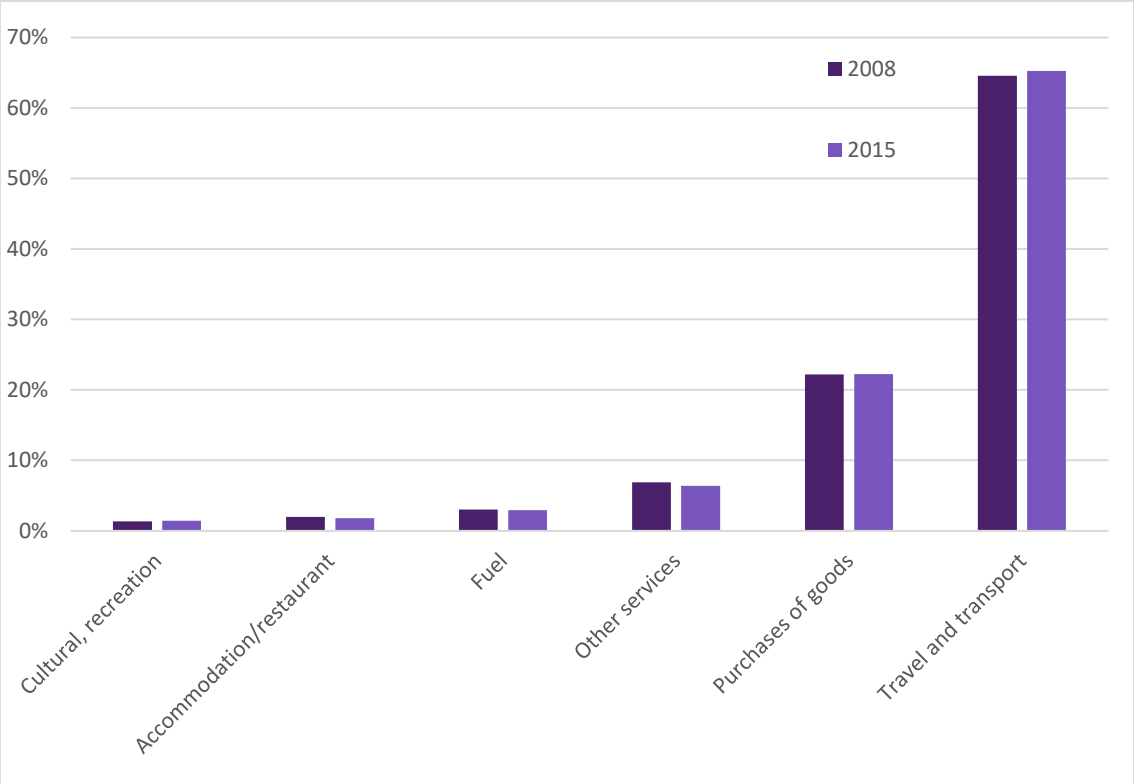
Source: National Accounts, Tourism Satellite Accounts and Environmental Accounts

5.2 Greenhouse gas emissions have decreased since 2008

Greenhouse gas emissions have decreased over time by 14 percent in the period 2008–2015. It is mainly the environmental impact of Swedish households and businesses that has decreased; the environmental impact of businesses has decreased by nearly 30 percent. However, emissions by international visitors remain largely at the same level over the seven-year period, as reflected in Figure 5.2, due to increased international tourism.

Figure 5.3

Share of greenhouse gas emissions from indirect tourism consumption, by product group, 2008 and 2015



Source: National Accounts, Tourism Satellite Accounts and Environmental Accounts

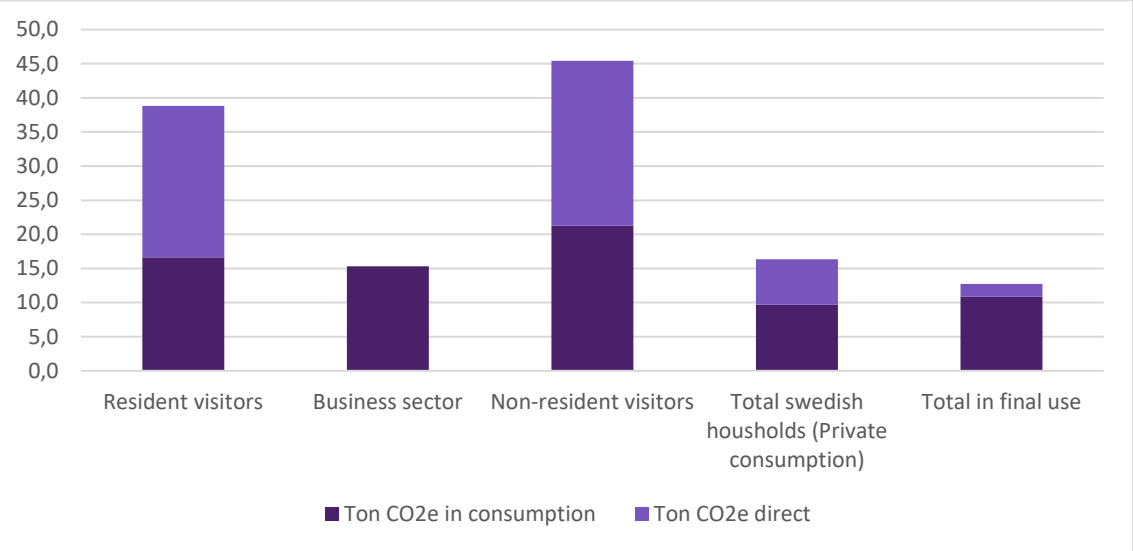
5.3 Travel is the main contributor to greenhouse gas emission

Travel and transport is the primary contributor to CO_2 emissions. Figure 5.3 shows the greenhouse gas emissions from indirect tourism consumption and about two thirds of the emissions comes from travel and transport. The direct emissions from transportation need to be added to this figure to show all the contributing emission derived from tourism trips.

Over time, the environmental impact decreases among all product groups, whereas the distribution between product groups has remained the same between 2008 and 2015, as shows in Figure 5.3. Travel is the primary contributor to greenhouse gas emissions. This can be compared with visitors' spending, where the largest share goes to shopping, food and accommodation (Swedish Agency for Economic and Regional Growth 2018).

Figure 5.4

Ton CO2e per million SEK tourism expenditure, by tourism visitor groups 2015



Source: National Accounts, Tourism Satellite Accounts and Environmental Accounts

5.4 International visits have the highest CO2e emissions

As shown in Figure 5.4, both domestic and inbound visits lead to a higher load of greenhouse gas emissions compared with the reference group of Swedish households. Figure 5.4 shows that a little more than half of the greenhouse gas emissions for a visit relate to the direct effect of the journey. However, even the indirect effect, which was calculated using input-output analysis, shows that transport constitutes an important part of total greenhouse gas emissions, as previously seen in Figure 5.3.

CO_2e emissions on the consumption side show that tourism generally means that travel leads to emissions. This applies in particular to non-resident visitors, with tonnes of CO_2e per SEK 1 million in consumption, which is twice as much as total private consumption or total final use. Domestic tourism and business travel figures are approximately 50 percent higher than average private consumption and total final use.

Table 5.1

Key figures for different visitor groups 2015

	Tourism			Reference values		Tourism ratio, %	
	Resident visitors	Business travel	Non-resident visitors	Swedish total private consumption	Swedish total final use	Resident visitors/ Private consumption	Tourism/ Total final use
Value added, SEK millions	73 504	25 461	55 491	1 089 687	3 719 757	7%	4%
Number of employed persons	102 338	45 997	84 638	1 415 722	4 807 300	7%	5%
Tonnes of CO_2e from consumption	1 655 972	539 502	1 538 767	13 111 280	52 008 994	13%	7%
Tonnes CO_2e incl. direct emissions	2 209 731	--	1 743 538	8 982 620	8 982 620	25%	44%
…per SEK millions in consumption							
Value added, SEK millions	0.7	0.7	0.8	0.8	0.8		
Number of employed persons	1.0	1.3	1.2	1.0	1.0		
CO_2e tonnes	16.6	15.3	21.3	9.7	10.9		

Source: TSA, Swedish Agency for Economic and Regional Growth, National Accounts and Environmental Accounts, Statistics Sweden

5.5 Key figures for TSA-SEEA

Table 5.1 shows the total results in 2015 with a few key figures for comparison. Here, the 233 000 employed persons in Figure 5.1 are arranged by the various tourist groups – resident, business and non-resident visitors. Value added and greenhouse gas emissions are similarly distributed. This is also related to the corresponding results in total private consumption (Reference value, Swedish total private consumption in the table) and for total final use (Reference value, total final use, in the table). Total final use is identical to the national total of Value added, Employment and CO_2e emissions.

On the right-hand side of table 5.1 shows that Swedish visitors expenses for domestic tourism accounts for 7 percent of value added and employment, but 13 percent for CO_2 emissions on consumption. Add to this nearly 25 percent in direct emissions from households' use of fossil fuels for vehicles.

Among non-resident visitors, corresponding shares account for five percent of value added, six percent of employment and 12 percent of emissions from consumption. Add to this 19 percent of direct emissions from households' use of fossil fuels for vehicles.

Non-resident visitors' spending is essentially included in private consumption in the National Accounts and in the Environmental Accounts. Table 5.1 suggests that 12 percent of domestic CO_2e emissions from consumption should be reallocated to exports. Nearly 20 percent of Swedish households' direct CO_2 emissions through fossil fuel use should be reallocated to exports. However, it is worth recalling that Swedish tourists abroad lead to the same effects in other countries.

Various key figures per SEK million in expenditure are presented in the lower section of Table 5.1. Value added accounts for approximately SEK 700 000 per SEK 1 million generated in expenditure, both regarding domestic tourism and business travel. Non-resident visitors generate SEK 800 000 in value added per SEK 1 million in expenditure, which is in line with the corresponding key figures for total private consumption and total final use.

The number of employed persons per SEK 1 million differs slightly between the different groups. The figure is low for domestic tourists, one employed person per SEK 1 million in expenditure. This is in line with the value of total private consumption and total final use. Business travel and non-resident tourism figures are 20 to 30 percent higher per SEK 1 million in expenditure.

6 Conclusions

The tourism sector is usually measure the direct effects. This study shows that by calculate indirect effects on tourism, by using input-output analysis, increasing the tourism sector in Sweden by 50 percent in terms of tourism employment. The multiplier for tourism value added is however lower than for tourism employment.

This report focusses on greenhouse gas emissions as the most important part for measuring tourism environment footprint. Other environmental aspects, such as water use, solid wasted and chemicals etc, is also important and can be analysed by using an input-output method. But since those indicators only measure moved consumption out of the usually environment to the place of visit, are these effects probably not as significant as for the CO_2 emissions.

Greenhouse gas emissions due to tourism have decreased by 14 percent in Sweden over the period 2008–2015. It is mainly the environmental impact of resident visitors and businesses that has decreased. For non-resident visitors the CO_2 emissions remain largely at the same level over the seven-year period due to increased inbound tourism.

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For non-resident visitors the greenhouse gas emissions per consumption unit is twice as high as the reference group of Swedish households, and domestic tourism has approximately 50 percent higher CO_2 than average private consumption.

The important link between tourism and greenhouse gas emissions must not be neglected. The trend of increased travel and tourism nationally and internationally need climate neutral transports. Transports need to bear their full social costs for air pollution. It is important that the trend of increased travel and transport can be kept at a sustainable level based on all aspects – economic, environmental and social.

Upcoming studies of tourism environmental footprint should consider analysis other environmental aspects, more than greenhouse gas emissions analysed in this study. Environmental aspects need to be combined with social and economic aspects to build knowledge of the tourism effects and if possible optimizing the size of the tourism industry.

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Appendix 1: Consumption products

A. Consumption products	
A.1 Tourism consumption products	
I551	**Hotels**
I55A	**Holiday villages, camping, etc.**
L68201B	**Second homes**
I56A	**Meals out**
H491A	**Rail transport**
H493A	**Public transport, bus**
H4932	**Taxi travel**
H50A	**Water transport**
H511	**Air transportation**
N7711	**Passenger car rental**
N7912	**Package trips**
N79A	**Other travel arrangements + tourist assistance**
R90	**Cultural services and entertainment**
J591	**Film**
R91	**Museums, libraries, etc.**
R931	**Sports**
R932	**Other recreational and entertainment services**
	Boating
A.2 Tourism products	
	Goods purchase
C10 and C11	Food
	Other goods purchase
C192000B+E	**Fuel**
	Cars
	MC
	Boats
N82A	**Trade fairs, congresses, conferences**
O84B	**Passport, visa**
A.3 Non-tourism-related services	
M742	**Photo services**
S9601	**Washing**
S9602	**Hairdresser, beauty care**
B.1 Valuables	**Valuables**

Appendix 2: Industry codes – Swedish Standard Industrial Classification

Industry, by NACE 2007		Tourism as share of total value added 2015
I55	Hotels	62%
I56	Restaurant services	31%
H49A	Rail transport, passenger	19%
H49B	Public and other passenger transport	8%
H49C	Taxi	29%
H50	Water transport	10%
H51	Air transportation	86%
N79	Travel agencies, tourist assistance	100%
L68A	Second homes	10%
O84	Public administration	0.2%
R90–93+S96	Culture, sports, entertainment, beauty care	16%
G45–47	Trade in goods	5%
N77	N77 Rental	11%
N82A	Other business services	9%
M74	Design, photo, interpreter	1%

Appendix 3: Example of results and how to interpret it

The results are illustrated in tables that show values in the entire economy by production chain in the categories of products that form part of the TSA.

In 2015, 233 000 persons in the Swedish economy were employed in activities related to tourism. Table A.3 shows the distribution of employed persons based on demand in tourism for various products and the links between various producers and the different production chains. Tourism demand for each product is presented in the lines and the production chains are described in the columns.

Table A.3 shows that hotel accommodation, camping, and restaurant services employed 78 000 persons in 2015 to meet tourist demand for these products. Among these, 75 000 persons were employed in the production of hotel accommodation, camping, and restaurant services. This production chain (that is, hotel accommodation, camping, and restaurant services) employs 97 000 persons in total. Other product categories are included in addition to hotel accommodation, camping, and restaurant services, such as trade, good and trade fairs. This production chain accounts for 40 percent of the total number of persons employed as a result of tourist consumption.

In this study corresponding results can be seen concerning value added and greenhouse gas emissions.

Table A.3: Tourism demand, employment 2015

Industries / Products	Food	Other products	Fuel	Hotels/ Camping / Restaurant services	Second homes	Road/ Rail transport	Water transport	Air transportation	Car rental	Package trips, etc.	Film, Culture,	Trade fairs	Passport / Visa	Photo/ Washing / Hairdresser	Boating	Other	Trade	**Total**
Food	3 126	5	1	1 641	20	19	12	17	7	33	48	3	1	4	1	0	57	**4 996**
Other products	152	1 943	12	425	183	187	61	79	85	83	134	19	5	19	5	0	574	**3 968**
Fuel	1	1	99	3	1	11	3	1	0	1	1	0	0	0	0	0	3	**124**
Hotels/Camping/Restaurant services	101	55	6	75 134	282	204	62	276	71	1 233	332	58	10	78	22	0	424	**78 349**
Second home	87	47	5	2 475	6 636	224	44	109	64	153	428	38	19	44	27	0	781	**11 183**
Road/Rail transport	178	87	11	461	156	12 389	50	82	57	432	153	15	7	12	6	0	535	**14 631**
Maritime traffic	4	2	2	7	2	5	1 131	1	1	8	2	0	0	0	0	0	8	**1 175**
Air transportation	1	1	0	8	3	3	2	2 306	1	233	5	1	0	0	0	0	7	**2 571**
Car rental	22	16	1	277	34	151	14	454	1 744	73	102	8	1	10	2	0	192	**3 101**
Package trips, etc	1	1	0	25	2	4	7	4	1	5 513	8	0	0	1	0	0	7	**5 574**
Film, Culture	31	20	2	695	107	56	18	37	31	78	13 722	10	4	10	5	0	269	**15 095**
Trade fairs	176	119	15	2 213	1 628	334	59	267	99	171	664	2 694	19	65	45	0	899	**9 465**
Passport/Visa	58	28	8	276	93	97	21	32	20	89	180	10	577	8	6	0	133	**1 636**
Photo/Washing/Hairdresser	56	36	4	555	101	88	30	387	45	82	120	53	4	1 669	10	0	312	**3 550**
Boating	53	35	8	742	566	158	43	85	28	137	121	21	7	24	638	0	272	**2 938**
Other	2 472	1 032	183	9 519	4 366	3 357	1 184	2 784	756	1 868	2 207	366	107	318	155	0	6 437	**37 112**
Trade	333	200	17	2 533	257	1 087	99	465	98	181	336	31	8	32	7	0	31 822	**37 507**
Total	**6 850**	**3 629**	**374**	**96 988**	**14 438**	**18 372**	**2 842**	**7 386**	**3 108**	**10 368**	**18 562**	**3 328**	**769**	**2 294**	**929**	**0**	**42 733**	**232 972**