14 MARCH 2019

# Integrated economic and environmental accounts for tourism: pressures of tourism industries on the natural environment

Istat releases experimental statistics on environmental pressures related to tourism industries, obtained by integrating two existing accounting frameworks – the Tourism Satellite Accounts (TSA) and environmental satellite accounts.

The integrated accounting framework combines two modules:

- the **economic module**, that covers the main economic aggregates such as output, value added, intermediate consumption by tourism industry (and for the 'other industries' as a whole);

- the **environmental module,** that measures environmental pressures directly generated by the same industries.

In the integrated accounting framework released by Istat[1], the economic module records *tourism domestic supply and internal tourism consumption*, as in the Italian TSA[2]; the environmental module, that is the pioneering part of the exercise, measures air emissions causing greenhouse effect, acidification and ground level ozone[3] as well as total intermediate consumption of energy products. Emission and energy intensities of tourism industries are also presented.

For each tourism industry, economic and environmental estimates are provided for:

- the industry as a whole (column 'output' in the framework)

- the part attributable to visitor activity and hence to tourism, so called *tourism share*. The TSA recommended methodological framework defines the Tourism share as: the 'share of the corresponding fraction of internal tourism consumption in each component of supply. For each industry, the tourism share of output (in value), is the sum of the tourism share corresponding to each product component of its

---

[1] See Table 'TSA_Environmental accounts' in 'Tourism_satellite_account_Environmental_accounts_Italy.xlsx'.

[2] TSA estimates for year 2015, released in December 2017. SEE. Istat, https://www.istat.it/it/archivio/207454

[3] Air emissions causing greenhouse effect include: carbon dioxide ($CO_2$), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluorides ($SF_6$), methane ($CH_4$), nitrous oxide ($N_2O$), Nitrogen Trifluoride ($NF_3$), measured in "tonnes of CO2 equivalents" by applying weights reflecting for each pollutant its 'global warming potential' (GWP) in relation to the GWP of $CO_2$: 1 for $CO_2$, 25 for $CH_4$, 298 for $N_2O$, 17200 for $NF_3$, 22800 for $SF_6$ and various weights for HFCs, PFCs and $SF_6$. ACIDIFICATION takes into account: sulphur oxides ($SO_x$), nitrogen oxides ($NO_x$) and ammonia ($NH_3$), measured in "tonnes of potential acidification equivalent", by applying the following weights: 1/32 for $SO_x$, 1/46 for $NO_x$, 1/17 for $NH_3$. GROUND LEVEL OZONE takes into account: Non-Methane Volatile Organic Compounds (COVNM), nitrogen oxides ($NO_x$), methane ($CH_4$) and carbon monoxide (CO), measured in "potential tropospheric ozone formation" with the following weights: 1 for COVNM, 1.22 for $NO_x$, 0.014 for $CH_4$ and 0.11 for CO.

output'. (UNWTO et al, 2010, Glossary of terms)[4].

Istat produced the preliminary estimates of environmental flows generated by tourism industries in the context of a pilot study carried out within the Measuring the Sustainability of Tourism (MST) initiative of the UN World Tourism Organization (UNWTO). The project, launched in 2015, with the partnership of the United Nations Statistics Division (UNSD), aims at developing an international statistical framework for measuring tourism's role in sustainable development, including economic, environmental and social dimensions[5].

Recognizing that accounting frameworks have a high potential for measuring the sustainability of tourism, the main idea behind the MST project is to integrate two existing accounting frameworks: the Tourism Satellite Accounts (TSA[6]) and the System of Environmental-Economic Accounting (SEEA[7]), both consistent with the accounting framework for measuring the economy – the System of National Accounts (SNA).

## Methodology

The main methodological reference for the estimates of environmental pressures related to tourism industries is the TSA-SEEA Technical Note (UNWTO, 2018a), prepared upon encouragement by the UN Committee of Experts on Environmental-Economic Accounting (UNCEEA) and by the UNWTO Committee on Statistics and the TSA. For the economic module the source of data is the Italian TSA Table 6 - Total domestic supply and internal tourism consumption.

### *Estimating environmental flows by tourism industry[8]*

The purpose of the exercise is to estimate environmental flows by tourism industry (regardless of the proportion directly attributable to tourism): **EF_EMI_TOURind$_{(i)}$** and **EF_EUQ_TOURind$_{(i)}$**, where (i) are the 11 tourism industries listed in Table 1, column 1.

The starting point are environmental flows by national accounts industry, available from annual air emission accounts and physical energy flow accounts: **EF_EMI_NA$_{(j)}$** and **EF_EUQ_NA$_{(j)}$**, where j are the national accounts economic activities listed in **Errore. L'origine riferimento non è stata trovata.**, column 2.

As a first step, the scope of the national accounts economic activities (**Errore. L'origine riferimento non è stata trovata.**, column 2) for which EF are already available, is compared to

---

[4] See the UN manual *Tourism Satellite Account: Recommended Methodological Framework 2008* (TSA: RMF 2008).
[5] See UNWTO (2018b). A final version is planned to be submitted to the United Nations Statistical Commission in March in 2020.
[6] See the UN manual *Tourism Satellite Account: Recommended Methodological Framework 2008* (TSA: RMF 2008).
[7] System of Environmental-Economic Accounting 2012 - Central Framework (SEEA-CF).
[8] The described method was developed on the basis of the Italian TSA methodology.

the scope of the corresponding tourism industry (column 1); column 3 of **Errore. L'origine riferimento non è stata trovata.** specifies the actual difference in scope for each case.

**Table 1 – Tourism industries and corresponding NA economic activities**

| Tourism industry (a) | NA economic activity (b) | Difference in scope - portion of NA economic activity (b) not included in tourism industry (a) |
|---|---|---|
| 1- Accommodation for visitors | Accommodation | Accommodation for students, and workers such as student residences, school dormitories, workers hostels |
| | Buying and selling of real estate and real estate activities for third parties | No conceptual difference in scope but the portion of real estate activities not related to tourism is not included |
| | Rental and management of properties owned or leased | See above |
| 2- Food and beverage serving activities | Food and beverage serving activities | Event catering and other food service activities |
| 3- Railway passenger transport | Railway transport | Freight rail transport |
| 4- Road passenger transport | Other land passenger transport | Urban and suburban passenger land transport |
| 5- Water passenger transport | Maritime and inland water transport | Sea, inland and coastal freight water transport |
| 6- Air passenger transport | Air transport | Freight air transport and space transport |
| 7- Transport equipment rental | Renting and operating leasing activities | Renting and leasing of recreational and sports goods (part of tourism industry 10 – sport and recreational industry) |
| 8- Travel agencies and other reservation services industry | Services activities of Travel agencies, Tourism Operators and related reservation services and activities | No difference in scope but the portion of output related to package tours is not included |
| 9- Cultural activities | Creative, arts and entertainment activities | None |
| | Libraries, archives, museums and other cultural activities | Library and archives activities |
| 10- Sports and recreational industry | Lotteries, betting and casinos related activities | None |
| | Sports, amusement and recreation activities | Activities of sports clubs. Fitness facilities |
| 11 - Retail trade of country specific goods | Retail trade, except of motor vehicles and motorcycles | Retail trade of country non tourism specific goods |

If a national accounts economic activity (col 2) and the corresponding tourism industry (col 1) have the same scope (no difference reported in column 3), the environmental flow of the tourism industry is equal to the (known) environmental flow of the specific corresponding national accounts economic activity:

**(1.1)  EF_EMI_TOURind$_{(i)}$ = EF_EMI_NA$_{(j)}$ and**

**(1.2)    EF_EUQ_TOURind$_{(i)}$ = EF_EUQ_NA$_{(j)}$** (where *i* are the 11 tourism industries listed in **Errore. L'origine riferimento non è stata trovata.** and *j* are the corresponding national accounts economic activities)[9].

If the scope of tourism industry is **smaller** than the corresponding NA economic activity, the amount of environmental flow for the tourism industry is calculated consistently as far as possible with the method applied to estimate output in the Italian TSA.

In the Italian TSA, output by tourism industry is estimated by breaking down NA output at the NACE class level (4-digit) and summing up as tourism output only the classes actually falling within the scope of tourism (that is to say, subtracting from NA activity output the portion of output related to classes falling outside the scope of tourism). In estimating environmental flows, the **first best option** is to exactly match the TSA output method, i.e. to quantify the specific amount of emissions/energy inputs related to activities falling within the tourism scope (that is to say, subtracting from NA activity-environmental flow the portion related to classes falling outside the scope of tourism)[10]. In practice a **second best option** is applied in most cases:

**(2.1)        EF_EMI_TOURind$_{(i)}$= EF_EMI_NA$_{(j)}$ * output_TOURind$_{(i)}$/ output_NA$_{(j)}$**

**(2.2)        EF_EUQ_TOURind$_{(i)}$= EF_EUQ_NA$_{(j)}$ * output_TOURind$_{(i)}$/ output_NA$_{(j)}$**

i.e. the environmental flows for tourism industries are estimated as a proportion of the related NA economic activity equal to the TSA output ratio (tourism industry/NA).

*Estimating the tourism share of environmental flows by tourism industry*

**Tourism share of environmental flows by industry**, can be calculated on the basis of TSA tourism output ratios (output_TS(i)/output_TOURind(i)):

**(3.1)        EF_EMI_TS$_{(i)}$= EF_EMI_TOURind$_{(i)}$ * (output_TS$_{(i)}$/output_TOURind$_{(i)}$)**

**(3.2)        EF_EUQ_TS$_{(i)}$= EF_EUQ_TOURind$_{(i)}$ * (output_TS$_{(i)}$/output_TOURind$_{(i)}$)**

---

[9] In two cases the scope of the tourism industry is identical to the national accounts economic activity: 'Creative, arts and entertainment activities' and 'Lotteries, betting and casinos related activities'. The relevant environmental flows therefore are exactly those calculated for the national accounts economic activity. In addition environmental flows for the tourism industry '8 - Travel agencies and other reservation services' are also identical to the NA economic activity ones since the relevant environmental flows actually relate to the portion of the output that is to be taken into account according to TSA (the portion of output related to package tours is not included and the same shall apply for corresponding environmental flows which indeed are caused by other economic activities such as transport, accommodation, etc.).

[10] For air emissions, this first best method is actually applied to estimate emissions of the 'transport equipment rental' tourism industry: all transport related air emissions are attributed to the tourism industry at stake whereas heating emissions can be singled out as belonging to the 'sport' component of the activity (part of tourism industry 10 as shown in column 3 of Table 1). In the case of EUQ, i.e. energy use estimates for tourism industry the first best option method was never feasible in practice.

In TSA Table 6, output and output tourism share are available not only by tourism industry, but also, for each tourism industry, by individual product. Ideally, then, estimates of TSA consistent environmental flows can be based on tourism output ratios by product, i.e. **output_TS$_{(ip)}$/ output_TOURind$_{(ip)}$**

Where **p** are the TSA products supplied by tourism industry **i**.

However, in order for the tourism output ratios by product to be actually used in the estimates, also a consistent environmental flows breakdown by TSA product (or grouping of products) is needed.

In practice, a breakdown matching TSA products is available in Italian official statistics for air emissions and energy use of the following tourism industries[11]:

3- Railway passenger transport

4- Road passenger transport

5- Water passenger transport

6- Air passenger transport

In the case of the four tourism industries that supply transport services, the emissions/energy use related to the specific transport activity supplied can be identified as specific subsets of the total emissions/energy use of the industry. Hence, in this four cases environmental flows (EF) of the tourism industry are calculated as the sum of two components:

     1. EF related to the provision of the specific transport service (railway, road, water or air transport, respectively);

     2. EF related to the provision of all other products

Correspondingly, two product specific environmental flows can be calculated:

   **(4)  EF_TS$_{(ip)}$= EF_TOURind$_{(ip)}$ * (output_TS$_{(ip)}$/output_TOURind$_{(ip)}$)**

Where

---

[11] Air emission accounts by NACE are annually published by Istat. The December 2017 release were used: Istat [2017] http://dati.istat.it/Index.aspx?lang=en&SubSessionId=7d9da96e-e22f-45ed-a07a-50ac25b25d47 (National Accounts, Environmental Accounts, NAMEA air emissions – NACE REV.2, Production activities -December 2017 release). For calculation purposes, air emission accounts at working level data were used: they are broken down by NACE activity as well as by process. Air emissions due to transport process match transport related products of TSA.

Similarly, energy use data by NACE are annually published by Istat. The December 2017 release were used: Istat [2017] Energy use http://dati.istat.it/Index.aspx?lang=en&SubSessionId=726e7fe2-422e-4ea7-9386-28bd227346c9 (National Accounts, Environmental Accounts, Energy use accounts, Economic activities – type of use - November 2017 release). For calculation purposes, energy use data at working level data were used: they are broken down by NACE activity as well as by purpose (transport, heating, etc.). Energy use for transport purposes match transport related products of TSA.

i= 3,4,5,6 i.e. the four industries listed above          and

p=1 (related to the specific transport mode corresponding to the principal activity of industry i), 2 (all other EF).

For tourism industries other than the four transport industries listed above, transport emissions in air emission accounts relate to transport as an ancillary activity and therefore cannot be related to the (secondary) output of TSA Table 6. Hence total tourism output ratios by industry (i) were used to estimate tourism share of environmental flows (see 3.1 and 3.2 above), in all cases but the four listed above.

## Main links to data sources

Istat (2017), Conto satellite del turismo per l'Italia, https://www.istat.it/it/archivio/207454; English version: http://www.istat.it/en/archive/20 8130

Istat (2017) Air emission accounts

http://dati.istat.it/Index.aspx?lang=en&SubSessionId=7d9da96e-e22f-45ed-a07a-50ac25b25d47 (National Accounts, Environmental Accounts, NAMEA air emissions – NACE REV.2, Production activities -December 2017 release).

Istat (2017) Energy use  http://dati.istat.it/Index.aspx?lang=en&SubSessionId=726e7fe2-422e-4ea7-9386-28bd227346c9 (National Accounts, Environmental Accounts, Energy use accounts, Economic activities – type of use - November 2017 release).

## Main references

Ardi C., Recchini E., Tudini A. (2018), *SEEA CF and tourism accounts – the Italian experience*, "London Group on environmental accounting", 24th meeting, Dublin, 1-4 October 2018. https://seea.un.org/sites/seea.un.org/files/lg 24 e 32.docx

Costantino C., Tudini A. (2005), "How to develop an accounting framework for ecologically sustainable tourism", in Lanza A. – Markandya A. – Pigliaru F. (editors*), The Economics of Tourism and Sustainable Development*, The Fondazione ENI Enrico Mattei series on Economics and the Environment, Edward Elgar, UK, USA

UNWTO et al (2010), *Tourism Satellite Account: Recommended Methodological Framework 2008* https://unstats.un.org/unsd/publication/Seriesf/SeriesF 80rev1e.pdf

UNWTO, (2016), *Measuring Sustainable Tourism Project concept note*, http://cf.cdn.unwto.org/sites/all/files/docpdf/mstconceptnote17032016.pdf

UNWTO, (2018a), *Linking the TSA and the SEEA: A Technical Note;* http://cf.cdn.unwto.org/sites/all/files/docpdf/tsaseeatechnote.pdf

UNWTO, (2018b), *Statistical Framework for Measuring Sustainable Tourism;* Consultation Draft http://cf.cdn.unwto.org/sites/all/files/pdf/sf-mst feb.pdf