MEASURING THE ENVIRONMENTAL IMPACT OF TOURISM IN THE NORDICS

UNWTO – Measuring the Sustainability of Tourism

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INTRODUCTION

Jonathan Lindahl:
• Economist
• Senior advisor at Centre for Regional and Tourism Research in Denmark

Centre for Regional and Tourism Research
• Research centre in Denmark working with regional development and tourism
• For instance, together with VisitDenmark, we are each year measuring the economic impact of tourism on municipality level by a regional tourism satellite account combine with our interregional input-output model called LINE.
Together with *The Swedish Agency of Economic and Regional Growth*, we are working on a project called *Measuring regional tourism and tourism’s environmental impact in the Nordics*.

Two work packages:

1. Developing Regional Tourism Satellite Accounts in the Nordics using credit card information
2. Measuring the environmental impact of tourism in the Nordics

Focusing on **WP2** in this presentation.

We are focusing on the **GHG emissions** from tourism (but are also looking at the possibility to include other environmental impact).
Literature review

Currently: Great variation in existing research methodologies calculating the carbon footprint of tourism – therefore, different results. Gössling (2013):

“Studies are difficult to compare, because they use different system boundaries and allocation principles, omitting or including lifecycle emissions and GHG other CO₂.”

Therefore, there is a need for a guideline that define the scope and boundaries for evaluating carbon emission from national tourism.

One possible approach: combine TSA with an IO-model and SEEA (environmentally extended IO-model).

Advantage: Data is based on internationally agreed principles, and most country have these data available.
Allocation Principles

When combining a TSA with an IO-model and SEEA, you can have different allocation principles. Sun et al. (2019) defines 4 allocation principles:

- **Producer Accounting Principle (PAP):** Emissions from residential producing units engaged in internal tourism and exported to tourism in other countries.

- **Kyoto Protocol Framework (KP):** PAP emissions without emissions of international transportation services produced by residential units.

- **Consumer Accounting Principle (CAP):** Emissions from the domestic travel + outbound travel of the domestic population.

- **Tourism Satellite Account Principle (TSAP):** Emissions from internal tourism consumption produced domestically + from imported goods and services consumed by the internal tourism.

We are focusing on the **TSAP**.
When using TSAP, you can distinguish between where the emissions takes place from the production of the goods and services consumed by the internal tourism, see table.

Denmark and Sweden has carried out pilot studies, where they include/exclude some type of emissions from the TSAP.

<table>
<thead>
<tr>
<th>Territorial emissions</th>
<th>Production-based emissions</th>
<th>Emissions embodied in import</th>
<th>Emissions from international transportation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DK</td>
<td>DK, SE</td>
<td>SE</td>
<td></td>
</tr>
</tbody>
</table>
Territorial- and production based emissions

For instance, in Denmark, there is a huge difference between the territorial- and production based emissions due to significant emissions from international sea transport.

*Figure 1:* Territorial- and production based emissions in Denmark (million ton CO$_2$-e.)

Therefore, it is relevant to measure the TSAP compared to Denmark’s territorial- and production-based emission.
Case: Denmark

We are using a standard approach using an environmentally extended IO-model:

\[ TSAP = e(I - A)^{-1}y_t + f_t = eL y_t + f_t \]

where:

- \( e \) is an emission intensity
- \( L = (I - A)^{-1} \) is the Leontief inverse/IO-multiplier
- \( y_t \) is the final demand from tourism in domestic country
- \( f_t \) is the direct emissions from tourism.

\( f_t \) is calculated using the household direct emissions from car use multiplied by the tourism share of consumption of gasoline.

We do not calculate tourism emission from using a house that have individual heating.
Case: Denmark

We are both doing the calculations using the normal SEEA, but also on data from an alternative SEEA developed by Statistic Denmark, where it is possible to distinguish between territorial- and production-based emissions.

Be aware of:

• The input-output multiplier is based on the Danish interregional IO-model LINE, which also include the induced effects. Therefore, the environmental calculations also include the induced effects. This is done to make the environmental calculations comparable to the economic numbers.

• We do not publish the numbers for the direct tourism emissions, $f_t$, as we have to confirm the numbers.

Therefore, the results are still preliminary.
Results

Figure 2: Territorial emissions in Denmark and territorial emissions in Denmark as a result of tourism in Denmark in 2020 (million tons CO\(_2\)-e.)

Figure 3: Production-based emissions in Denmark and production-based emissions in Denmark as a result of tourism in Denmark in 2020 (million tons CO\(_2\)-e.)
Results

Figure 4: Tourism share of employment, GVA, territorial- and production-based emissions in Denmark in 2020

<table>
<thead>
<tr>
<th>Category</th>
<th>Emission Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td>4.3%</td>
</tr>
<tr>
<td>GVA</td>
<td>2.7%</td>
</tr>
<tr>
<td>Territorial emissions</td>
<td>2.3%</td>
</tr>
<tr>
<td>Production-based</td>
<td>2.6%</td>
</tr>
</tbody>
</table>

Note: Calculation based on the TSA for Denmark combined with the interregional IO-model LINE, which include the indirect and induced effects from the tourism consumption.

Be aware that the numbers does not include tourism direct emissions (car use). This will probably increase the tourism emissions significantly.
Future work

• Quality assurance of the calculations
• Include emissions from imported goods and services (using for instance EXIOBASE) consumed by the internal tourism and emissions from international transport.
• Calculations on regional level
• Include other environmental impact (water consumption, etc.).
• And so on...