

MEASURING THE SUSTAINABILITY OF TOURISM: FROM TOURISM SATELLITE ACCOUNTS (TSA) TO TOURISM SUSTAINABILITY SATELLITE ACCOUNTS (TSSA)

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Abstract

Based on national accounting, the Tourism Satellite Account (TSA) is an internationally harmonised method for measuring the direct economic contribution of tourism consumption to the national economy. Understanding the analytical boundaries of the TSA, particularly given the negative impacts of tourism, has led to the development of a model aimed to quantify both the positive and negative impacts of tourism. It is called the Tourism Sustainability Satellite Account (TSSA), and it enables comparative analyses of the direct contribution of tourism to both the economy and the environment. The TSSA stems from the same original methodological framework as the TSA, and integrates the core accounts of the TSA with the environmental accounts of water flows, energy flows, greenhouse gas emissions, and solid waste. This paper provides a critical overview of the TSSA methodological framework from the perspective of tourism activities in countries where foreign visitors generate the dominant share of tourism consumption, but also bearing in mind the growing importance of the sharing economy. The production boundary and the scope of tourism activities in environmental accounts are recognized as the key model limitations. The paper proposes an adjustment of the initial TSSA model in order to overcome these limitations, using the example of greenhouse gas emissions accounts. The updated model is based on an extended scope of tourism activities, and integration of both the residential and territorial accounting principles. The proposed improvements allow for the conclusion that the TSSA could become the analytical tool for reliable comparative assessment of the economic and environmental impacts of tourism. This implies an extension of content and coverage of the environmental accounts, together with the harmonization of the international methodological framework and the improvement of the national tourism and environmental statistics.

Key words:

tourism, sustainability, tourism satellite account (TSA), tourism sustainability satellite account (TSSA), system boundaries

JEL classification: E01

Introduction

The estimation of the economic contribution of tourism has been the subject of tourism economics research for decades (Comerio & Strozzi, 2019), and it stems from a number of different stochastic and deterministic quantitative methods. The Tourism Satellite Account (TSA) is included in the group of deterministic methods, together with input-output analysis, system of national accounts, and computable general equilibrium modelling (Hara, 2008). The purpose of these models is to analyse the interrelations between tourism and different segments of the national or regional economy, and to quantify the direct and indirect impacts of tourism on the economy (Zhao, Yanagida, Chakravorty & Leung, 1997; Comerio & Strozzi, 2019).

The tourism satellite account has become a widespread part of tourism statistics, with 22 European Union Member States submitting data on total domestic supply and internal tourism consumption to Eurostat (Eurostat, 2020). This is a reflection of the institutional support and recognised importance of the TSA to assess the macroeconomic contribution of tourism, but also of the recognized benefits that the TSA results can have on national tourism policies and marketing strategies, on improving and harmonizing tourism statistics, and on increasing the use of research results in private sector (Ivandić & Marušić, 2009). In 2019, the TSA became an integral part of the official statistics in Croatia (Central Bureau of Statistics, 2019), and the integration of the TSA and input-output models formed the basis to measure the indirect and overall contribution of tourism consumption to the gross domestic product (Ivandić & Šutalo, 2019).

Compiling the TSA enables assessment of tourism importance in the national economy, and provides the key prerequisites for efficient and effective tourism development policies (Baker, 2013). However, defining efficient and effective tourism policies requires a deep understanding of the negative impacts of tourism, not only on the economy, but also on the environment and on society. Tourism may generate a wide spectrum of negative environmental impacts at the local, national or international scale, from the loss of biological diversity to pollution and climate change (Tribe, 2020). It also impacts the living conditions of the local communities (Gössling, McCabe & Chen, 2020; Mihalic, 2020). Tourism can generate significant pressure on space, crowding out of other economic activities (Ivandić, Telišman-Košuta & Carić, 2022), and the erosion of human capital (Kožić, 2019). Understanding the negative impacts of tourism is particularly important in conditions of nearly constant growth of tourism activities, and the consequential effects of overtourism (Dodds & Butler, 2019).

A recognition of the analytical limitations of the TSA resulted in the initial development of a new methodological framework, the Tourism Sustainability Satellite Account (TSSA). It is a rigorous and consistent method based on the national accounts that enables a standardised assessment of the direct effects of tourism on the economy and the environment. However, compiling the TSSA is still in the 'pilot' phase, and not standardized. This is a reflection of lack of international methodological harmonisation and insufficient statistical basis for its compilation. The evidence for different approaches is given by two examples of good practice within the European Union. The development of the TSSA in Germany (Balaš at al, 2021) combines the indicators from the TSA, such as tourism share, employment or gross value added, with 17 groups of indicators from management, social and environmental aspects of tourism. The used approach has resulted in a departure from the fundamental form and content of the proposed accounts (World Tourism Organization, 2018). Some of the indicators were not calculated due to a lack of data and/or clearly defined concepts (e.g. waste generation, environmental protection and biodiversity, land cover, and noise). On the other hand, the

Instituto Nazionale di Statistica (2019) published an experimental calculation of the tourism industries environmental impacts in Italy, based on the integration of TSA and environment satellite accounts. The used approach quantified, both, the direct economic and environmental (greenhouse gas emissions [GHG] and intermediary energy consumption) impacts for each tourism activity as a whole, and the part that can be attributed to visitor activities, i.e. to tourism.

In order to promote the process of international harmonization of TSSA, this paper aims to give an overview of the key issues of the initial TSSA methodological framework, and to propose its adjustments from the perspective of analysing the effects of tourism activities in countries in which foreign visitors generate the dominant share of tourism consumption. Besides the need to connect the production perspective of the environmental accounts with consumption/demand perspective that determine tourism activities (UNWTO, 2018), the analysis indicated additional issues pertaining to setting the production boundary and production table structure. The initial TSSA model does not enable measurements of all direct environmental impacts, particularly when tourism is mostly driven by foreign demand, and when tourism represents an important driver of growth, as in most countries of the Adriatic region (Gričar, Bojnec, Karadžić & Backović, 2022). Therefore, the paper proposes the adjustments to the initial TSSA model through an extended scope of the impacts of tourism on the environment. The case of greenhouse gas account is used to assess various aspects of the extension of the scope of tourism activities, and integration of both the residential and territorial principles.

Tourism Satellite Account

The Tourism Satellite Account is a specific method for measuring the direct contribution of tourism consumption to the national economy (Frechtling, 2010), as a contemporary solution for the collection, presentation and comparison of national tourism statistics (Kenneally & Jakee, 2012). It is based on the principles and structure of the System of National Accounts (SNA 2008) (European Communities et al, 2009) and European System of National and Regional Accounts (ESA 2010) (European Commission & Eurostat, 2013). TSA reflects the fact that tourism, from the supply side, should be viewed as a composite system that combines productive activities that cater mainly to visitors. Through the relationship between tourism demand and the supply, the TSA determines the gross domestic product of tourism, in a similar way as the supply and use tables determine the gross domestic product (Mikulić, 2018). As a rigorous accounting framework of national accounts enables the quantitative overview of the total economic activities at the national level (Lequiller & Blades, 2014), the TSA, based on an equally rigorous accounting framework, enables a quantification of the key economic tourism aggregates at the national level.

After several decades of development and an international harmonisation of the many approaches, the methodological framework for the TSA was established by the document *Tourism Satellite Account: Recommended Methodological Framework 2008* (TSA:RMF 2008) (United Nations, World Tourism Organization, Eurostat – Commission of the European Communities & Organisation for Economic Co-operation and Development, 2010). Starting from a standardised determination of the production boundaries given by the national/European accounting system, the TSA:RMF 2008 provides a detailed explanation of tourism from the supply and demand side perspectives. It identifies the tourism characteristic products and activities, including also accommodation services associated with all types of vacation home ownership, but not including the similar economic effect of personal vehicles.

The TSA has a number of analytical limitations. It is focused only on direct and not the indirect and induced effects of tourism. The calculation of tourism direct gross domestic product is tied only to tourism consumption, but not to total tourism demand. The approach of the TSA related to business trips differs from the approach of the national accounts, while the employment account measures employment in tourism characteristic activities, but not in tourism. Due to the asymmetry of the spatial distribution of tourism activities, and the presence of negative impacts of tourism, the key analytical limitation arises from a lack of a harmonized methodological framework to assess the regional economic contribution (Ivandić & Pavlić, 2020), and the environmental and social impacts of tourism.

Development of the Tourism Sustainability Satellite Account

The platform for rigorous and consistent measurements of the economic and environmental impacts of tourism is given by ESA 2010, that assesses the relationship between the environment, tourism and the economy through the satellite accounts. The satellite accounts enable linking the environmental and economic information, and analysis of their interactions, at the level of economic activities (Regulation (EU) No 691/2011 of the European Parliament and of the Council of 6 July 2011 on European environmental economic accounts, SL EU L 192/1, 2011). The integration of tourism and environment satellite accounts is the basis for a TSSA model that enables comparable and standardised assessments of the direct impacts of tourism on the economy and the environment. The TSSA connects the economic accounts from the TSA with four environmental flow accounts (World Tourism Organization, 2018):

- Water account
- Energy account
- Greenhouse gas emissions account
- Solid waste account.

The initial model for the TSSA given by World Tourism Organization document Linking the TSA and the SEEA: A Technical Note (2018) is burdened by a number of methodological and analytical issues. First issue arises from different classification of productive activities. The second one arises from the need to integrate the demand driven tourism activity with the supply side environmental impacts. The third issue is gap between the physical expression of different environmental impacts of tourism, and the monetary aspects of tourism activities. But, even more important, the TSSA does not encompass all the relevant dimensions of sustainability. It does not include indicators of social sustainability, or of environmental asset (stock) accounts, nor does it assess all the tourism impacts on the environment, such as the influence on the distribution and concentration of heavy metals (Mihelčić, Barišić, Vdović, Legović, & Mihelčić, 2010) or noise (Sánchez-Sánchez, Fortes-Garrido & Bolivar, 2015). It also lacks the analytical power to recognise the indirect and induced impacts of tourism on the environment (Jones & Munday, 2007), nor does it take into account tourism generated emissions of personal means of transport, primarily personal cars (Jones, 2013). These issues are primarily due to the methodological limitations, but also, partly, to a lack of data that uniformly and consistently link the economic and environmental impacts of tourism flows with the key dimensions of tourism sustainability (World Tourism Organization, 2022).

Following the recognized limitations, possible upgrades of the initial TSSA methodological framework are assessed using an example of linking the production account of tourism activities with the greenhouse gas emissions account. Tourism activities generate significant GHG emissions, particularly in the passenger transport, but also in accommodation, and food and beverage services (Li, Li, Tang & Wang, 2019). However, an increase in tourism activities does

not necessarily result in an increase in the emissions if adequate policies and practices aimed at reducing emissions are applied (Lee & Brahmašrene, 2013).

The GHG emission account is focused on direct carbon dioxide emissions into the atmosphere. It includes physical supply generated by tourism industries (accommodation for visitors, food and beverage serving, passenger transport, culture, sport and recreation, and other tourism industries), other industries and households. Emissions of each industry are divided into two groups, the total emissions, and the emissions generated by tourism, while the household sector emissions are presented for total emissions, only.

Emissions generated by internal passenger transport are one of the largest producers of tourism generated GHG emissions. However, the measurement of emissions generated by international and interregional passenger transport is not straightforward, as in other activities, due to the different accounting approaches applicable. The System of Environmental Economic Accounting [SEEA] allocates GHG emissions based on the residential principle, while the United Nations Framework Convention on Climate Change (UNFCCC) (United Nations, 2016) applies the territorial principle. A comparison of the measurement approaches for emissions according to the residential (SEEA) and territorial (UNFCCC) principles is outlined in Table 1. Emissions generated from internal tourism, according to the territorial principle, are the sum of all emissions by residents and non-residents. According to the residential principle, included are the emissions generated by residents, only (Eurostat, 2015).

Table 1. Measurement of GHG emissions according to the residential (SEEA) and territorial (UNFCCC) principles

Topics	SEEA (residential principle)	UNFCCC (territorial principle)
National territory	<ul style="list-style-type: none"> Emissions are allocated according to the residence of the economic entity generating the emissions 	<ul style="list-style-type: none"> Emissions are allocated by location of their generation
Activity	<ul style="list-style-type: none"> Emissions are allocated according to activity classification 	<ul style="list-style-type: none"> Emissions are allocated according to the technical properties of specific processes (e.g., combustion in power plants)
Special issues	<ul style="list-style-type: none"> Emissions generated in international maritime and air transport are allocated according to the residence of the carrier Emissions generated by private vehicles are allocated according to the residence of the households 	<ul style="list-style-type: none"> Emissions generated in international maritime and air transport are allocated to the country in which the fuel was sold, regardless of the residence of the carrier Emissions generated from fuel in road transport are allocated to the emissions of the country in which the fuel was sold, and not in which the vehicle was driven

Source: adapted from United Nations (2016) and Eurostat (2015)

The key methodological issues from the perspectives of the national economies in which tourism plays an important economic role, while the dominant part of tourism activities are generated by foreign visitors are presented in more details in Table 2. The table compares the economic and the environmental accounts from the perspective of measurement units

(monetary vs non-monetary), scope of tourism products and tourism activities, and production boundaries.

Table 2. Methodological issues and challenges of constructing the TSSA

Issues	Economic accounts (approach in TSA and TSSA) <i>United Nations et al. (2010)</i>	Environmental accounts (approach in TSSA) <i>World Tourism Organization (2018)</i>
Different measurement units	<ul style="list-style-type: none"> • Monetary expression of the measurable and clearly visible economic variables, including: <ul style="list-style-type: none"> • tourism expenditures and internal tourism consumption by products and visitor groups • production and value added of tourism activities by products and services • imports, taxes minus subsidies, retail and transport margins by products and services 	<ul style="list-style-type: none"> • Physical expression of use and supply of individual environmental variables, adjusted to the specific environmental account: <ul style="list-style-type: none"> • water: table of physical units of supply and use of water • energy: table of physical units of supply and use of energy • greenhouse gas emissions: table of physical units of supply of greenhouse gases (emissions) • solid waste: table of physical units of supply (generated) and use of solid waste
Different definition of tourism products and tourism activities	<ul style="list-style-type: none"> • Tourism products and tourism activities as defined by the TSA:RMF 2008 (Table 1), with the extraction of products and activities characteristic for a specific country (e.g., nautical charter, marinas, retail trade, etc.) 	<ul style="list-style-type: none"> • Aggregation of tourism activities as defined by the TSA:RMF 2008 and, extraction of country specific activities (pursuant to the scope of the economic account) • Individual means of transport (personal vehicles and recreational vessels) used for tourism purposes are not separated as generators of greenhouse gases or energy consumers in tourism • Inadequate treatment of commercial accommodation in households, and vacation (second) homes since they are ‘embedded’ in the household sector
Residential vs territorial production boundaries	<ul style="list-style-type: none"> • Application of the residential principle by which production is defined as an activity performed under the supervision, responsibility and management of a domestic individual unit (ESA 2010, Sections 1.57 and 3.07) 	<ul style="list-style-type: none"> • SEEA, and also the methodological framework for the TSSA (World Tourism Organization, 2018) are based on the residential principle • In countries in which tourism is significantly oriented towards inbound tourism, the residential principle excludes the potentially relevant part of greenhouse gas emissions generated by incoming

		(foreign-owned) collective and individual means of transport
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The listed methodological issues and challenges therefore, impose a need to:

- Extract the environmental impacts of commercial accommodation in households, and non-commercial accommodation in vacation (second) homes from the total household sector, in order to separate their impacts from the impacts generated by residential living;
- Extract the impacts of individual means of transport (personal vehicles and recreational vessels) that are used for tourism purposes, as important generators of greenhouse gas emissions;
- Extension of the residential principle applied in the SEEA with the territorial principle (through adding ‘bridging tables/items’), since the residential principle:
 - excludes the potentially relevant part of greenhouse gas emissions generated by foreign mobile collective (airplanes, boats, buses, etc.) and individual (personal vehicles, recreational vessels) means of transport, and
 - generates an imbalance between inbound expenditures (e.g. on fuel, which are taken into account within the TSA) and environmental impacts of inbound tourism (that are out of the scope of SEEA).

Table 3 gives a proposal for structuring the tourism activities, especially from the perspective of combining the residential and territorial approach. In addition, due to the significant changes related to the sharing economy, both commercial and non-commercial accommodation (second homes) are recognized within the household sector. Further, personal vehicles and recreational vessels used for one-day or multi-day tourism trips by, both, residents and non-residents are also visible within the proposed system.

Table 3. Proposed structure of GHG emissions account within TSSA

Activity – Economic account (TSA) (according to United Nations et al., 2010)	Activity– GHG emissions account (according to World Tourism Organization, 2018)	GHG emissions account – proposed activity structure (the emissions of each sector are reported in total and in part generated by tourism)
Accommodation for visitors	Accommodation for visitors	Accommodation for visitors
Food and beverage serving	Food and beverage serving	Food and beverage serving
Railway passenger transport	Passenger transport	Passenger transport <ul style="list-style-type: none"> • Residential carriers • Non-residential carriers (emissions generated by fuel sold in the national territory)
Road passenger transport		
Water passenger transport		
Air passenger transport		
Culture	Culture, sport and recreation	Culture, sport and recreation
Sports and recreational		
Transport equipment rental services	Other tourism activities	Other tourism activities including activities relevant
Travel agencies and other reservation services		

Retail trade of country-specific tourism characteristic goods		for tourism in a specific country
Other country-specific tourism characteristic activities		
Other activities	Other activities	Other activities
	Households	Households <ul style="list-style-type: none"> • Commercial accommodation in households • Non-commercial accommodation in households (second homes) • Residents' personal vehicles and vessels used for tourism purposes • Non-residents' personal vehicles and vessels (emissions generated by fuel sold in the national territory)

Using the implicit form of the bridging table/items, the proposal (Table 3) integrates, both, the residential and territorial approaches, and enables a comparison of the economic and environmental impacts of tourism. However, certain methodological discrepancies appear between the economic and environmental accounts due to the inclusion of the household sector in the environmental account. These issues can be resolved through the following:

- Visitor accommodation activities should be divided to those provided by commercial entities / by companies, and those provided by households (commercial accommodation in households and non-commercial accommodation in second homes) in order to ensure comparability of the economic and environmental contributions of visitor accommodation activities. It should be noted that TSA already recognizes the non-commercial accommodation in second homes as a tourism activity;
- Retail trade, as country specific activity, should be divided into retail trade of motor fuels and lubricants in specialised shops, and other retail trade of tourism characteristic products. This enables linking the economic effects of the retail trade of motor fuels with the environmental impacts of the consumption of motor fuels tied to the tourism use of personal vehicles and recreational vessels (households).

The proposed approach still does not necessarily include all GHG emissions of the internal tourism, since the emissions associated with the use of foreign means of transport are allocated to the country in which the fuel is sold (according to the territorial principle), and not necessarily to the country where the means of transport was used. These are, for example, emissions from the air transport if a plane is not fuelled in the national territory, as well as the emissions from vessels, such as international cruise ships and recreational vessels, and, finally, personal vehicles, particularly those in transit.

Conclusions

The compilation of the Tourism Sustainability Satellite Account (TSSA) enables a consistent and rigorous methodological approach to measure the direct impacts of tourism on, both, the economy and the environment. This provides a quality base for the strategic planning of sustainable tourism, and monitoring of its implementation impacts. Furthermore, TSSA presents a quality base for development of internationally harmonised set of indicators of sustainable tourism, such as the UNWTO *Statistical Framework for Measuring the Sustainability of Tourism*. Therefore, in the future, the TSSA, like the TSA (Regulation (EU) No 692/2011 of the European parliament and of the Council of 6 July 2011 concerning European statistics on tourism and repealing Council Directive 95/57/EC), should be recognised as a relevant and internationally harmonised methodological and analytical tool. Such analytical basis will further boost the tourism statistics development to ensure the consistent assessment of the economic and environmental, but also social and spatial tourism impacts.

The analyses presented in this paper raised many methodological and analytical limitations of the initial TSSA model. From those immanent to the model, such as the focus on direct impacts, to the many methodological issues, such as the treatment of households as generator of tourism activity, or disbalance between the scope of the economic and environmental impacts of inbound tourism. Such unresolved issues can highly impact the relevance of the final TSSA results, particularly for countries with incoming tourism as an important driver of economic activity and growth. This paper presents a feasible approach to tackle some of the key issues pertinent in the current TSSA methodological framework.

In order to ensure the TSSA as an internationally harmonised tool, the first step should be towards overcoming the mentioned methodological issues. That implies raising the level of consistency of the economic and the environmental accounts of tourism activities together with integrating the residential and territorial approaches, as well as implications of the sharing economy. Furthermore, the methodological framework should in future also include sustainability aspects such as land use, state of the ecosystems, tourism management, local population attitudes, education etc. Finally, the overall TSSA system should also include the regional aspect of tourism sustainability and sets a methodological framework for regional tourism sustainability satellite accounts (RTSSA).

However, the adjustments of the TSSA framework depend heavily on the appropriate development of statistical bases at the national, international and EU levels. Some of the existing data sources need to be adjusted to the scope and content of the TSSA (e.g. the supply and use tables), while some new data need to be collected. The development of new primary research should tackle, first of all, the road, air and water passenger transport, but also the different providers of accommodation, and food and beverage services. In addition, due to the strong environmental impacts, new research are also necessary for different aspects of marine tourism, primarily for cruise ship tourism and yachting.

It can be expected that the application of the TSSA will expand in the future to become the core statistical framework of tourism sustainability indicators (UNWTO, 2018), enabling consistent linking of economic and environmental, but also social and spatial dimensions of sustainability.

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