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Using alternative data sources and tools to measure and monitor tourism

OECD

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OECD Tourism Papers

Using alternative data sources and tools to measure and monitor tourism

The rapid succession of recent crises has underscored the need for timely, granular, and comparable tourism data to inform policy and business decisions in a changing world. Traditional methods of collecting tourism data, while valuable, often face challenges such as high costs, slow processes, and declining response rates. Alternative data sources can help enhance tourism measurement and provide a more comprehensive view of tourism dynamics, while data sharing tools can guide and inform effective policy decisions, at national and sub-national level. This paper explores how alternative data sources such as transaction data and mobile positioning data can complement existing statistical approaches to improve the timeliness and granularity of tourism data and fill data gaps. It highlights how data hubs and other data sharing solutions can help promote transparency, collaboration and innovation in the tourism sector. Drawing on recent case studies, it sets out considerations for a path forward for the effective implementation of alternative data sources and tools for tourism.

JEL codes: L83, Z3, Z38
Keywords: tourism, tourism statistics, alternative data sources, tourism measurement, data sharing tools, mobile positioning data, transaction data, tourism data hubs

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It was authorised for publication by Lamia Kamal-Chaoui, Director, Centre for Entrepreneurship, SMEs, Regions and Cities, OECD.

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Acknowledgements

This paper on Using alternative data sources and tools to measure tourism was produced by the OECD Centre for Entrepreneurship, SMEs, Regions and Cities (CFE), led by Director Lamia Kamal-Chaoui, as part of the Programme of Work of the OECD Tourism Committee. It examines opportunities and approaches for using new data sources and tools to complement existing statistical approaches, improve the timeliness and granularity of tourism data, and fill data gaps and considers the statistical and decision-making processes required to identify and classify tourism within new datasets.

The paper was co-ordinated and drafted by Julie Reimann, Economist (CFE), under the supervision of Jane Stacey, Head of the Tourism Policy and Analysis Unit (CFE). Monserrat Fonbonnat, Assistant (CFE) provided administrative support and Jack Waters (CFE) prepared the paper for publication.

The paper builds on country inputs to collate and share experiences and use cases of alternative data sources and tools to improve the tourism evidence base. In particular, it draws on 18 case studies prepared and submitted by volunteer countries: Australia, Austria, Canada, Finland, Germany, Korea, Latvia, Lithuania, Netherlands, New Zealand, Portugal, Saudi Arabia, Slovenia, Spain, Sweden, Switzerland and Türkiye. The case studies can be accessed from Annex A. The paper benefitted from contributions, feedback and guidance from policy makers and statisticians from OECD member and partner countries. It also benefitted from feedback from OECD colleagues in the Centre for Entrepreneurship, SMEs, Regions and Cities.

Executive Summary

Reliable tourism measurement, data, statistics and sharing of relevant data are key to support evidence-based decision-making and help guide effective policy decisions, at national and sub-national level. Traditional methods of collecting tourism data, while valuable, often face challenges such as high costs, slow processes, and declining response rates. Meanwhile the rapid succession of recent crises has underscored the need for timely, granular, and comparable data to inform policy and business decisions in a rapidly changing world.

Many of the limitations currently associated with traditional tourism statistics can be addressed by using alternative data sources. Combining traditional and alternative data allows for a more comprehensive view of tourism dynamics, informing strategic decision-making for sustainable tourism development. Advanced analytics and AI tools can further complement these efforts with the potential for lower costs related to decision-making and prediction and opportunities.

Alternative data sources and data sharing tools can help enhance tourism measurement and decision-making. Notwithstanding some challenges, for example, with respect to representativeness, mobile positioning data can offer very granular insights into visitor flows and travel patterns, while transaction data, derived from card payments, can provide robust and timely estimates of tourism spend. Further, the development of data hubs and platforms for sharing tourism data, can facilitate the integration and dissemination of diverse data sources, promoting transparency, collaboration, and innovation within the tourism sector.

Key opportunities presented by alternative data sources include:

- **Timeliness and granularity**: Providing more timely and detailed data, allowing for more timely policy responses and improved understanding of seasonal impacts and visitor habits, for example. Tourists can also benefit from real-time data to help plan their travel.
- **Potential cost savings**: Reducing costs associated with traditional survey methods, including response burdens.
- **Wider coverage**: Offering broader coverage of tourism activities, including those not captured by traditional methods.

Several challenges exist when working with alternative data sources and ways to share tourism data:

- In contrast to tourism surveys and traditional tourism statistics, alternative data sources are not created specifically for tourism measurement, which results in **unstructured data** from a tourism perspective.
- **Data quality** is an issue as the data can under- and over-represent segments of the population, for example, with mobile positioning data capturing also the resident numbers, and transaction data not including cash spent by tourists.
- **Access** is a key issue for using alternative data sources, as these are rarely owned or generated by national statistical bodies and are instead generated by private companies.
- **Significant resources and costs** are often required to work with alternative data and tools to share tourism information. A significant up-front investment is typically required to set up a data hub or to acquire new data, while on-going maintenance also can necessitate substantial

resources. Securing funding in the long term is important for the sustainability, stability and continuity of the data hub over time.

To support decision makers, data not only need to be available, they also need to **reach the decision makers and end users**. Countries are exploring how to share tourism data through data hubs and other solutions to promote transparency, collaboration and innovation, and to strengthen evidence-based decision-making. The tools do not necessarily need to depend solely on alternative data sources to be effective. Providing easy and intuitive access to existing datasets can offer significant value to tourism stakeholders. By integrating different types of data and making them accessible through user-friendly interfaces, these tools can provide a more comprehensive and holistic overview of the tourism landscape, thereby supporting informed decision-making and strategic planning.

Against this background, the following considerations are identified to set out a path forward for the effective implementation of alternative data and tools for tourism:

- **Leverage peer learning and collaboration** to accelerate progress, avoid pitfalls, and identify innovative solutions, helping to reducing the time and cost required to work with new types of data.
- **Develop commonly agreed definitions and approaches** to structuring and using alternative data sources in a standardised way to support comparability and collaboration.
- **Strike a balance between leveraging collective expertise and addressing local nuances**, as each country and destination faces unique challenges and priorities that influence their needs.
- **Build capacity** to meet the growing demand for skilled professionals capable of navigating complex data landscapes and interpreting analytical insights to support tourism decision-making.
- **Leverage legislative measures** to help secure access to alternative data sources and mitigate some of the risks associated with working with privately held data.
- **Explore options to secure sufficient resourcing** to develop and maintain data hubs and to work with new sources of data to improve tourism measurement.
- **Strengthen co-operation between policy makers and the experts in tourism measurement** to support evidence-based decision-making.
- **Move beyond data, translating it into usable insights** that resonate with diverse audiences, including policy makers and industry stakeholders.
- **Explore how international organisations can play a role in streamlining data acquisition** processes, as well as the development and management of data hubs, for countries.

Using alternative data sources and tools to measure tourism

Reliable tourism measurement, data and statistics are important to guide effective policy decisions. As tourism is a complex, service-based sector built on the movement of people, including very high shares of non-resident households, it is difficult to measure. Official statistics collected regularly through structured statistical process remain the gold standard for decision-making. However, such approaches are often slow, expensive and reliant on high levels of aggregation. In many countries, response rates to survey methods are typically declining due to survey fatigue, and these are exacerbated by increasing costs and reducing effectiveness. Meanwhile, the rapid succession of recent crises has highlighted the importance of having timely, granular and comparable data to effectively inform policy and business decisions in a rapidly changing world (OECD, 2024[1]).

Several of the limitations currently associated with traditional tourism statistics can be addressed by using alternative data sources. Alternative data are any data that are obtained from outside traditional sources, including both public and private data. These data sources can complement official tourism statistics, offering a broad perspective on trends and improving the timeliness and granularity of existing data. A wide range of data sources exist, each with their own opportunities and challenges. For tourism, examples range from private data on credit card transaction data to public administrative data.

New sources of data can complement traditional methods by improving the timeliness and granularity of existing tourism data, filling gaps, and reducing the burden on survey respondents, both at national and regional level. Combining traditional and alternative data, while evaluating the context and purpose of data and its ability to measure priority policy issues, can help enable data efforts are both meaningful and effective.

Alternative data sources can open up new possibilities within tourism measurement, offering a strong potential to inform strategic decision-making processes for the effective management of tourism. By incorporating insights derived from advanced analytics and real-time data streams, policy makers can gain a deeper understanding of tourism dynamics, supporting them to identify emerging trends, anticipate future challenges, and capitalise on opportunities for sustainable tourism development. These data sources can allow policy makers to tailor interventions and policies to address the specific needs and characteristics of different destinations for targeted and effective policy responses.

Artificial Intelligence (AI) is emerging as a transformative force in statistical analysis and offers significant potential to improve the collection, analysis and application of tourism data. AI can bridge the gap between traditional statistics and big data, facilitating the analysis of unstructured data and offering the potential for lower costs related to decision-making and prediction. With the opportunities for analysing large volumes of data, AI offers the potential to support informed decision-making by building a more substantial evidence base (OECD, 2024[2]).

While alternative data sources offer opportunities to enhance tourism measurement, they need to be used with caution. It is important to evaluate the context and purpose of data and their ability to measure priority policy issues, exercising judgement and assessing the relevance and accuracy. Many aspects of tourism,

particularly those requiring detailed demographic or behavioural insights, will continue to rely on traditional sources such as surveys.

It is important for tourism data to reach decision makers and end users. Sharing tourism data through accessible platforms can help end users, including policy makers, businesses and the public, make informed decisions based on the most current and relevant information available. Tools to share tourism data can enable the combination and integration of different types of data, which can provide a more complete overview of the tourism landscape.

It is in this context that this paper examines the potential for alternative data sources and data sharing initiatives to strengthen tourism data collection, analysis and application, building on previous efforts and existing initiatives. This paper shares recent developments, exploring concrete use cases for alternative data sources to strengthen tourism measurement and for data sharing initiatives to disseminate tourism data. It builds on and contributes to wider OECD work under the OECD Smart Data Strategy (OECD, 2025[3]) to strengthen official statistics and the wider data infrastructure, including through the integration of alternative data sources and data sharing on a wide range of topics such as the OECD Data Explorer and other platforms (OECD, 2025[4]).

Using alternative data to strengthen and complement official tourism statistics

Alternative data sources offer potential to support the creation of official tourism statistics, within the frame of the International Recommendations for Tourism Statistics, Tourism Satellite Account: Recommended Methodological Framework (TSA:RMF) and Statistical Framework for Measuring the Sustainability of Tourism (SF-MST) (United Nations, 2008[5]; UN Statistics Division, Eurostat, OECD, 2008[6]; UN Tourism, 2024[7]) and as a complement to official tourism statistics. As the structure and contents of alternative data sources do not always align with official guidelines for tourism statistics, the most significant opportunities likely exist in using alternative data sources to strengthen and complement official tourism statistics, rather than to replace them. The following sections in this paper include examples of both use cases.

Previous work on this topic has focused on how to use big data for tourism statistics, including an overview of different sources of big data and their potential relevance in compiling tourism statistics (Eurostat, 2017[8]), and an analysis of the relationship between big data and statistical frameworks to measure the economic, social and environmental impact of tourism (UN Tourism, 2021[9]). Meanwhile, the importance of co-ordination to develop new data sources and applications within tourism measurement was highlighted at the Global Forum on Tourism Statistics, Knowledge and Policies hosted by Korea in 2021 (OECD, 2021[10]).

Multiple initiatives are underway with the purpose of improving tourism data collection, analysis and application, including through the integration of alternative data sources and tools as evidenced in the case studies (see Annex A), and the recent Workshop on Tourism Data Sharing, Governance and Integration co-organised by the OECD and the European Commission (European Commission and OECD, forthcoming[11]). Countries are also pursuing knowledge sharing, for example through the “travel workshop” at European level, an interest group of representatives from national banks and national statistical institutes working on how to make best use of transaction data in tourism statistics and for calculating the balance of payments item for travel. Strengthening tourism statistics is a priority under the Council of the European Union’s Agenda for Tourism 2030 and the EU Transition Pathway for Tourism (Council of the European Union, 2022[12]; European Commission, 2022[13]).

Efforts on alternative data sources and tools within tourism have moved beyond experimentation to implementation. Eurostat collects and publishes data from four collaborative economy platforms to better understand the short stay accommodation sector (Eurostat, 2024[14]). The UN Tourism Data Dashboard provides statistics and insights on key indicators for tourism at the global, regional and national levels (UN

Tourism, 2024[15]). The OECD calculates and publishes estimates for carbon dioxide emissions from commercial passenger, freight and general aviation flights, with allocations across countries following both the territory and the residence principle (OECD, 2025[16]; Clarke, 2022[17]). Countries are also publishing experimental statistics based on alternative data on a regular and ongoing basis.

The data sources and methods most commonly being explored and used by countries for tourism measurement include (see Table 1 for an overview):

- **Transaction data**: includes spend data from card companies, acquirers and national banks.
- **Geospatial data**: includes mobile positioning data from one or more mobile network operators and data from satellite tracking units.
- **Web scraping**: includes scraping data on social media platforms, price comparison portals and other online platforms.
- **Platform data**: includes experimental statistics on online platforms intermediating accommodation services (Eurostat, 2024[14]).
- **Administrative data**: existing administrative sources that are put to new use within tourism, for example existing employment data.
- **Flight data**: includes arrivals, departures and passenger counts, ticket prices and flight capacity.
- **Other data sources**: for example web scraping, Google search data trends, national rail data, and data duty-free purchases.

OECD Member and Partner countries are implementing and investigating alternative data sources for tourism purposes through a range of approaches, with different intended outcomes, and are at different stages of exploration and implementation, covering everything from proof of concept and data acquisition to data experimentation and successful implementation. The country case studies (see Annex A) illustrate in detail some of the ways in which countries are using alternative data sources.

The two most common alternative data sources being used to strengthen tourism measurement are mobile positioning data and transaction data. Mobile positioning data are being used by countries to measure outbound departures, inbound visitors, domestic tourism, and all visitors (domestic and inbound). Transaction data are being used to estimate or distribute outbound tourism spend, inbound tourism spend, and total tourism spend. The key learnings and challenges from working with these two sources, as well as from working with existing accommodation data, duty-free purchases, employment data, transport data, and satellite data will be covered in more detail later in the paper.

The wide range of data and experimentation highlights the breadth of possibilities that exist when working with alternative data sources, and the relevance of this paper in sharing key lessons learnt from data experimentation. However, it also illustrates a challenge, namely drawing learnings and conclusions that apply across different data sources, purposes, and levels of progress. The following sections will discuss the opportunities and challenges associated with alternative data sources for tourism measurement in more detail.

Table 1. A wealth of alternative data sources and methods are being explored and used for tourism

Overview of alternative data sources currently being explored

Country	Transaction	Geospatial	Web scraping	Platform	Administrative	Flight data	Other
Australia	✓	✓		✓		✓	✓
Brazil							✓
Canada	✓	✓			✓	✓	✓
Chile		✓			✓		✓
Colombia	✓		✓			✓	✓
Costa Rica		✓	✓	✓		✓	✓
Croatia				✓			
Czechia		✓	✓	✓			
Denmark	✓	✓	✓	✓		✓	
Finland	✓	✓					✓
Hungary	✓	✓	✓			✓	✓
Iceland	✓		✓	✓		✓	✓
Ireland		✓			✓		✓
Italy	✓	✓	✓	✓	✓		✓
Korea	✓	✓	✓		✓		✓
Latvia	✓		✓				
Lithuania	✓	✓					
Malta				✓	✓		
Mexico	✓		✓				
Netherlands	✓	✓					
New Zealand	✓	✓	✓		✓		✓
Peru					✓	✓	✓
Poland	✓	✓	✓				
Portugal	✓	✓		✓	✓	✓	✓
Saudi Arabia	✓	✓		✓	✓		✓
Slovenia	✓	✓	✓	✓	✓		✓
Spain	✓	✓	✓	✓			
Sweden	✓	✓					
Switzerland	✓						✓
Türkiye	✓				✓		
United Kingdom	✓	✓	✓	✓			✓
United States							✓

Source: OECD Member and Partner country survey and country comments.

Opportunities for using alternative data sources for tourism measurement

More **timely and granular data** can help countries to better understand the seasonal impacts of tourism and the habits of visitors based on the country of origin. Increased geographic granularity allows countries and destinations to better understand the travel patterns and most visited locations, which many countries cited as a primary reason for exploring alternative data sources. In Spain, using transaction data as an

additional source supports the monthly reporting of outbound tourism expenditure data for 120 countries, instead of 5 countries quarterly using traditional sources. Increased timeliness, compared to traditional statistics, also allows policy makers and stakeholders to respond more swiftly to changes in tourism patterns. Although not the focus of this paper, tourists can also benefit from real-time data to help plan their travel, for example for changes in travel, response to changing weather and traffic, and for local events and attractions.

Although generally costly to acquire, alternative (commercial) data sources can over the long term lead to **cost savings** and overcome challenges related to falling response rates. Australia reports a cost saving of 45% by using mobile positioning data as a complementary source for domestic tourism statistics, while Sweden reports an overall reduction in costs by using transaction data as a complementary source to produce their Tourism Satellite Account (TSA).

Alternative data sources can provide a **wider coverage** than traditional data sources. For example, mobile positioning data can cover all inbound visitors rather than just those choosing traditional accommodation, and can therefore be used not only for tourism planning but also considering all the services for the inbound visitors, providing a broader overview.

Other opportunities include an **increased reliability** due to the larger sample size and the data showing **actual rather than stated or recalled behaviour**.

Challenges associated with using alternative data sources for tourism measurement

Alternative data sources also present challenges for tourism practitioners, especially in the production of official statistics where national and international statistical standards must be followed. Although statistics can be published as experimental, statistical bodies are responsible for the integrity and independence of their data. These challenges need to be addressed for the alternative data sources to reach their full potential within tourism measurement.

In contrast to tourism surveys and traditional tourism statistics, alternative data sources are not created specifically for tourism measurement, which results in **unstructured** data from a tourism perspective. To answer tourism-specific questions, data need to be modified and analysed which brings several methodological challenges:

- **Identifying tourists**: without tourism-specific data, ‘tourists’ are not readily identifiable in the data. Mobile positioning data contain information on all cell-phone users regardless of their purpose of visit or whether they are resident or not. This creates challenges for measuring and identifying domestic, inbound, and outbound tourism. Some private data providers use micro-data to identify tourists based on usage patterns, but these rules can be complex and the output difficult to validate.
- **Representativeness**: alternative data sources can under- and over-represent segments of the population. Transaction data typically exclude other forms of spending such as cash and direct debits. Moreover, transactions conducted via digital platforms resident abroad but providing services in the visited economy can also be difficult to capture. Understanding these biases and having the means to address them, such as complementing with other data sources, is important to mainstreaming their use.
- **Lack of sociodemographic information**: in addition to lacking information about the purpose of visit, the alternative data sources typically lack, or cannot share, information about sociodemographic factors that can be relevant for making more informed decisions, such as age, gender, education, and income. To understand these factors, traditional survey methods are still needed.

Access is a key issue for using alternative data sources to strengthen and complement tourism data. Many alternative data sources are not owned or generated by national statistical bodies or individual organisations and are instead generated by private companies:

- **Privately held data**: data protection legislation, costs of storage, and data-specific knowledge mean the privately held microdata are typically aggregated by the private companies before being shared with statistical bodies. Identifying tourists from usage patterns is usually also done by the private company, which can complicate the ability to reproduce statistics.
- **Sustainability of data**: as data are not owned by the statistical bodies, concerns of how to ensure the continued access to, and availability of, the data exist. The risk of a sudden price increase, or changes in the terms of access, can make statistical bodies hesitant to rely too heavily on these data sources. However, there is potential to consider legislating for access.
- **Missing data:** data protection and privacy regulations can restrict the level of granularity that data can be reported at, despite the data being available. This is often the case for remote, sparsely populated areas. However, this is likely even a greater challenge for conventional data sources where the sample size is typically even smaller.
- **Opaque overview of the market**: It can be challenging to understand how the market for the data operates, the different data types and products that can be acquired, and how prices and products between companies differ.

Significant **resources** are required to acquire, analyse, and integrate new data sources, particularly in the beginning of a project. A significant up-front investment is typically required to work with new data, while on-going maintenance also can necessitate substantial resources:

- **Costs**: the cost per data point for new data sources typically is relatively low, but acquiring new data can require a significant investment, especially if purchasing data from private companies. It may also be necessary to hire new employees or provide training for existing employees, further adding to the costs.
- **Skills and education**: data producers may need new skills to understand, manage and analyse the new data sources, while users may need education to correctly interpret the data, including understanding its limitations.
- **Time**: getting access to new data sources and managing issues related to the unstructured nature can require a significant amount of time. This includes understanding the structure and contents of the new data, setting new methodological standards and adhering to data protection legislation. This can be particularly intense in the initial phases of a project.

There is also a need to consider that changing a data source or methodology can cause a break in statistical series, although the impact can be minimised if in at least one (link) year the original and new source are collected. Staying on top of developments in an ever-changing market and keeping track of the different data sources available can be challenging, while some new data sources may have only a limited scope. Finally, some countries are hesitant to work with data sources held by private companies because of risks of changes in the methodology or coverage of the data, including changes that are not communicated.

Considerations for working with alternative data sources for tourism purposes

When using a new source of data for tourism purposes, it is important to have **close collaboration with the organisation or company that owns the data**. Significant technical skills, data-specific expertise, time and resources are required to develop models that identify tourists from usage patterns. As it is rare to share micro-data, such models are typically made by the private companies themselves, which can make it difficult for the statistical bodies to validate the tourism estimates. Close collaboration can help

build trust between the stakeholders and in the quality and validity of the estimates, as data issues and concerns can easily be raised, discussed and addressed.

Maintaining **public trust and trust in data is important**, as sources like mobile positioning and transaction data, despite being aggregated, can raise privacy concerns among the public. People are increasingly aware of, and sensitive to, how their personal data are collected, stored and used. While these data sources provide valuable insights and can significantly enhance the accuracy and relevance of statistical analysis, the perception of privacy invasion can lead to public apprehension and resistance. The issue goes beyond legal compliance; it is about securing public acceptance and trust. Clear and transparent communication reassures the public that their data are handled responsibly, which can help secure continued confidence in statistical bodies.

As no single new data source contains information on all variables of interest for tourism measurement, such as arrivals, spend, demographics, and reason for visit, **combining complementary sources can provide additional value**. By leveraging the strengths of both new and traditional data sources, statistical bodies can benefit from the relative strength of each dataset while minimising the issues and uncertainties related to the data, enabling more detailed and robust conclusions. Most of the case studies on new data sources combine the data with at least one other, typically traditional, source.

When working with new sources of data, it is relevant to develop new methodologies and ways of working. This will help address the data challenges, and to reach their full potential within tourism statistics. The following sections provide more details of the concrete challenges, as well as potential solutions, associated with specific alternative data sources.

Estimating tourism spend with transaction data

Transaction data refer to spend data based on card transactions. Every transaction carried out with credit or debit card is stored, with information regarding the time of payment, amount spent, where the merchant that sold the product is located, and the card used for the payment. This provides a large amount of detailed information regarding card purchases within a given geographical area. The data can be used both to investigate inbound tourism spend, outbound tourism spend, domestic tourism spend, or a combination of these. Box 1 provides an overview of the comment common terms relevant for understanding and working with transaction data.

Box 1. Transaction data: relevant terminology

Acquirer: A financial institution that allows merchants to accept card payments (merchant's financial institution).

Issuer: A financial institution that issues bank cards for customers (cardholder's financial institution).

Merchant Category Code: A four-digit number assigned to describe a merchant's primary business based on annual sales volume measured in local currency.

Source: (Marqeta, 2024[18]), (Visa, 2024[19])

The potential for transaction data to improve tourism expenditure estimates is highlighted by the number of countries experimenting and working with these data sets, see Box 2 for an overview of selected country examples. The main strength is that transaction data can be disaggregated by different regions, time periods and types of spend, which can enable the estimation of tourism expenditure at a similar level of detail. This is especially useful as it can help overcome the issues of low response rates and self-reporting

bias in surveys. In the case of strong correlation between traditional data sources, such as statistics on overnight stays, and the transaction data, the validity of using transaction data as a complementary source of tourism data is strengthened.

Box 2. Using transaction data to estimate tourism spend – selected country examples

Austria combines aggregate payment data from the Austrian National Bank with data from traditional tourism surveys to estimate touristic accommodation expenditure of Austrian residents abroad.

New Zealand publishes data on Tourism Electronic Card Transactions to understand tourism spend activity. The data include both domestic and international tourism spend, split by region and industry. The series was originally created as an interim replacement for Monthly Regional Tourism Estimates which was disrupted by COVID-19 (MBIE, 2024[20]).

Slovenia aims to combine mobile positioning data with transaction data to estimate inbound tourism spend. A key takeaway from a workshop organised by the OECD and funded by the EU Technical Support Instrument to support this work was the importance of continued exchange of experiences through peer learning.

Spain estimates the tourism expenditure of Spanish residents abroad by using transaction data to distribute the total tourism expenditure captured by their tourism survey. The complementing data sources allows Spain to provide estimates for 120 countries compared to five previously. Spain also uses transaction data to estimate the inbound tourism expenditure in Spain.

Türkiye combines transaction data with traditional statistics to improve the geographic granularity of tourism income, with transaction data simultaneously enabling faster and more cost-effective analysis.

Sweden uses data from the card companies Visa and Mastercard, and the acquirer Nets, in combination with traditional sources, to create regional (sub-national) TSAs.

United Kingdom publishes data on cardholder spending on categories associated with tourist activity, including domestic tourism and international tourism based on aggregated and anonymised data provided by Visa Europe Limited. These statistics are labelled as “official statistics in development” (Office for National Statistics, 2024[21]).

Korea, Portugal and Saudi Arabia also present transaction data as part of their respective data hubs.

Due to the technical nature of this topic, and the limited resources available on the application of transaction data specifically within a tourism context, the learnings in this section are primarily built on the learnings from the country case studies.

Transaction data are generally acquired directly from card issuers and/or acquirers, often at a cost. The data are aggregated and anonymised by the card issuer and/or acquirer to adhere to data protection regulation. National Statistical Offices (NSOs) in some EU countries can obtain aggregated transaction data directly from the national central bank, as EU Regulation 2020/2011 makes it mandatory for central banks to compile cross-border card-based transactions via payment service providers (European Central Bank, 2020[22]). Accessing data though the central bank can significantly reduce the costs of accessing the data for the statistical bodies, but also limits the ability to tailor the data, which the issuers and acquirers can do for a fee, as central banks only have access to aggregated data.

Transaction data do not include non-card payments (such as cash and direct debits) and using this alone could provide incorrect totals for tourism spend and erroneous conclusions about the relative importance of different source markets. Austria and Spain use transaction data to split the total tourism spend into more granular details including nationality, region and time. However, this still necessitates the

collection of tourism expenditure from other (traditional) data sources, such as survey data. Alternatively, Sweden estimates total non-card spend as a share of all transactions, and then extrapolates the card expenditure accordingly. However, this also adds some uncertainty to the estimates. Türkiye uses a hybrid calculation, where the transaction data are used as the total tourism spend for countries where the value from traditional sources is below that of the transaction data.

It can be difficult to decipher the time and location of tourism spend through transaction data. Tourism is a large expenditure item, where several elements like accommodation and flights require pre-payments, often well in advance of the trip, sometimes to a managing company or head office in the case of multi-national corporation. The country where the transaction took place can be distorted, for example in the case of online booking platforms, where a service may be purchased by a tourist for a visit to a country, but the transaction location may be recorded in the country of the booking platform headquarters (which may differ from the country the tourist is visiting). These issues make it difficult to correctly allocate online tourism spend to the right time of the year and the right country, potentially leading to misleading conclusions regarding the tourism spend.

Using only face-to-face transactions can be a way to alleviate the biases concerning online spend, although this reduces the absolute payment value investigated. This data can then be used to improve the granularity of existing tourism statistics. Alternatively, online transactions can be investigated on an ad-hoc basis. In the Swedish case, the total spend has been calculated using alternative sources for product categories where online tourism purchases are more prevalent, such as accommodation and train tickets. In other product groups, such as restaurants, groceries and fuel, online tourism spend is assumed to be zero.

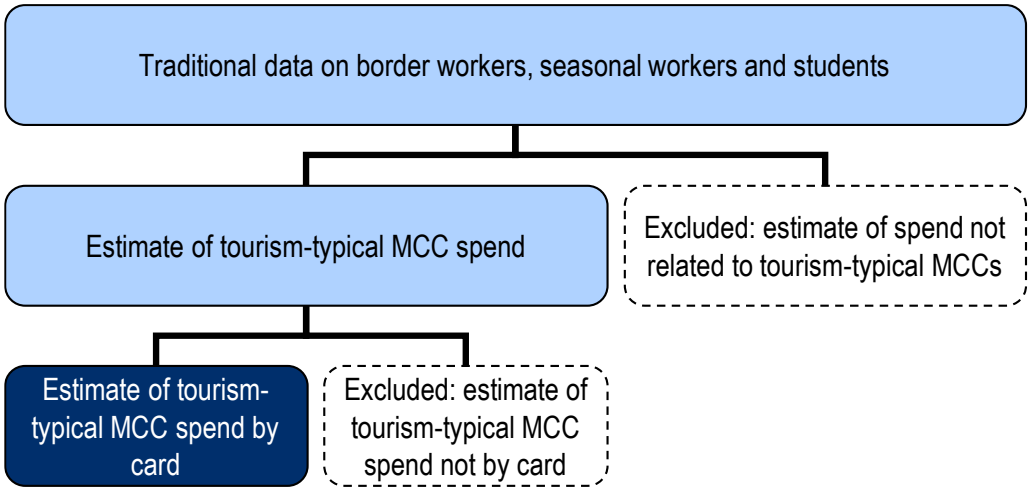
Itemising transactions is a key step to **identify what tourists spend their money on**. Businesses are categorised by merchant code category (MCC), corresponding to the main type of good or service they provide. This MCC is recorded and stored with every transaction and allows spend to be itemised accordingly. Similar to ISIC and NACE codes, identifying the MCCs that correspond to tourism expenditure (for example accommodation, restaurants, tour services, and other categories following the International Recommendations for Tourism Statistics 2008) can help to estimate tourism-related transactions. Creating a concordance between the MCCs and existing industry codes can help to create a bridge between this new data source and traditional tourism statistics, providing scope for more detailed product breakdowns. The Austrian case study contains the full list of the touristic MCC set used.

Transaction data can provide information about where the card was issued, and where the purchase was conducted (within the limitations mentioned above). However, it **does not contain information on the purpose of travel**. Therefore, the tourism-typical MCC data can still contain non-tourism expenditure, including spend from residents, border workers, seasonal workers and students. This is a challenge when estimating both domestic tourism, inbound tourism and outbound tourism. For example, in border regions with frequent cross-border commuting, including all transactions conducted with international cards as inbound tourism spend could lead to an erroneously high estimate of inbound tourism spend, potentially resulting in misleading conclusions about the economic impact of tourism.

Transaction data can be combined with complementary sources to remove the non-tourism spend from the tourism-typical MCC data, or to add tourism spend that is not included in the transaction data. Austria took a multi-phased approach to exclude spend by border workers, seasonal workers and students from the tourism-typical MCC estimates. First, spend on tourism-typical MCCs was estimated as a share of total spend using the transaction data. This ratio was applied to Austria's traditional data on spend by border workers, seasonal workers and students to understand the total spend on these categories by this cohort. Second, an estimate of the share of card expenditure for this cohort was applied to filter out cash and other payment methods. The remaining expenditure represented card spend within tourism-typical MCCs by border workers, seasonal workers and students, see Figure 1. This estimate could then be

removed from the tourism-typical MCC transaction data, resulting in tourism card expenditure by Austrian residents abroad.

Figure 1. Using traditional sources to estimate non-tourism card spend in Austria



Tourists can be identified from their card usage patterns. Sweden estimates domestic tourism by using models based on historical transaction data spending patterns to estimate cardholders' usual environment. Similarly, Türkiye uses historical card spend to exclude non-tourists from their inbound card spend. Internationally issued cards that are used at least five times per month for a period of more than 6 months are classified as residents, and their expenditure is thus excluded from the tourism revenue. For both Sweden and Türkiye, these calculations are undertaken by the data providers, which means that the confidential micro data remains with the data owners. It requires strong and close collaboration between the statistical bodies and the data provider to develop models that are relevant for tourism measurement.

The data can be used to improve the granularity for existing statistics. Spain uses transaction data to geographically distribute the total outbound tourism expenditure from its Resident Travel Survey, creating a statistical product that is consistent with official statistics. This method implicitly assumes that Spanish tourists travelling abroad are equally likely to use their cards across destinations.

Estimating visitor numbers and flows with mobile positioning data

Mobile positioning data are based on mobile phones' contact with cell towers. To ensure a constant connection, each mobile device connects with a cell tower multiple times every minute, providing a large amount of detailed (anonymised) information regarding visitors and visitor movements within a given geographical area over time.

The importance and potential of using mobile positioning data for tourism is highlighted by the number of countries experimenting or using this data, see Box 3 for an overview of selected country examples. The granularity, frequency and timeliness are the main opportunities of using mobile positioning data to strengthen tourism statistics, creating the possibility of detailed, up to date information about visitor flows. The timeliness of the data supports more informed and timely policy responses, particularly useful for times of crises, while the granularity allows for more detailed analyses of same-day trips and the development in tourism numbers throughout the day.

Box 3. Using mobile positioning data to estimate visitor flows – selected country examples

Australia uses mobile positioning data to increase the timeliness and granularity of its Domestic Visitor Survey. This is a response to increasing costs and falling response rates for traditional surveys which resulted in collection mode bias, as higher income households are relatively more likely to participate in telephone surveys compared to other households.

Estonia uses mobile network operator data to produce tourism statistics, including inbound and outbound travel. The Estonian central bank, Eesti Pank, collects monthly MNO data, while a private company, Positum, conducts the data processing and analysis. The central bank validates the data using other data sources, including credit and debit card payments, airport statistics, household surveys for inbound travel, and accommodation statistics (Positium, 2022[23]).

Finland: Statistics Finland has tested MNO data and found that its use seemed especially relevant to analyse seasonal fluctuations and trends (Nordic Innovation, n.d.[24]).

Indonesia uses mobile positioning data to supplement its official surveys to fill data gaps for international arrivals, domestic tourism, and outbound travel. Statistics Indonesia entered a commercial relationship with Positium. Utilising mobile positioning data was challenging, but it has provided more accurate, detailed and frequent data, which has had a positive impact on business performance (OECD, 2022[25]).

Lithuania has produced three dashboards with statistical indicators that describe the mobility patterns of inbound travellers in Lithuania. The indicators include monthly visitor numbers by country and country of origin, daily number of visitors, and number of visitors at specific locations.

Saudi Arabia uses mobile positioning data to measure domestic tourism, considering both same-day and overnight stays, collecting detailed information on the visited destinations, encompassing both main and secondary visits.

Slovenia publishes mobile positioning data from the major Mobile Network Operators in Slovenia as an experimental statistic. The purpose of the experimental publication is to complement existing statistics on visitor numbers to evaluate tourist flows in Slovenia in more detail.

Spain receives information from the three largest mobile phone operators in the country, and from that publishes experimental statistics on domestic, inbound, and outbound tourism. The short-term goal is to provide timely estimates that can serve as a complement to traditional statistics (National Statistics Institute (INE), 2022[26]).

Due to the technical nature of this topic, and the limited resources available on the application of mobile positioning data specifically within a tourism context, the learnings in this section a primarily built on the learnings from the country case studies.

Mobile positioning data can be obtained directly from mobile network operators, often for a fee. Although rare, cost-free data sharing agreements exist too. For example, in Slovenia, the Agency for Communication Networks and Services (AKOS) collects aggregated mobile positioning data from the major mobile network operators (MNOs) in Slovenia, aggregates the data and shares it free of charge with the NSO and Bank of Slovenia. The legal framework for this agreement is under the Slovenian Annual Programme of Statistical Surveys and the Slovenian National Statistics Act (Statistical Office of the Republic of Slovenia, 2024[27]).

Identifying tourists can be an important challenge when using mobile positioning data. As the purpose of the visit remains unknown, it is difficult to draw inferences about tourism behaviour specifically.[1] Tourists can be approximated from the data based on the length of connection and usage patterns. As these

calculations are done by the mobile network operators, and not the tourism practitioners, the confidential micro data remain with the data owners. It requires strong and close collaboration between the tourism practitioners and data provider(s) to develop and maintain models that are valid and relevant for tourism measurement. In Slovenia, the duration of the data sessions established between users' mobile devices and their respective operator over a two-day period is used to classify users as either tourists, same-day visitors, half-day visitors or transit passengers. To measure domestic tourism in Australia, the home location is identified based on overnight hours over a 90-day rolling period, and follows the definition in the Tourism Research Australia domestic survey. To be an overnight tripper, the device needs to travel greater than 40km from home with a stay of at least one night away. Daytrips are defined as travelling at least 25km from the home location, with a duration of at least 4 hours and no overnight stays. For both definitions, routine travel for work and study (one or more days per week) is excluded, taking into account nightshift work such as airports and emergency services.

Estimating the total number of tourists or visitors using mobile positioning data can be a challenge. If purchasing/acquiring data from a single MNO, the data will not cover the entire market. It is possible, however, to extrapolate the total number of visitors, given data from one MNO and its market shares. However, while well-designed traditional surveys use random sampling allocations to represent the population, administrative data sources are structured differently. Despite its significant sample size, the mobile positioning data are a census of a commercial customer base and has not been designed to be representative of the broader population, particularly if, for measures of domestic tourism, there is some price differentiation around the various providers or if some providers are more prevalent in specific regions of the country (e.g. rural, urban, remote). Similarly, a commercial customer base may also change over time, for example, in terms of demographics, i.e., in terms the provider's appeal to different age groups. To examine this bias, Australia has tracked travel propensity by mobile network operator since 2014 through the National Visitor Survey. Despite a large sample for each mobile network operator, they found that the propensity to travel varied greatly across the operators. Australia plans therefore to include some form of monitoring in the use of mobile positioning data and, where necessary, adjustment for biases in the customer base.

Sense-checking the data and methodology continuously is important for consistency and to minimise any biases. It is worth noting that challenges remain even if mobile positioning data are obtained from all the largest mobile network operators in a country. Although Slovenia's data cover all major operators, the data are not completely suitable for absolute estimates, as the numbers potentially overestimate (for example, the data may include non-tourist mobile devices, and some travellers may use more than one device) or underestimate (some travellers may not have an active mobile device, meaning they will not be included in the data) the total number of tourists. The focus therefore is on monitoring changes in tourist flows.

Strengthening tourism statistics with other alternative data sources

Countries are exploring a wide range of additional sources to strengthen tourism measurement, including using accommodation data from digital intermediation platforms, duty-free purchases, employment data, transport data, and satellite data.

Using existing platform data on accommodation for more timely information

Existing data from platforms intermediating **accommodation services** has the potential to increase the timeliness of tourism statistics. Launched in 2024 and using existing data from eTurizem, a system in Slovenia for reporting information about tourists and their overnight stays for administrative and statistical purposes, Slovenia's experimental interactive dashboard "Tourism Daily" publishes daily data on tourist arrivals and overnight stays for the current year with a three-day delay, thereby providing a timely indication

of changing tourism performance compared to the final official data, which is published 25 days after the reference month (Statistical Office of the Republic of Slovenia, 2024[28]).

The data in Tourism Daily are published as experimental, as they do not follow the same methodology as the official monthly statistics. The eTurizem system allows data reporters to change and edit the data on accommodation establishments and guests after the daily data has been published, which means that the totals of the daily data may not sum up to the final official monthly statistics. Although the data source itself is not new, the approach of publishing it as experimental, knowing that the data will be revised, is novel within tourism statistics. This approach helps meet the user needs for as timely accommodation data as possible without compromising the methodological robustness of the regular monthly statistics.

Using duty-free purchases to improve the granularity of tourism spend

Data on duty-free purchases are based on refunded Value Added Tax (VAT) to tourists for private exports worldwide. An opportunity of these data, as with transaction data, is that they provide information on actual spend rather than the self-reported spend the tourists remember. In Latvia, a single company offers the service of tax refunds, meaning that data from this company cover all duty-free purchases conducted in the country. This provides a new source for international tourism spend, making it an attractive data source for details on this topic.

The main limitation is that the data on duty-free purchases **does not cover the entire market** on inbound tourism spend. For EU countries, data are only available for visitors living outside the EU (European Commission, 2024[29]). A solution to this issue can be to assume that the spending behaviour of tourists from non-EU countries closely resembles that of tourists from EU countries. In Latvia, this does indeed seem to be the case, where an analysis of payment card data showed that spend patterns were similar. However, this will not necessarily be the case in other countries and therefore warrants further investigations.

Not all purchases are recorded. This can either be because tourists choose not to claim their tax refund or because the purchases are below a threshold (in the EU, this threshold is EUR 175, or the equivalent in national currency outside the Eurozone, for the total purchase), in which case the taxes cannot be claimed back (European Commission, 2024[29]). Duty-free purchases therefore cannot be used to estimate the total amount of purchases by a nationality, rather it can be used as an estimate of the detailed breakdown of certain purchases, or to provide details on big ticket tourism spend. This source is thus dependent on being combined with other data sources with information on the total tourist spend.

Using employment data to increase the timeliness of tourism labour market data

Employment data are typically collected by NSOs and can be used to increase the timeliness of tourism labour market data. The strength of this data is that as they are already available and follow statistical standards, they are relatively less costly to obtain, and the statistical soundness of the data has already been verified. This data does not cover the informal economy, which may result in biased results in countries with large informal economies.

In New Zealand, the Monthly Employment indicator (MEI) was developed to provide an early indication of employment levels in the labour market in terms of filled jobs and gross earnings. The indicator is created using payday filing data and is based on pay as you earn data supplied by Inland Revenue within four weeks after the end of the reference month. All firms and enterprises in New Zealand with paid employees must submit this data to Internal Revenue, making it a comprehensive dataset for employment data.

The up-to-date administrative employment data can **reflect employment in select tourism industries, but not tourism employment** which is a derived proportion of any particular industry's overall employment. In New Zealand, although the tourism industries in the employment data are based on the

official TSA groupings, they are not a comprehensive representation of, or exact match with, the TSA groupings. As this data do not directly measure employment from tourism, but employment in tourism related industries, the traditional tourism statistics on employment are still needed. However, this source is a useful way to get a timely indicator for the employment status of the tourism sector.

Using transport data to measure tourism flows

Transport data contain information on trips, for example via train or airplane, within a given region or geography, on actual trips, and can be obtained directly from the transport provider or a third-party intermediary. Flight data provide information on scheduled and past flight arrivals, departures and passenger counts, and can for example be obtained directly from the airports. National rail data consist of information of tickets purchased by visitors, type of ticket, as well as the starting point and end point of the trip. As the transport data provide information on travel and the actual (rather than stated) number of trips, it is a potential useful additional source to monitor tourism flows and same-day trips within a country. This data can also help test models or provide quality assurance when assumptions are made about the behaviour of the resident population relative to tourists. The exact information in, and methods of obtaining, this data will depend on the country and data provider in question. In Switzerland, national rail data are provided by the Federal Swiss Railways which surveys every connection operated by them.

Identifying tourists is a challenge with this data. In Switzerland, certain tickets are only available to tourists with a proof of address abroad. Additionally, some ticket types are more attractive to buy for non-tourists, while others are more attractive for tourists. The different ticket types can be used to estimate tourists, though biases are likely to be present. Inbound tourists that purchase single tickets at a machine or counter are excluded from the data if strictly looking at tourist tickets, though transaction data might be used to estimate this effect. On the other hand, taking all tickets and trying to remove commuters and regular trips may result in the data still containing non-tourists. Switzerland constructed such two samples, as well as an average, and saw only a small difference in the distribution (not in levels). This will not necessarily be the case in other countries and therefore warrants ad hoc investigations.

The data do not contain all tourist trips, meaning that it does not cover the entire market. It contains information on tourist trips by public transport but does not contain information on the visitor flows from other types of transport. The scale of this issue depends on the share of tourists using public transport as their main mean of transport within a country, meaning that this issue is likely to be relatively smaller in countries with good public transport systems, and bigger in countries where tourists primarily travel by car. The Swiss case is thus particularly well suited due to the high usage of public transport. However, even for countries with good public transport systems, the quality of the estimates will decrease on routes where public transport is less popular (such as cross-border daytrips).

Using satellite data to monitor tourism trends and impacts

Satellite data have the potential to map tourism development and monitor the environmental impacts of tourism. With tourism rebounding in Malta following the pandemic, the country aims to monitor tourism impacts in line with the Sustainable Development Goals. To support Malta's Tourism Strategy 2021-30, Malta is developing a set of sustainability indicators to be monitored by the Malta Tourism Authority and its Observatory. This initiative helps the Ministry for Tourism understand and monitor tourism dynamics and trends, supporting the implementation of Malta's tourism strategy (OECD, 2024[1]).

Malta is incorporating satellite data combined with tourism data in an interactive dashboard combined to monitor the environmental impact of tourism. The twelve indicators cover vegetation health, nature and urban green extent, agricultural potential, forest health, water quality (chlorophyll, turbidity, salinity, temperature), urbanisation evolution and its proximity to cultural or natural heritage as well as city air quality. This initiative, a collaboration between the Malta Tourism Authority and tech company

Murmuration, combines advanced satellite data with traditional indicators to inform decision-making. The technology's resolution allows for assessing tourism's environmental impact in both residential and natural areas (OECD, 2024[1]).

Sharing tourism data to reach end users and inform decision making

While countries are experimenting and using alternative data sources to improve the measurement of tourism, this data also need to reach the decision makers and end users. Sharing data through tourism data hubs and other solutions can play a role in promoting transparency, collaboration and innovation within the tourism sector. A main reason for exploring new tools is to strengthen evidence-based decision-making, typically by making it easier for stakeholders to access a wide range of data sources from a single place. These tools do not have to rely on alternative data sources to be useful. Easy and intuitive access to existing data can in itself be of great value to tourism stakeholders.

Many countries are exploring novel ways to disseminate tourism information. Box 4 and the Annex provide an overview of the eight country case studies provided on this topic, while the full country case studies can be accessed from Annex A. In addition to the country case studies, the discussion in this section builds on a Workshop on Tourism Data Sharing, Governance and Integration organised by the OECD, together with the European Commission on 27-28 September 2023 (European Commission and OECD, forthcoming[11]).

Box 4. Using new tools to share tourism data with end users – selected country examples

Austria: The primary objective of Austria's **Tourism Data Space** is to unlock opportunities for innovation and value creation in the tourism sector by facilitating secure and efficient data sharing across the entire tourism value chain and with adjacent domains such as energy, mobility, culture, construction, and agriculture, both nationally and internationally. An interconnected data ecosystem is a strong asset in times of big data analytics and AI, providing the basis for the development of new products and business models. A long-term objective is to create data and app marketplaces as elements of the data space, allowing interested parties to work with tourism data and develop new applications and products. Aa part of this long-term initiative, it is planned to integrate the data space into the European Tourism Data Space once it becomes operational.

Canada: The **Tourism Activity Tracker** was designed to track tourism activity during the COVID-19 pandemic relative to pre-pandemic levels, providing more timely and frequent insights into tourism activity than existing official tourism statistics. The Tracker was positively received, and stakeholders advocated for the continued production post-pandemic, highlighting the importance of timely tourism data to stakeholders. The Tracker used data from the count of entry survey, passenger and aircraft movements, food sales, hotel occupancy and more to create an index of tourism activity at the country and provincial level. This product shows how administrative data and modern tools can be used to provide timely tourism indicators in the event of disruption to traditional surveys and for general use in tourism activity reporting.

Finland: The **Visit Finland DataHub** is a centralised database which facilitates the sharing of travel-related data across digital platforms, created to support sustainable growth in Finland's tourism sector. As of January 2024, the data hub included 7 733 travel products from 2 264 Finnish travel companies, and supported a diverse range of product types, including experiences, accommodation, attractions, restaurants, venues, rental services, events, shops and transportation. The DataHub offers data integration, multilingual product information and tools for product grouping and campaign management

and provides a more streamlined and cost-effective product compared to previous manual processes, fostering a more cohesive approach to promoting Finland's tourism offerings.

Germany: The **DataHub North Rhine-Westphalia** (NRW) created by Tourismus NRW and its tourism regions aims to create a complete digital image of tourism in North Rhine-Westphalia, a so-called "digital twin". Destinations can enter five data types into the data hub: points of interest, tours and routes, accommodations, gastronomy, and events. Destinations in North Rhine-Westphalia already maintain the points of interest, while the remaining data types are unequally maintained across the touristic regions. More work is needed to for all data types to be available for the entire customer journey, such that guests only need to access one data source. As AI development bring the possibility of individualised recommendation systems, digital twins will become increasingly important.

Korea: The Korea **Tourism Data Lab** was designed to assist tourism policy and business decision making for governments, regional tourism organisations, tourism businesses and academia. The data hub includes regional tourism analysis showing how travellers behave within Korean regions and tourism analysis of inbound visitors in Korea. The data hub includes 9 different data sources from the private sector and 15 from the public sector, containing information on tourism statistics and surveys, as well as big data such as mobile positioning and transaction data. From 2021 to 2023, the average number of monthly visitors to the site increased from 14 000 to 44 000, while the number of members also expanded from 12 000 to 41 000.

The Netherlands: The **National Data Alliance** was established to support data driven decision-making. They decided to go for a data alliance instead of a data hub, as this was deemed the best way to serve their two main target groups, namely researchers and policy makers, in their day-to-day work. Not everyone has the skills to work with big datasets and big dashboards, and users may only find it relevant to use the data once or twice per month. It was thus decided to share the data via reports, factsheet tables, specific data sets, presentations, etc., on an ad hoc basis. Because so many different stakeholders are working together in the Data Alliance, governance has emerged as a key issue and important area of focus.

Portugal: The **TravelBI** data hub, developed by Turismo de Portugal, aims to integrate all relevant tourism data sources in a single platform, explore new sources of data to promote data-driven management and innovation, and address tourism sustainability challenges faced by destinations and tourism companies. In addition to official statistics and research, the data hub acts as a tool for the exploration and dissemination of 30 alternative data sources, including transaction data, mobile positioning data, airline data, and short-term rental data. The alternative data sources work as complementary information to official data from the tourism statistics system, providing more granular and frequent data to allow for richer and more timely insights for tourism stakeholders' decision-making.

Saudi Arabia: The **Data and Decision Support Deputyship** is designed to modernise tourism statistics through the adoption of innovative data sources and analytical methods to enable data-driven decision making for the Saudi tourism sector. It was implemented as part of Saudia Arabia's Vision 2030 to position tourism as a pivotal element in economic diversification. The data hub integrates data from the visitor border and household surveys, administrative data, mobile positioning data, transaction data, and accommodation bookings data, along with innovative data analytics tools such as machine learning and AI modelling. This data hub is designed to cater to government agencies, tourism boards, and tourism businesses, and offers granular information, near real-time insights, demographic analysis, and trends for tailored marketing strategies, infrastructure development, and visitor services. The developmental approach initially focuses on national-level data, gradually expanding to cover individual tourism destinations.

Source: OECD country case studies.

In addition to the work on data sharing at the country level, the European Commission in its Communication from 20 July 2023 highlighted its commitment and dedication to create a European Tourism Data Space. The initiative aims to enhance data sharing and innovation across the tourism ecosystem by involving various stakeholders, including Member States, local and regional authorities, the private sector, and EU institutions. The goal is to address challenges related to data interoperability, access, and provision, and to support the tourism sector in leveraging data for better management and planning (European Commission, 2023[30]).

Several projects are being carried out to develop the European Tourism Data Space. For example, the completed DATES project explored approaches and options for the deployment of a tourism data space, with a focus on the development of governance and business models. Building upon this work, the DEPLOYTOUR project brings together 43 partners from 13 countries to deploy the technical infrastructure, define a governance framework, and implement five use case pilots to demonstrate the strengths of the European Tourism Data Space, while taking into account the interoperability, transversality, and synergies with other data and tourism initiatives.

Tools to share tourism data with end users

Data hubs are a common tool to share tourism information, and the most common tool mentioned in the country case studies. The learnings in this paper thus draw heavily on this type of data sharing. Data hubs can take different forms but at the core are centralised platforms used to collect, manage and disseminate various types of data. They can contain information about destinations, attractions, accommodations, transportation, activities, events, visitor demographics, and tourism statistics. Given the demand for up-to-date and relevant information, they can include the use of some of the new data sources. Tourism data hubs are set up for a wide range of reasons including to provide governments, businesses, researchers and travellers with easy access to accurate, relevant and up-to-date information for planning, decision-making, analysis and/or marketing purposes.

A data hub can include several features. Although the specific features depend on the nature and purpose of the data hub, the most common are:

- **Data integration**: collecting data from different sources, including traditional statistics and new data sources, to create comprehensive datasets that offer a holistic view of the tourism ecosystem.
- **Data management**: storing, organising, and managing large volumes of data in a structured and accessible manner.
- **Data analysis**: analysing data to identify trends, patterns, and insights that can inform strategic planning, marketing campaigns, and policy decisions.
- **Data visualisation**: presenting data in visually engaging formats such as maps, chats, and graphs to facilitate understanding and interpretation.
- **Data sharing**: providing data access through web portals, Application Programming Interfaces (APIs), and other means of sharing to enable stakeholders to easily retrieve relevant information for their own use.
- **Privacy and security**: implementing measures to protect the confidentiality, integrity, and availability of sensitive data in compliance with applicable regulations and good practices.

Where data hubs provide a centralised and standardised approach to data sharing, tourism practitioners can also opt for more **tailored methods to share data**. For example, the National Data Alliance in the Netherlands shares data on an ad hoc basis through reports, factsheet tables, specific datasets, or presentations, depending on the specific needs of the end user. Although the Korea Tourism Data Lab is a data hub, tailored training and support is also provided to introduce the Data Lab to local governments, tourism businesses and academia, and help solve real-work business problems.

Data marketplaces can also be used to share information and develop new insights. Unlike data hubs, where data from various sources is aggregated and managed in a centralised repository, marketplaces are decentralised platforms where data are exchanged, typically bought and sold. They can offer access to a diverse range of tourism-related datasets, facilitating comprehensive analysis and insights, augmenting traditional measurement methods with more timely and granular information by providing access to niche datasets or real-time data streams. An example of a data marketplace is the Development Data Partnership of which the OECD is a partner, created and managed by the World Bank, which facilitates collaboration between private companies with data and international organisations that can use the data to improve and strengthen decision-making (World Bank, 2024[31]).

Tailored AI systems are emerging as transformative tools for sharing tourism data with end users, helping non-technical users understand data. Without the relevant technical expertise, using existing data dashboards to extract and download data can be challenging and time-consuming. While the use of openly available AI systems such as ChatGPT is becoming more prevalent, the data provided is not always reliable. Tailored AI systems based on official tourism data, such as Switzerland Tourism's project "hAIdi" (see Box 5), provide the opportunity of combining the conversational nature of open AI systems with the reliability and integrity of official statistics. This approach can enhance data accessibility by shifting from a passive consumption of pre-defined metrics to active, user-directed exploration of data.

Box 5. Switzerland Tourism's project "hAIdi"

hAIdi is an internal conversational AI system developed by Switzerland's national tourism marketing organisation, Switzerland Tourism (ST), in collaboration with the private company Artifact. Utilising Large Language Models and Natural Language Processing capabilities, hAIdi serves as an intelligent interface that allows tourism stakeholders without technical experience to visualise and interact with reliable data.

By providing a natural language interface, hAIdi addresses the some of the limitations typically associated with data analysis. Users can make complex data analysis requests and visualisation instructions through conversational queries. The AI interprets the query, retrieves and analyses the relevant data from a controlled internal database, and synthesises the results into accessible formats, including automated report generation and graphical representations. Users can customise the outputs and visualisations to meet their specific requirements.

Unlike most openly available AI systems, hAIdi indicates when a request cannot be fulfilled given the available data, maintaining the integrity of reliable data. hAIdi can currently access data from ST's national guest survey and others of ST's databases. Access can be expanded to include data from the Federal Statistical Office, which would allow comparisons between tourism destinations from both demand and supply perspectives.

As hAIdi operates as an interpreter between common language and dataset variables, it does not possess genuine semantic understanding or contextual awareness comparable to human cognition. Consequently, hAIdi cannot replace users in interpretating the data; domain expertise and critical judgment are required to validate the substance of the analysis.

Source: Switzerland Tourism

Opportunities for sharing tourism data with end users

One of the main opportunities when sharing tourism data with end users is to **strengthen decision making**, as access to comprehensive and up-to-date tourism data can assist end users in making

evidence-based decisions and respond to emerging trends. The combination of multiple different data sources can provide a more holistic understanding of tourism. The Canadian Tourism Activity Tracker combined multiple data sources into an index to represent tourism activity, providing timely information that was used in policy and ministerial briefings. The main goal of the Korea Tourism Data Lab is to help inform tourism policies and better business decision-making by central and local governments, regional tourism organisations, and businesses.

Sharing tourism data through a centralised platform offers the potential for **increased efficiency and cost savings** by streamlining the data collection and management process and reducing duplication of efforts. Advanced analytics tools such as machine learning and AI can be used to process and interpret the datasets that are shared to enhance accuracy and efficiency. The Visit Finland DataHub centralises travel product information, which facilitates efficient sharing across digital platforms and reduced the time spent on manual processes. Saudi Arabia uses machine learning methods to forecast daily domestic tourism spending and weekly room occupancy.

Sharing tourism data across end users offers the potential for **innovation** within the tourism sector. The primary aim of Austria's National Tourism Data Space is to facilitate secure and efficient data sharing across the tourism value chain and adjacent domains to enable the development of new products and business models. The objectives of Turismo de Portugal's TravelBI include the promotion of data-driven management and innovation. The Korea Tourism Data Lab organises an annual Best Use Case Contest with the aim to investigate how the Data Lab can be used to solve business problems

Challenges associated with sharing tourism data with end users

Developing and maintaining any data hub involves several **technical challenges**. Harmonising and integrating the different datasets while providing data accuracy, completeness and reliability can be a significant challenge, especially for tourism, as tourism data often originate from different data sources. Managing data privacy and security is important to follow data protection legislation and protect sensitive information from unauthorised access or misuse. Implementing robust data governance policies, compliance measures and security protocols is important to mitigate these risks and build trust among stakeholders.

The associated **costs** are an important consideration when setting up a tourism data hub. Adequate funding enables the acquisition of necessary resources, technologies and expertise to build and operate the data hub effectively. The costs can vary significantly depending on factors such as the scope and complexity of the project, the amount and type of data to be managed, the technological infrastructure required, and the availability of skilled personnel. The yearly maintenance cost for the Canadian Tourism Activity Tracker was approximately CAD 40 000 in salaried expenses, while the Korea Tourism Data Lab on average incurs annual maintenance and data purchase costs of about USD 2.4 million. Initial costs must typically cover expenses related to hardware and software infrastructure, data acquisition, software development or customisation, and personnel salaries or consulting fees, while maintenance costs can include ongoing data purchases, personnel salaries, and updates or changes to the software.

Securing funding in the long term is important for the sustainability, stability and continuity of the data hub over time. It is also necessary to support the data hub to remain relevant and adapt to evolving needs, technological advancements and trends within the tourism sector. A learning from Saudi Arabia's experience with the Data and Decision Support Deputyship points to the need to secure funding for a minimum of three years, as initial setup costs are higher than operational costs, and a project typically takes at least a year to mature through pilots and trials. The Visit Finland DataHub received initial funding from the European Commission's Recovery and Resilience Facility, which supported the development and sustainability of the data hub until 2025, where it has transitioned to Visit Finland's regular budget.

Considerations for sharing tourism data to reach end users

Data hub projects can require a **diverse set of expertise**. Having the right mix of skills and expertise within the project team and organisation means the data hub can be developed, implemented and maintained efficiently, resulting in high-quality data products and services that meet the needs of stakeholders. In the development of TravelBI, Portugal found that the team working with the data must have analytical skills to make descriptive use of data, curiosity to derive insights from it, creativity to be predictive and critical and empathetic thinking to allow prescriptive analytics initiatives.

The areas of expertise relevant to setting up and working with a data hub include:

- Data scientists and analysts to extract insights and patterns from the data.
- Data engineers to ensure the reliability, scalability and security of the underlying infrastructure.
- Domain experts familiar with the nuances within the tourism sector to provide valuable insights into the specific data needs and requirements of stakeholders, acting as a bridge between the users and the more technical developers.
- Effective project management and communication skills to co-ordinate the efforts of multidisciplinary teams and align with strategic goals and timelines.

Capacity building can play an important role when setting up a new tool for data sharing to help develop the relevant skills and capacity within the project team. In Austria, the National Tourism Data Space made use of a "data steward" network, which played an important role in the training and onboarding processes to align on data standards on a national level, and to strengthen data competencies within the industry. This initiative consisted of one person in charge of data per federal state (the data steward), his or her deputy, project leaders from the Austrian National Tourist Office, and an external service provider specialising in data excellence and AI. Regular meetings were organised (once every three weeks), together with data trainings (online and in person), and invited keynote speakers for relevant topics such as open data, data standards, and the data landscape. Additionally, working groups were dedicated to addressing specific issues, such as data licensing and data quality, as well as the current working group focusing on the standardisation of naming conventions within the data space. In some extra sessions, they worked hands-on directly in the data space, experimenting with different functionalities in the training environment before applying them in operational data spaces.

In addition to developing the technical skills of the project team, **relevant training** can also help the end users of data hubs, such as government officials or small business owners, understand the capabilities and potential applications of the available data. The Korea Tourism Data Lab also provides training and support to its users, as the demand for data literacy is increasing together with the analysis services and data provided. The Data Lab is introduced to local governments, tourism businesses and academia, to raise awareness and help solve real-work business problems. In 2024, a total of 12 training programmes were provided to 235 users. These sessions were targeted to the technical skills of the users, providing lessons for beginners (understanding tourism big data), intermediate users (measuring local tourism trends using big data), and advanced users (analysing tourism big data and developing AI powered insights).

The Workshop on Tourism Data Sharing, Governance and Integration underlined the importance of **effective communication**, as the users need to know what they are looking for and how to find it for a data hub to be useful, which reduces the risk of the user becoming overwhelmed by the amount of available information. Sharing data in multiple ways, such as enabling downloads, printouts and API linkages, allows users to access and utilise the data according to their specific needs and preferences (European Commission and OECD, forthcoming[11]).

Tailoring the data collection and presentation to meet the specific needs, preferences, and priorities of end users is necessary to maximise the usefulness and impact of the data hub. For instance, government policy makers may require comprehensive data sets to inform strategic planning and policy decisions,

while businesses may seek actionable insights to optimise marketing strategies and improve service offerings. As part of the Korea Tourism Data Lab, surveys are regularly conducted to recognise user needs for new data and analysis services. As the services provided become increasingly sophisticated, a more diverse range user of needs can be met. Additionally, the Data Lab also provides customised support for tourism companies. They select tourism companies with high growth potential and integrate the company's data with data from the Data Lab. In 2024, 24 companies were supported. One example is, 'HiMedi', a medical tourism concierge service company, which used data on overseas customer behaviour data as the foundation to attract medical tourists. It is worth noting that the Korea Tourism Data Lab has had access to significant resourcing compared to the experiences in most other countries. As such, this level of tailored support may not be feasible in all cases. However, surveys can be helpful in prioritising resources, and providing tailored support at a fee can be a way for a data hub to raise money.

Adopting a **flexible and scalable infrastructure**, methodologies and partnerships can help the data hub to adapt to evolving trends and incorporate innovative solutions. Rapid changes in travel behaviour, merging destinations, and new technologies such as AI and big data analytics can significantly impact data collection, processing and utilisation. Fostering collaboration and knowledge exchange with industry stakeholders, research institutions and technology providers can help stay abreast of emerging trends and good practices, which can help support the continued sustainability and relevance of the data hub in the long run. The Canadian Tourism Activity Tracker was developed during the COVID-19 pandemic with the specific purpose to monitor tourism activity relative to pre-pandemic levels in 2019. As this product was received positively and integrated into policy and ministerial briefings, stakeholders advocated for a continued production post-pandemic with a flexible base period. A learning that emerged from the experience was the importance of a longer-term view in the initial design phase, as this would make it easier to adapt to changing user needs later on.

The Workshop on Tourism Data Sharing, Governance and Integration highlighted the importance of **open data sharing**, with a particular focus on having data as open as possible but as closed and secure as necessary. Although it is ideal with open access data, this will not always be feasible due to data sharing and privacy rules. Striking the balance between open access and data protection can help to get as much out of the data as possible while respecting data privacy and confidentiality concerns (European Commission and OECD, forthcoming[11]).

Data quality is important for tourism data hubs, as these platforms serve as reliable sources of information for different stakeholders. Managing the quality of the data can be especially challenging if the data are decentralised, for example with regions managing data themselves. In such cases, clear communication about quality is important. In North Rhine-Westphalia in Germany, the Data Hub NRW created a "data score" to provide stakeholders an easy overview of the data inventory, enabling them to assess which areas may need improvement. The data score is calculated based on the data quantity, open data quality, open data approach and data quality at field level. Similarly, Austria developed a quantitative method to evaluate data quality for the National Tourism Data Space. This metric is based on the fill-out rate of data fields, and a dashboard on the quantitative data quality is shared and updated weekly. Qualitative, content-based data indicators are also expected to emerge from AI projects such as AI chatbot queries.

Hackathons can be used as an innovative way to develop use cases for the data available on a data hub, and to find solutions to issues within tourism measurement by fostering collaboration, creativity, and experimentation among diverse groups of participants. The initial design of the Canadian Tourism Activity Tracker took place in January 2021, arising from a hackathon organised by the department of Innovation, Science and Economic Development. The goal of the hackathon was to re-use administrative data sources to fill an identified data gap from the pandemic's effect on tourism survey activities. The development and release of the project took place over a 6-week period, starting in March 2021, and culminating in the first monthly data release in May 2021. Meanwhile, the Korea Tourism Organisation held a generative AI hackathon in July 2023 that combined big data from Korea Tourism Data Lab and the participants'

generative AI technology. A total of 456 people participated, and 52 innovative tourist service were developed. 'BBa-BAM' developed a generative AI-based tourism-specific search engine, advanced the hackathon prototype, and succeeded in commercialising 'Trip Builder', an AI customised tourism recommendation solution in October 2023.

Towards the effective implementation of alternative data and tools for tourism

Opportunities for improving evidence-based decision-making are greater than ever, as shown by the diversity of the alternative data sources. As official tourism statistics remain the gold standard for decision-making, alternative data sources can be seen as a way to complement the tried and tested traditional tourism statistics. Transaction data can be combined with traditional survey data to provide more granular tourism expenditure estimates while helping overcome issues of low response rates and self-reporting bias. Mobile positioning data offer the possibility of improved granularity, frequency and timeliness of data on visitor flows. The lessons learnt from the country case studies provide some initial direction and guidance on a path forward for implementing new data sources.

The number of countries working on new ways to share tourism data with users highlights the importance of this topic. Sharing data through tourism data hubs and other solutions can play a role in promoting transparency, collaboration and innovation within the tourism sector. This sharing can include a combination of traditional and alternative data sources, thus providing an opportunity for holistic and evidence-based decision-making.

Alternative data sources and tools have the potential to enhance transparency, accountability, and stakeholder engagement within the tourism sector. Leveraging data-driven approaches, policy makers can communicate policy objectives, outcomes, and impacts more effectively to stakeholders, fostering trust and collaboration among government agencies, industry stakeholders, and local communities. Making data more accessible and understandable to the public empowers citizens to actively participate in the decision-making process, contributing to more inclusive and democratic governance of tourism resources and activities.

An important topic for future work and investigations is the exploration of emerging technologies, such as AI and machine learning to enhance the efficiency, accuracy, and transparency of tourism measurement and associated processes. Exploring use cases that combine alternative data sources or tools with AI can further strengthen tourism measurement and evidence-based decision-making. As data sources become increasingly diverse, detailed and well-documented, the scope for using machine learning to extract knowledge from data increases.

The path to effective implementation of alternative data sources and tools involves concerted efforts in peer learning and collaboration, standardisation, balancing collective expertise and addressing local nuances, capacity building, effective resourcing, co-operation, and translating data into usable insights (in no particular order). By prioritising these key areas, stakeholders may be able to unluck the full potential of data-driven approaches to enhance tourism measurement practices and support informed decision-making:

- Leveraging **peer learning and collaboration** allows practitioners to accelerate progress, avoid pitfalls, and identify innovative solutions, possibly reducing the time and cost required to work with a new type of data. By sharing insights and good practices, tourism practitioners can address common challenges more effectively. Additionally, collaboration facilitates the identification of shared priorities and opportunities for collective action, further enhancing the impact and sustainability of efforts to improve tourism measurement practices.
- Developing **commonly agreed definitions and approaches** to structuring and using alternative data sources for tourism purposes will allow for data comparison and combination, thus helping

tourism practitioners and professionals in their decision making, while at the same time facilitating collaboration between statistical bodies across borders. This work could include a manual with concrete and practical guidance on how to use and implement a specific type of alternative data.

- It is helpful for practitioners to **strike a balance between leveraging collective expertise and addressing local nuances**, as each country and destination face their unique challenges and priorities that influence its needs. It is helpful if the approaches and solutions are tailored to fit the specific circumstances of the specific destination. Embracing both standardisation and customisation can enhance the relevance and impact of tourism measurement practices.
- **Capacity building** can help meet the growing demand for skilled professionals capable of navigating complex data landscapes and interpreting analytical insights. Moreover, fostering and investing in a culture of continuous learning and professional development strengthens the overall capacity and resilience of organisations to address emerging challenges and opportunities in tourism measurement.
- **Legislative measures** can help secure access to alternative data sources and mitigate some of the risks associated with working with privately held data. Moreover, it can promote transparency and accountability, which can build public trust in the data being used ethically.
- Sufficient **resourcing** is required to develop and maintain data hubs, and to work with new sources of data within tourism measurement. Upfront investment is needed for the initial phase of new work, but the funding needs a long-term view to increase the longevity and sustainability of the project and create a return on investment into perpetuity.
- Close **co-operation between policy makers and the experts in tourism measurement** can support evidence-based decision-making. As statisticians possess specialised knowledge and expertise, they can give policy makers a deeper understanding of the strengths, limitations and nuances of the tourism data, such that decisions are informed by reliable evidence. Conversely, understanding the objectives and priorities of policy makers allows statisticians to tailor their data collection and analysis to better meet the needs of decision-makers. Additionally, the co-operation fosters transparency and accountability in the policy making process, and encourages the use of objective, data-driven approaches to inform decision-making.
- There is a need to **move beyond data, translating it into usable insights** that resonate with diverse audiences, including policy makers, industry stakeholders, and the public. This involves not only presenting data in a visually engaging and understandable format but also contextualising findings within the broader socioeconomic and environmental contexts, tailoring communication to the specific needs and preferences of different user groups, and considering factors such as background, language and data literacy.
- **International organisations can play a role in streamlining data acquisition processes** for countries, as well as the development and management of data hubs. This is already the case with Eurostat's work to collect data from platforms intermediating accommodation services, and the European Commission's commitment to create a European Data Space. Centralised efforts have the potential to enhance the efficiency and reduce the costs associated with data acquisition and management.

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Note

[1] It is worth noting that it may not be necessary to identify tourists if the data are to be used for visitor flow management in general. The mobile network data can enable policy makers to make decisions based on the total number of visitors in an area rather than focusing only on tourists. Lithuania investigates all inbound travellers, rather than inbound tourists, excluding only those inbound users that are deemed to be Lithuanian residents.

Annex A. Overview of country case studies

Country	Title and link
Case studies on using alternative data to strengthen and complement official tourism statistics	
Australia	Mobility data to measure domestic tourism movement
Austria	Payment statistics to compile tourism accommodation expenditure
Latvia	Tax-free shopping data to enhance tourism statistics
Lithuania	Mobile tourism data initiative to provide information on travel patterns
New Zealand	Tax data to develop monthly employment indicator
Slovenia	Mobile network operator data to measure inbound and outbound travel
Spain	Transactions data to measure expenditure by residents in other countries
Sweden	Transactions data to measuring regional tourism in Nordic countries
Switzerland	Railway data to estimate tourism flows between Swiss cantons
Türkiye	Diverse data sources to improve official tourism statistics
Case studies on sharing tourism data to reach end users and inform decision making	
Austria	National Tourism Data Space
Canada	Canadian Tourism Activity Tracker
Finland	Visit Finland DataHub
Germany	Data Hub North Rhine-Westphalia
Korea	Korea Tourism Data Lab
Netherlands	National Data Alliance
Portugal	TravelBI Data hub
Saudi Arabia	Data and Decision Support Deputyship and Data Warehouse