OXFORD ECONOMICS

THE ENVIRONMENTAL AND SOCIAL IMPACT OF TRAVEL & TOURISM

METHODOLOGICAL REPORT FOR WTTC

APRIL 2025

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1. INTRODUCTION

Oxford Economics has quantified the environmental and social impact of Travel & Tourism in 185 territories worldwide, available online. Building on *The Environmental Impact of Global Tourism* and *The Social Impact of Global Tourism* released in 2023, this analysis updates results for 2019-2022 with the latest data and provides additional findings for 2024. The analysis relies on tourist spending estimates from nationally reported TSAs. As additional or updated historical data are made available, modelled estimates are replaced by reported data. The impact estimates for 2019-2022 have been updated with newly available data on tourist spending.

This document describes the methodology to quantify the environmental and social impact. It focuses on the sources, approaches and assumptions used to produce the environmental and social indicators. This report does not explore the methodology underpinning WTTC/Oxford Economics' Economic Impact Research (EIR). This research assesses the volume of Travel & Tourism activity, the composition of tourist spending, and the sector's contributions to national GDP and employment in each country. EIR figures are taken as inputs into the method presented in this report, and the economic concepts and definitions used here are equivalent to those in the EIR methodology.[1]

1.1 SCOPE OF THIS ANALYSIS

The study takes a demand-led perspective, tracing the footprint of Travel & Tourism-linked spending, whether by domestic travellers, inbound tourists, businesses, or governments. The analysis encompasses tourists who travel for both personal/leisure reasons, as well as for business.

For environmental impacts, we also capture the impacts occurring along the supply chains that support Travel & Tourism. These supply chains are modelled using the Global Sustainability Model (GSM), an environmentally extended input-output model described in further detail throughout this report. The GSM resolves environmental data with national accounts and, in doing so, is consistent with the principles of the System of Environmental Economic Accounts (SEEA-CF).[2] Official data on physical environmental flows (e.g., GHG emissions, material extraction, water use) are matched to Travel & Tourism's economic data, itself based on national Tourism Satellite Accounts (TSAs) that produced in line with the System of National Accounts (SNA 2008).

This analysis attributes the impacts of Travel & Tourism activities to the territory where the spending occurs (both domestic and inbound), whether the impact itself takes place within each territory or along international supply chains (unless otherwise stated). The impacts associated with cross-border travel are estimated and modelled separately, as discussed in Chapter 4.

Impacts are estimated for 185 countries and territories (see Appendix for full list). Our modelling uses economic and environmental datasets that are global in scope, but the comprehensive coverage necessarily involves estimation and extrapolation in countries where data are less detailed, less timely, or unavailable. This means using regional averages or applying data from comparable countries.

[1] Please see WTTC & Oxford Economics, Economic Impact Report (2023). References to 'WTTC EIR' refer to this project.
[2] UN Statistics Division, "System of Environmental-Economic Accounting 2012" (Central Framework, 2014).

1.2 RELATIONSHIP TO OTHER TOURISM SUSTAINABILITY FRAMEWORKS

International standards for measuring sustainable tourism have improved in recent years. Building on the SEEA and TSAs, organisations such as the UNWTO, along with other international agencies, national statistical offices (NSOs) and national tourism agencies (NTAs), have developed a draft Statistical Framework for Measuring the Sustainability of Tourism (SF-MST).[3] This framework is comprehensive and wide-ranging, establishing a coherent basis for global economic, environmental, and social measurement and reporting.

Our methodology is partially consistent with the draft SF-MST approach. However, the estimates in this project do not comprise a complete set of SF-MST accounts or indicators. For example, we do not attempt to quantify the full economic value of Travel & Tourism's dependencies on natural and environmental assets, or the annual flows of ecosystem services on which it depends. There is also no estimate of the generation and flows of solid waste associated with Travel & Tourism. These are all vital metrics to consider, not least due to the centrality of the natural environment to tourism itself. Their exclusion from this study reflects the complexity of and data challenges of their measurement, rather than a disregard for their importance.

This project aims to provide a starting point for further assessments in line with emerging standards. This research provides an initial estimate of Travel & Tourism's environmental and social footprint, utilising official data in a manner that is robust, global, and multidimensional. The methodology is structured to facilitate the consistent and timely future tracking of these metrics, with each update representing an opportunity for methodological refinement.[4] We also anticipate that these figures will be incrementally superseded by official estimates, as more and more NSOs publish official tourism sustainability assessments. In the interim, this assessment aims to support immediate insight and action while efforts to produce more rigorous and detailed statistical are underway.

1.3 THIS REPORT

A high-level overview of the method is shown in Fig. 1. This report provides further detail on the technical methodology underpinning some of these steps, set out in the following chapters:

- Chapter 2 sets out the methodology for disaggregating Travel & Tourism's economic impact into its constituent industries, permitting subsequent strands of the research.
- Chapter 3 details how the aligned GSM results help to understand Travel & Tourism's direct and value-chain environmental footprint.
- Chapter 4 sets out the approach for measuring the environmental impact of international flights and cruises.
- Chapter 5 describes the sources underpinning the GSM.
- Chapter 6 explains how some social and demographic aspects of Travel & Tourism's employment impact are identified.
- The appendix contains detailed tables and resources referred to throughout.

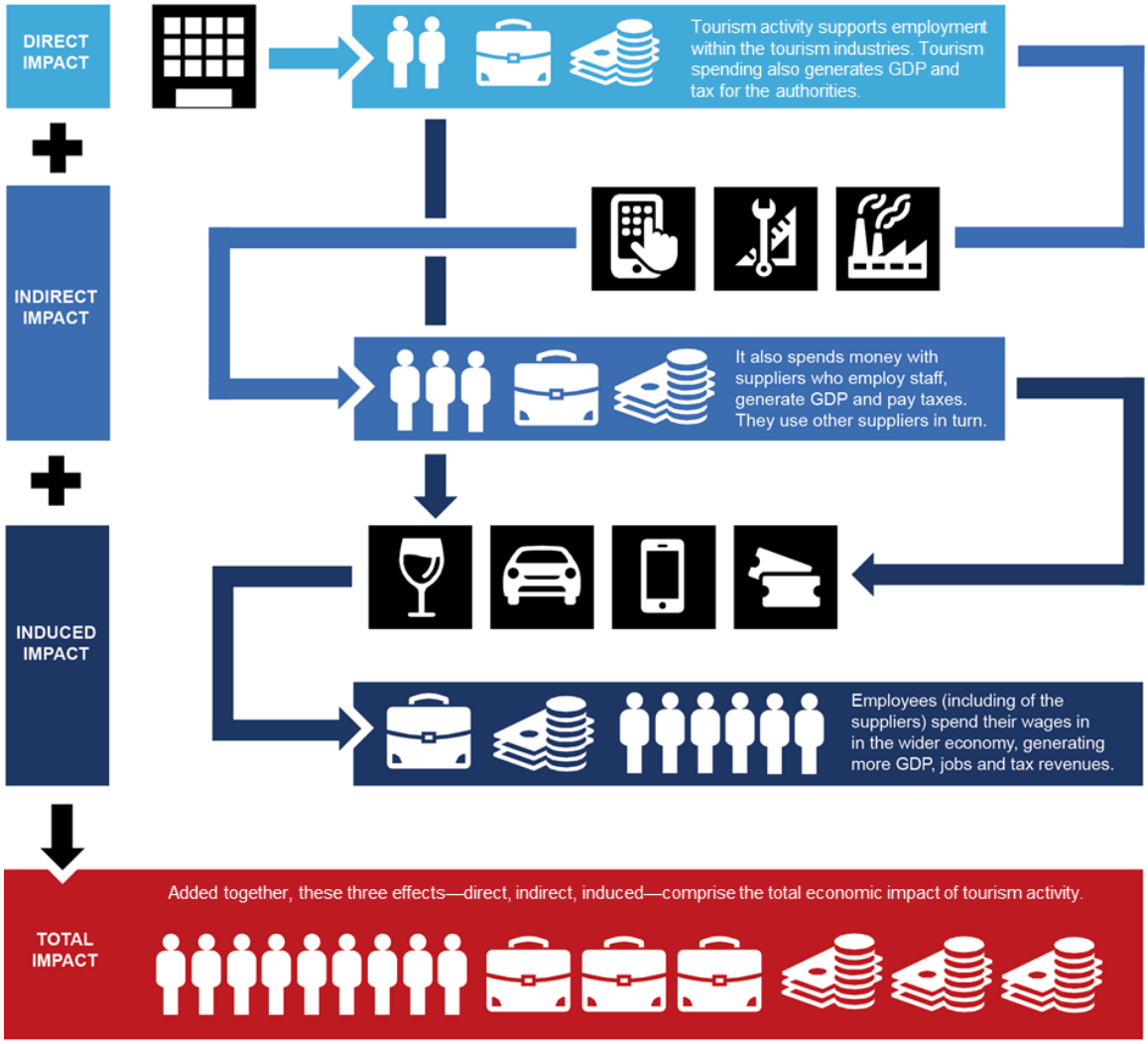
[3] UNWTO, "Statistical Framework for Measuring the Sustainability of Tourism" (Draft framework, 2023).
[4] In this context, the SF-MST also provides a useful pathway for methodological improvements over time.

Fig. 1. Overview of method

2. THE INDUSTRIAL BREAKDOWN OF TRAVEL & TOURISM

The framework for assessing Travel & Tourism's impact across industries is illustrated in Fig. 2.

Fig. 2. Overview of direct, indirect, and induced impacts



2.1 DIRECT, INDIRECT, AND INDUCED IMPACTS

2.1.1 Direct impacts

The direct impacts of Travel & Tourism are allocated among the industries in which Travel & Tourism activity takes place. To begin with, tourist spending is broken down into common categories used within many countries' Tourism Satellite Accounts (TSAs) in the WTTC EIR research: for example, accommodation, food and beverages, retail, transportation, etc. We transfer this activity – revenue, GDP, and jobs – into a more detailed 34-industry breakdown used by the GSM, based on the ISIC Rev. 4 system of industrial classification.

Fig. 3. Alignment of direct Travel & Tourism activity between TSA headers and GSM industries [5]

TSA tourism sector	GSM industry and ISIC Rev. 4 equivalent
Retail	Wholesale and retail trade (ISIC 45 - 47) Food products manufacturing (ISIC 10 - 12) Clothing & footwear manufacturing (ISIC 13 - 15) Various other manufacturing industries (ISICs 16 - 33)
Transportation	Transportation and storage (ISIC 49 - 53)
Accommodation	Accommodation and food services (ISIC 55 - 56)
Food & Beverage services	Accommodation and food services (ISIC 55 - 56)
Recreation, culture & sports	Arts, entertainment, recreation & other services (ISIC 90 - 96)

These disaggregated results allow Travel & Tourism in all countries to be analysed along industry lines. For example, it is possible to assess the number of manufacturing jobs in each country or region that are supported by Travel & Tourism. Our analysis also uses these industry breakdowns to assess the environmental and social impacts of Travel & Tourism.[6]

2.1.2 Indirect impacts

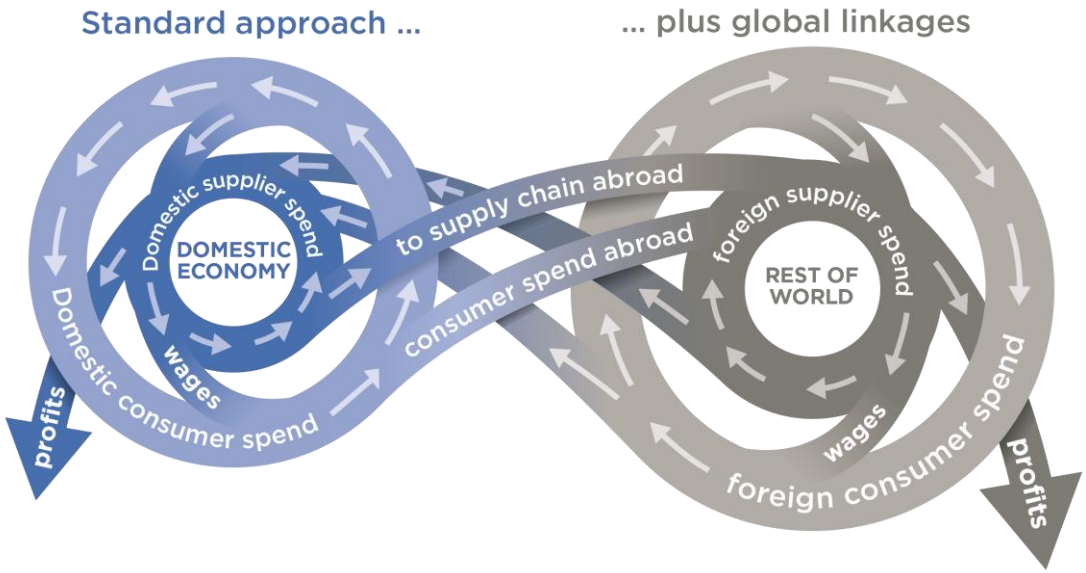
The indirect channel captures impacts occurring along the supply chain. Following the alignment of direct impacts, the GSM provides an analogous set of indirect impacts, for each country. This is determined by the pattern of inter-industry supply chain links, as specified in the input-output (I-O) tables underlying the GSM.

The GSM measures indirect impacts along supply chains across the world. This is because the GSM explicitly maps the trade relationships between all industries and countries in the model. As such, the spending of tourists in (e.g.) Spain will have knock-on impacts upon supply chains that extend throughout Europe and the wider world. It is crucial to understand the magnitude and composition of these global impacts, to establish the global resource footprint of Travel & Tourism in each country.

[5] Where these TSA aggregates need to be split into more than one GSM industry, the weightings reflect the relative magnitude of household consumption from each of the industries, within the domestic economy in question. This is discussed further in chapter 2.2.1.

[6] The ratios and intensities that convert Travel & Tourism's economic activity into environmental impact are estimated with respect to these ISIC Rev. 4 designations (see Chapter 5 for more detail). Social impact methodology is discussed in Chapter 6.

Fig. 4. Visualisation of the GSM's global linkages



When discussing the GDP and jobs sustained by Travel & Tourism (i.e., the indirect impact), the results encompass only the 'within-country' portion of the supply chain. This is consistent with the conceptual framework of the existing WTTC EIR. However, when we assess the full environmental impacts of Travel & Tourism, we include a global measurement of its supply chain activity. This allows us to understand the environmental impacts embedded within its imported goods. These impacts are characterised as **supply chain** environmental impacts.[7] Throughout the research, these are split between domestic (in-country) and international components.

2.1.3 Induced impacts

Induced impacts capture the GDP and jobs supported by spending of Travel & Tourism employees, and those employed along its supply chain. They are calculated using the GSM, by incorporating official data on the average household consumption basket in each country. The GSM disaggregates induced impacts along industrial lines, consistent with the other two channels.

We note that Travel & Tourism's induced impact is only considered in terms of economic and social metrics (i.e., GDP and employment) due to the lack of a corresponding concept in environmental measurement and reporting. Where our report discusses "total" Travel & Tourism environmental impacts or intensities, it encompasses only the direct and (global) indirect economic measurements.

[7] The research assesses only supply chain emissions – the upstream emissions associated with the production of the goods and services consumed by tourists. A full value chain assessment would also include downstream emissions associated with consumers' use of purchased products. Travel & Tourism is primarily a service sector (89% of spending occurs in service industries). This means that Travel & Tourism has a limited downstream footprint . Therefore, the value chain is approximately equivalent to the upstream supply chain. Note that there are some exceptions to this such as the disposal of waste generated in Travel & Tourism activities, or fuel used in a tourist's private car journey. These exceptions are not addressed in this study.

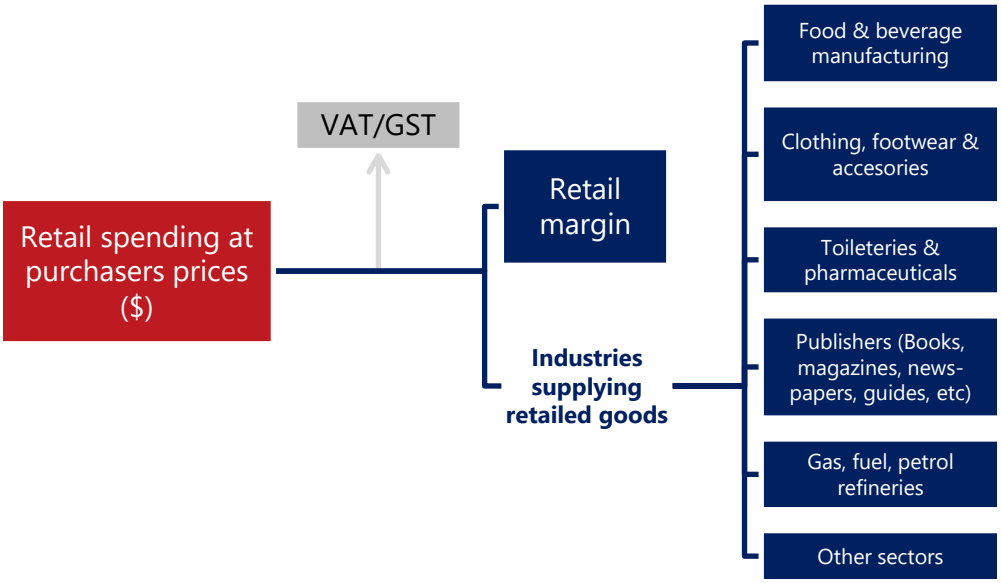
2.2 THE TREATMENT OF TOURISTS' RETAIL SPENDING

Most of the spending categories in TSA data correspond to just one GSM industry (see Fig. 3 above). However, retail is a special case: retail spending generates direct impacts across many industries because retail acts as a 'margins' activity under national accounting rules. The retail industry includes all shops, department stores, stalls and markets, street vendors, vending machines, etc, but excludes sales directly from farmers (i.e., food from farm shops). Retailers' primary activity is to facilitate consumers' purchases rather than to produce commodities. In essence, retailers act as a 'middleman' between consumers and (non-retail) producer industries.

The 'production' of the retail industry is therefore measured as the gross margin it achieves on the items it sells. This margin represents the valuation of the services that retailers provide to consumer. The remainder of the purchasers' spending flows to the industries that produced the goods.

Ascribing all of tourists' spending as revenues to the retailer would overstate the economic and environmental impact within the retail industry. Distributing the spend among the producing industries allows the appropriate retail impact (via margins) to be estimated. Fig. 5 below illustrates the treatment of tourists' retail spending and its onward flow to industries. The blue-shaded boxes collectively represent the direct impact of tourists' retail spending.

Fig. 5. Depiction of how retail spending flows through our models to estimate direct impacts



The manufacturing sub-industries in Fig. 5 are not part of the *supply chain* of retailers - and so do not form part of the *indirect* impact of retail spending, but rather are captured in its *direct* impact. Supply chain inputs are defined as goods and services that are transformed or 'consumed' to create a new product.[8] In circumstances where goods are sold in the same condition as they were purchased, they are not considered inputs.

[8] An example of this would be the transformation of raw metals into a fabricated metal product.

2.2.1 The composition of retail spending

Our estimation of how retail spending breaks down across industries is based on the typical household retail consumption basket for residents in each country. This information is drawn from each country's published or estimated I-O table.[9] This is a necessarily simplistic assumption, in the sense that we have not assumed a 'tourist-specific' basket of retail goods that might differ from the average consumer's choices. This is because:

- TSAs do not typically break down the composition of retail spending by tourists, meaning other sources would be needed to break this down into industries.
- It would be possible to estimate a tourist-specific' basket of retail goods but this would be based on a small number of developed countries which publish the required data. This is not sufficiently representative.
- Using household consumption as a template for tourism spending means we can calculate country-specific retail baskets, informed by industries' relative strength in the local economy. It also allows us to capture countries' import-dependence in each industry.
- The household consumption basket captures differences in relative price levels in each country.[10]

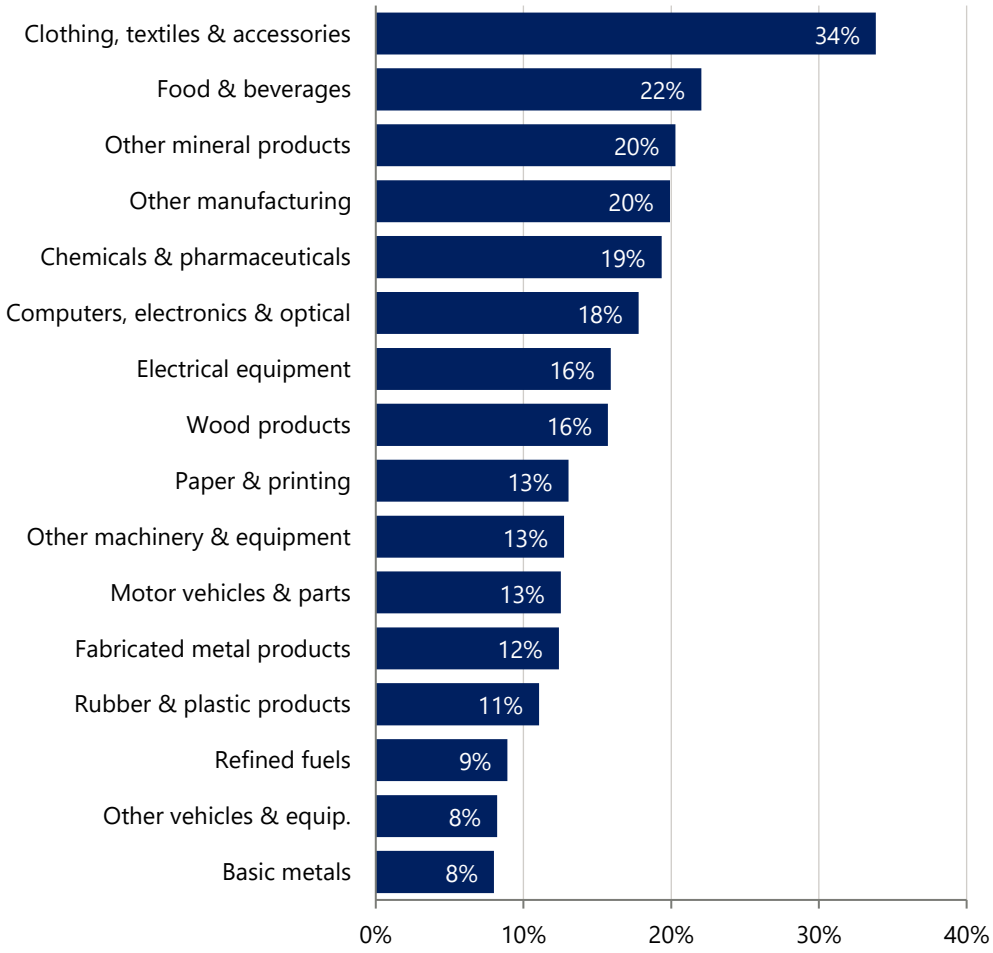
Based on this method, about two-thirds (65%) of all tourist retail spending is allocated to food and beverages, clothing and footwear, and toiletries/cosmetics. The exact basket of retailed goods varies by country.[11]

2.2.2 Calculating the retail margin

For each product in the retail basket, some share of the price flows to retailers in the form of margins (see Fig. 5). These margins, derived for each country through the I-O framework, are applied to the retail expenditure to derive the share of this spending that is 'captured' by the retail industry (see Fig. 6). The remainder flows to manufacturing industries (domestic and international).

[9] A complete list of sources for I-O tables, along with any proxy sources used, are set out in the appendix to this document.
[10] For example, a 'template' tourist spending profile, derived from developed nations' data (where fuels are more expensive) would exaggerate the scale of fuel purchases if applied to a country in the Middle East (where fuels are relatively cheaper).
[11] Further detail is provided in the Appendix.

Fig. 6. Estimated average margin rates (retail and wholesale margin, as a percentage of purchase at consumer prices), world average, 2019



2.2.3 Direct impacts in the retail industry

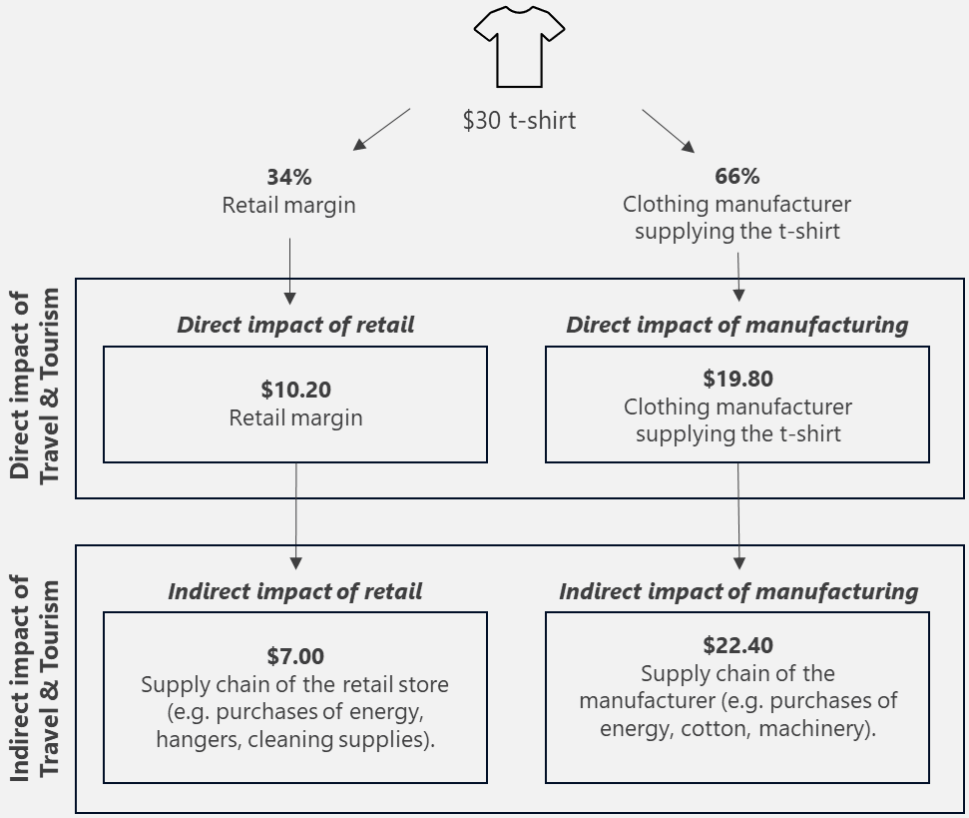
The retail margin of tourists' retail spending is assigned to the retail industry to estimate direct impacts. We can then quantify the contribution of retail to Travel & Tourism's environmental footprint. The direct environmental impacts, attributed to the retail industry, encompass (for example):

- GHGs from the gas boilers (or other fuels) for space heating in shops and shopping centres. It also includes emissions by any vehicles and machinery owned by retailers or retail companies.
- The water used by retail premises for cleaning and sanitation, fountains, etc.
- The energy consumed to supply electricity to retailers, shopping malls or markets; whether by electricity grids or by local/on-site generators.
- Pollution contributed by on-site gas boilers, or fertilizers applied on outdoor vegetation, or vehicles owned and operated by the retailer.

The retail industry's direct environmental impacts exclude the impacts embodied in any of its products. These impacts are assessed in the various manufacturing industries.

EXAMPLE: THE IMPACT OF PURCHASING A SOUVENIR T-SHIRT

Consider the impact of a tourist purchasing a souvenir from a retail shop. This purchase would create a direct and indirect impacts via both the retail and clothing manufacturing industries:



3. THE ENVIRONMENTAL FOOTPRINT OF TRAVEL & TOURISM

Travel & Tourism's environmental footprint is estimated based on the sector's economic footprint across this study's 34 industries and 185 countries. Environmental impacts are estimated using the average environmental- and resource-intensity of each industry (see Chapter 5.2 for detail).

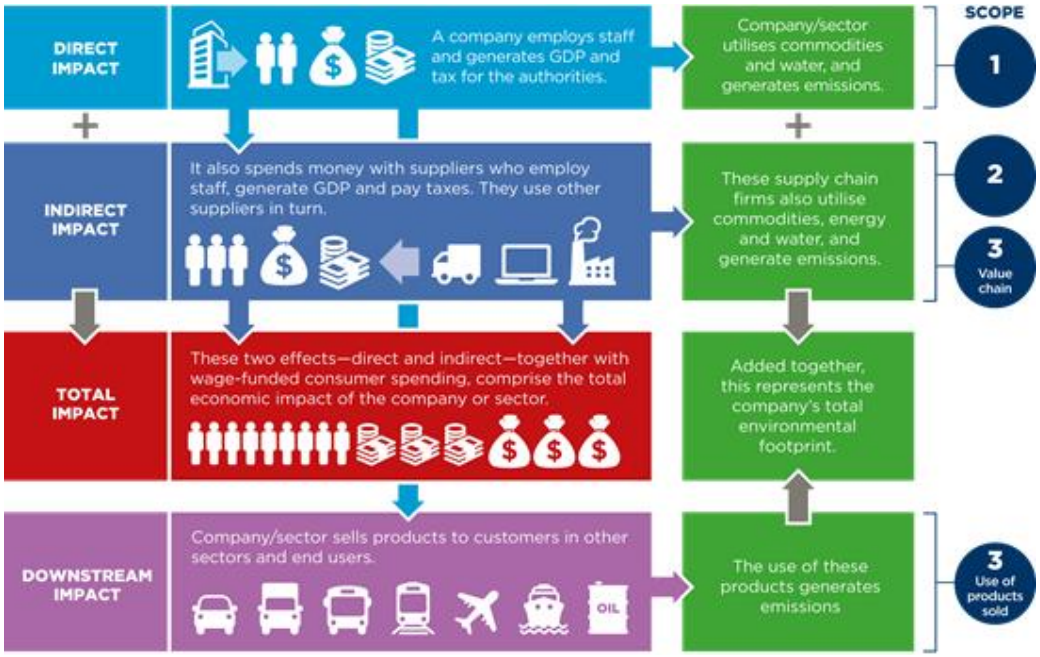
The environmental impacts are calculated in a similar way to the economic impacts using the I-O framework. Economic impacts are quantified based on each industry's production volume, along with its average rate of productivity, labour-intensity, its propensity to generate tax revenues, etc. Environmental impacts are likewise estimated using each industry's production volume, along with (e.g.) its average rate of greenhouse gas emission intensity, water consumption intensity, etc.

The environmental footprint of Travel & Tourism is categorised differently than its economic impact. Rather than direct, indirect, and induced channels, we discuss:

- **Direct** or **Scope 1**: The environmental impacts of activities and businesses that directly serve Travel & Tourism demands, and
- **Supply chain:** The environmental impacts created within Travel & Tourism supply chains.

For greenhouse gas (GHG) emissions, supply chain emissions are equivalent to Scope 2 and (a subset of) Scope 3, as defined by the GHG Protocol. An alignment between economic impact channels and environmental impact channels is illustrated in Fig. 7 below.

Fig. 7. Alignment between economic and environmental impact channels [12]



[12] We note that the "use of products sold", i.e., the downstream aspects of Scope 3, are outside the scope of the GSM and are not included here. To this extent, our estimates could be considered conservative. See Fig. 11 in the Appendix for further detail.

3.1 DIRECT (SCOPE 1) ENVIRONMENTAL IMPACTS

Direct environmental impacts of Travel & Tourism are allocated to the nation or territory where spending occurs. This covers all industries and businesses that generate Travel & Tourism direct GDP and employment in each country. Some examples of these direct environmental impacts below:

- **Transportation:** The fuels used and air pollution emitted by vehicles carrying tourists, domestic marine and aviation tourism, heating and water use in transport firms and HQs.
- **Accommodation:** The fuels burned by hotel boilers to heat rooms, the water used for cleaning/house laundry, grounds maintenance, etc.
- **Food & beverage**: Emissions from fuels for space heating, gas or coals used in cooking, water used for food preparation and cleaning, etc.
- **Retail:** The fuels burned for space heating in shops; water used by employees for drinking or cleaning, etc. It will exclude resource consumption embodied in any of the sold products.
- **Recreation, culture & sports:** water used to maintain greens and pitches; fuels used in space heating for recreational venues.

3.2 ENVIRONMENTAL IMPACTS IN THE SUPPLY CHAIN

Environmental impacts in the supply chain extends beyond the direct tourism market. These impacts include all 'upstream' resource consumption and pollution in the supply chain. Our framework maps these impacts to specific countries and regions of the world.

For example, the tourism sector in Country A features a supply chain that causes environmental impacts within Country A. Importantly, this includes the electricity consumption that comprises Scope 2 emissions and is a significant driver of all global emissions.[13] It also includes the resource use of all domestic supply chain activity that supports local Travel & Tourism.

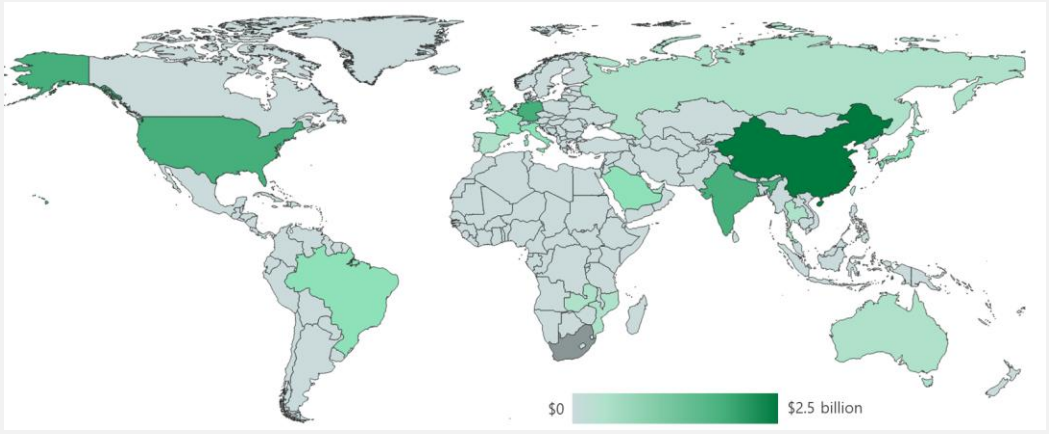
However, Country A's supply chain extends beyond its own borders. These impacts can be identified and disaggregated based on the supply chain model in the GSM, and include upstream resource consumption, such as the embedded GHG emissions, energy and water use.

EXAMPLE: THE SUPPLY CHAIN OF TRAVEL & TOURISM IN SOUTH AFRICA

In 2022, tourists in South Africa spent $26.7 billion, which generated global supply chain transactions worth around $58.5 billion. While the vast majority (83%) of this supply chain activity occurred domestically within South Africa, 17% (or $9.8 billion) occurred internationally. Fig. 8 shows the geographic distribution of South Africa's Travel & Tourism supply chain.

[13] Our estimates of emissions and energy use from electricity generation follow a 'grid-average' approach. This means the emissions-intensity of power generation in Country A is assumed be the same for all consuming sectors. It reflects the average mix of generation technologies in use in the country. The GSM does not contain detail on (e.g.) self-generation, or industry-specific renewable electricity contracts, that would mean that electricity purchases of certain industries are less polluting than others.

Fig. 8. South Africa's international Travel & Tourism supply chain



4. INTERNATIONAL TRANSPORT EMISSIONS

4.1 INTERNATIONAL AVIATION

National GHG inventories exclude emissions from international aviation. Domestic aviation is included in national totals, but international aviation and marine emissions are recorded and reported separately by convention. This means that the Travel & Tourism emissions modelling described previously in this document (based on national inventories) do not cover the emissions linked to international aviation and cruises.[14]

International aviation emissions are calculated at a global level. However, allocating them to countries is not straightforward. A range of options exist (see box below).

OPTIONS FOR ALLOCATING AVIATION EMISSIONS

- **Origin-based**[15]: emissions are assigned to the country where the flight takes off.
- **Origin-based with tourism adjustments:** This refinement of the origin-based method is intended to better-reflect the countries responsible for tourism activity. It pushes emissions more strongly towards the countries that contribute a lot of outgoing tourists, while reducing the burden from countries which predominantly host tourists.
- **Destination-based:** allocates aviation emissions to the destination country (of either the flight, or the passenger).
- **Balanced origin-destination approaches**[16]**:** This method seeks to split aviation emissions between origin and destination country. The rationale is that environmental responsibility is shared between the countries which benefit economically from the person flying between them.

We applied a modified origin-destination approach in this study. Our modified approach also captures the role of hub airports to reflects their key role in facilitating aviation. The emissions from inbound or outbound *flights* at busy hubs are therefore attributed to these hub nations, even though these flights do not generate an equivalent level of inbound or outbound *tourists*.

The starting point for the analysis is OECD's Air Transport CO_2 Emissions figures, an origin-based dataset.[17] However, these data do not provide emissions from international arrivals, and do not cover all countries in our study. We therefore build on these data based on the following method:

[14] National inventories do, however, include emissions domestic aviation and domestic water transport.
[15] The OECD provides origin-based emissions accounting for approximately 150 countries. This provides a comprehensive dataset for international aviation emissions from passenger and cargo flights from 2013-2023.
[16] The UN World Tourism Organization (UNWTO) published a landmark study using this balanced approach: UNWTO, "Transport-related CO2 Emissions of the Tourism Sector" (Modelling results, 2019).
[17] This dataset is CO_2 terms, meaning that the international aviation estimates encompass CO_2 only, rather than a wider GHGs measure. This dataset is used in the absence of an equivalently rich GHGs measure, and uncertainty around the full warming potential of other (non-CO_2) aviation emissions.

(1) Calculate the number of passenger-kilometers (paxkm) departing from and arriving into each country, using passenger flow data and the average distances travelled on flights between airports in each country.
(2) We allocate the CO_2 from outbound flights (sourced from OECD) among all of its destination partners, in proportion to the paxkm observed between each country pair.[18]
(3) We then calculate CO_2 emissions attributable to international arrivals in each country. This is based on the rate of outbound emissions linked to passenger flows from each country calculated in Step 2, and the arriving paxkm from Step 1.
(4) Country estimates are scaled, so that global emissions are equivalent on both an arrivals and departures basis. Our final estimates of each country's aviation CO_2 comprise 50% of the emissions from its departing flights, and 50% of the emissions from arriving flights.

The simplifying assumption implicit in this method is that each route departing a given country 'accrues' CO_2 emissions in proportion to its passenger volumes, rather than in proportion to actual flights and frequencies.[19]

Our method yields comprehensive estimates of emissions associated with arrivals and departures in 185 countries in 2023. We then back-cast emissions estimates for 2019 to 2022 using estimates of outbound emissions in those years from the OECD and a country-specific factor relating departure emissions and arrival emissions in the estimates for the year 2023.

4.2 INTERNATIONAL MARINE TRAVEL

Our estimates for total global cruise emissions are built up from the Scope 1 reporting of major cruise ship companies. Emissions data from Carnival Corporation and Royal Caribbean are used, along with an estimate that they account for roughly 75% of the global cruise market, and 'scaled-up' to cover the entire industry. The allocation among countries then makes use of each country's share of total global cruise passenger arrivals, using data from Tourism Economics' Cruise Intelligence Platform. This is a relatively simple method compared to aviation emissions, reflecting data challenges and conceptual issues involved with the allocation of cruise emissions.

[18] This step involved estimating aviation emissions for countries that did not have OECD data. These estimates are based on the paxkm departing from that country, along with a global average rate of CO_2 emissions per paxkm in that year.
[19] This simplifying assumption is made in the absence of sufficiently detailed flights data.

5. GSM SOURCES

5.1 ECONOMIC MODEL

Underlying the GSM is an environmentally extended input-output (EEIO) table of the global economy. The EEIO builds upon Oxford Economics' comprehensive I-O table that represents the economies of the world. Our I-O table estimates gross output and value-added between 34 industries across 185 countries (and a 'rest of the world' aggregate). Its global scope means we capture economic impact and resource use throughout the world. The base year of the structural economic data is 2019.[20]

Oxford Economics' I-O table is drawn together from a wide variety of sources:

- **Input-output tables:** the OECD's database of I-O tables form the initial basis for the model. We extend this framework across more than 100 additional countries, using additional I-O tables sourced from national statistical offices or built in-house by Oxford Economics.[21]
- **Global trade flows:** information about how each economy interacts with every other is mapped using UNCTAD's trade structure database. This is combined with an estimated bilateral allocation of global services trade by Oxford Economics.
- **National accounts:** We source national accounts information from the Oxford Economics Global Industry databank,[22] national statistics offices, and the UN National Accounts database. This ensures a common base year for the entire model and that our model reflects the actual observed size of all industries in each calendar year.
- **Employment:** The GSM incorporates Labour Force Surveys (LFS) from national statistical agencies, or the International Labour Organisation (ILO). This allows us to allocate global employment into industries.

The full industry disaggregation is set out in the appendix to this document. All economic and environmental variables are aligned to this industry definition.

The level of detail available in national accounts or LFS data are often too aggregated for the GSM, particularly in the case of smaller economies.[23] To achieve greater detail within these aggregated industries, we assume a similar composition of sub-industries as in comparable economies. These comparator nations are selected based on geographic proximity, and for their similar levels of development and comparable economic structure.

[20] The base years of the country I-O tables ranges from 2015 to 2019. The global I-O is harmonised to a 2019 base year.
[21] Oxford Economics constructs input-output tables for countries where no official dataset exists (or if an existing official I-O table is considered old and unrepresentative). These use the published national accounts as a starting point. Our estimation method resolves the known macroeconomic data for a country (output and GDP, labour force data, trade data, etc) and reflects its unique economic characteristics and industrial mix.
[22] This databank, built and maintained by Oxford Economics' Industry team, is sourced from national statistical offices.
[23] For 74 GSM countries, national accounts and employment data are available only at the 1-digit ISIC level, typically covering 16 industries. These countries collectively cover about 2.1% of global GDP in 2023, and around 5.1% of world GHGs. This illustrates that while modelling is used to achieve greater detail across a relatively lengthy set of countries, these countries collectively account for only small shares of Travel & Tourism's global impact.

5.2 ENVIRONMENTAL AND RESOURCE DATA

The GSM uses a range of government, NGO, industry, and academic sources to link environmental impacts to economic activity. These sources use a range of methodologies, generally based on national and industry estimates, along with satellite/earth observation data and spatial modelling.

These sources typically provide environmental data at the national level, or sometimes into high-level sectors. We therefore aligned national totals to the set of industries in the GSM. Our industrial allocation uses a range of methods, depending on the environmental variable. These are discussed throughout this chapter of the document.

5.2.1 Greenhouse gas emissions

Our principal source for GHG emissions data is the PRIMAP-hist dataset.[24] This project is led by the Potsdam Institute for Climate Impact Research and combines several emissions sources (see box below) into a comprehensive GHG inventory for every country and Kyoto gas type. The latest PRIMAP-hist dataset describes all years between 1850 to 2021.[25] The figures we report are headline CO_2-equivalent measure, inclusive of all Kyoto protocol GHGs (CO_2, CH_4, N_2O, HFCs etc).[26]

SELECTED SOURCES OF THE PRIMAP-HIST DATASET

- **UNFCCC** (Framework Convention on Climate Change) national inventory reports and updates.
- **EDGAR** (Emissions Database for Global Atmospheric Research), European Commission's in-house database. It is informed by satellite data that guides the spatial (and thus industrial) distribution of national emissions.
- **CDIAC** (Carbon Dioxide Information Analysis Center), US government's now-discontinued dataset.
- **FAOSTAT database** for estimates of agricultural emissions and fertiliser use.
- **BP Statistical Review of World Energy**

PRIMAP-hist combines these sources into a coherent long-term series, resolving the volatility and conflicts inherent with diverse primary sources and applying smoothing and interpolation where necessary.[27] We use PRIMAP-hist to estimated (e.g.) trends in emissions-intensity, comparisons with economic growth, and international variations. Such analysis would not be possible without the continuous, high-quality emissions data provided by this source.

The PRIMAP-hist data are expressed for every country among the main IPCC 2006 categories, with high-level sectoral disaggregation (e.g., energy, industry, agriculture). Our allocates emissions in each sector to its constituent industries (at an ISIC Rev. 4 level) using national emissions data where available. Almost all European and OECD nations publish an industrial GHGs that can be

[24] Johannes Gütschow, Annika Günther and Mika Pflüger, "The PRIMAP-hist national historical emissions time series v2.3.1 (1850-2019)". Accessed at https://www.pik-potsdam.de/paris-reality-check/primap-hist/

[25] We use timelier data from the BP Statistical Review to project GHG inventories beyond 2021, to encompass 2023.

[26] Emissions from biomass burning/forest fires, and from land-use, land-use change and forestry (LULUCF) are excluded.

[27] It should be noted that these estimations and smoothing can mean that PRIMAP-hist estimates do not always match exactly with any other single source.

straightforwardly mapped to the GSM industries. For the nations that do not publish industrial breakdowns, we estimate industrial emissions based on:

- The national inventory GHG emissions totals by IPCC category, from PRIMAP-hist.
- The industrial structure of the country in question, from national economic accounts.
- The estimated consumption of emissions-linked commodities, such as oil, natural gas, and refined (oil-derived) fuels by each industry, modelled using Oxford Economics' I-O database.

This method yields estimated emissions by each GSM industry per country and year. Each industry's GHG emissions are then expressed as a proportion of their gross output (in dollar terms). This is the *GHG emissions intensity*, measured in terms of mass per dollar of output. Our subsequent modelling allocates Travel & Tourism-related spending among industries and derives the emissions associated with this production based on industries' emissions intensities.

International transportation emissions are measured separately in the PRIMAP-hist dataset, and are allocated according to the methodology discussed in Chapter 4.

5.2.2 Air pollutants

Pollution data is sourced from the European Commission's Emissions Database for Global Atmospheric Research (EDGAR) database.[28] This provides national time series estimates for a range of air pollutants, disaggregated into IPCC categories. We estimate the following pollutants:

- **Particulate matter (PM):** tiny inhalable particles including dust, mould, minerals, and other chemicals. The metrics include the most common two measures: PM2.5 (particles of 2.5 microns or less in diameter) and PM10 (particles with a diameter of 10 microns or less).
- **Carbon monoxide (CO)**: a toxic gas linked to vehicles and industrial processes.
- **Non-methane volatile organic compounds (NMVOCs):** a class of harmful chemicals associated with fuel burning, solvents and cleaning products.
- **Ammonia (NH3)**: commonly produced by agricultural activities, which can damage plant and soil health.
- **Nitrogen oxides (NOx):** a class of poisonous gases linked respiratory problems and ecosystem damage.

We combine these air pollution estimates with the national accounts and I-O accounts for each country to identify each industry's size in output terms and its relative consumption of pollution-linked fuels and commodities. Each industry's estimated pollution footprint was also informed by the typical air pollutant intensity of that ISIC industry. This was represented by an index, developed using pollution data across 30 European and OECD countries that are disaggregated across an ISIC-linked industrial scheme.

[28] Crippa, Monica and Guizzardi, Diego and Muntean, Marilena and Schaaf, Edwin and Oreggioni, Gabriel (2019). EDGAR v5.0 Global Air Pollutant Emissions. European Commission, Joint Research Centre (JRC). http://data.europa.eu/89h/377801af-b094-4943-8fdc-f79a7c0c2d19. Date accessed: 30 November 2022

The air pollutants associated with international aviation and marine travel are identified separately in the EDGAR database. These pollutants are measured at a global scale. We assess a share of these global totals to individual countries, in proportion to their share of international Travel & Tourism GHGs, as described in Chapter 4.

For four air pollutants (PM2.5, NMVOCs, CO, and NOx), we also compare the Travel & Tourism-linked air pollution in each country with its existing, baseline level of exposure to these air pollutants. These exposure levels are sourced from Yale University's Environmental Performance Index.[29]

5.2.3 Water use

Water use in this analysis refers to fresh water—water drawn from renewable freshwater resources (e.g., rivers, lakes, and groundwater) by human infrastructure.[30] It is based on statistics from the UN Food and Agriculture Organisation's statistics (UN FAO AQUASTAT). Our calculations also include the direct use of non-conventional sources (e.g., treated wastewater, desalination).

In our reporting, the terms water *use*, water *withdrawals* and water *consumption* may be used interchangeably and do refer to different concepts. Water *footprint* is used to mean total direct and indirect water use (i.e., inclusive of the embodied water in products purchased by Travel & Tourism from its supply chain).

AQUASTAT national water use data are split into three broad categories:

- **Agriculture**: fresh water used for irrigation, livestock, and aquaculture purposes. Principally self-supplied, rather than drawn from public mains water networks.
- **Industry**: water used by mining, manufacturing, power supply and construction industries. Principally self-supplied.
  Municipal: primarily the fresh water that is supplied via public networks to commercial and domestic users. This subcategory is interpreted to represent water consumption by service industries and households.[31] However, it also includes some water used by agriculture or industrial firms (for example, those in urban centres and/or small-scale activities that use mains water rather than a dedicated self-supply).

Our analysis disaggregates these three AQUASTAT sectors into the GSM industries using country I-O tables. These tables measure industries' purchases of various products including water[32] and can be used to estimate how much of each AQUASTAT water demand category is contributed by each GSM industry.

[29] Environmental Performance Index, Yale University (2021): a population-weighted average of air quality measurement readings for four separate pollutants.

[30] Our water use analysis is broadly comparable with the 'blue' water footprint, as defined by the Water Footprint Network (WFN). The WFN concept includes other categories of water use. Green water refers to rainwater collected in soil and embedded in harvested crops. Grey water is an estimate of the volume of freshwater needed to dilute waterborne pollution sufficiently to ensure that prevailing water quality standards are met.

[31] Service sectors here refer to ISIC Rev.4 divisions 45-98.

[32] The product flows described in I-O accounts are measured in monetary values, which include imputed values for commodities used by an industry but not purchased from an external party, i.e., those which are produced and consumed by the same entity (e.g., self-supplied water). As such, the monetary values can be considered broadly representative of total water use.

5.2.4 Energy use

The main source of energy data within the GSM is the International Energy Agency's (IEA) World Energy Balances dataset.[33] This measures the total production, supply, transformation, and consumption of energy throughout the world. These energy data are presented across the following forms, which we aggregate into the three broad categories:

- **Fossil fuels:** including coal, oil, and natural gas.
- **Low-carbon energy:** renewables (e.g., solar, wind, wave, and geothermal), traditional hydroelectricity, and nuclear.
- **Biofuels and waste:** this category includes different activities in different regions and income levels. In lower-income regions, it predominantly involves (e.g.) wood and charcoal fires, and domestic and industrial waste burning. In higher-income areas, this energy category features a higher prevalence of bio-additives to gasoline and diesel, such as crop-derived ethanol.

These IEA data include a limited industrial disaggregation, allowing us to allocate and map energy flows both between the main energy industries (i.e., from extraction, to refining/petrochemicals, and electricity), as well as the final consumption by industry, disaggregated among several high-level economic sectors. We then allocate the energy use of these aggregated sectors into the GSM industries in proportion to each industry's consumption of energy commodities, again using each country's I-O accounts.[34]

Some countries are not included in the IEA dataset. Here, we model their energy use based on their estimated share of regional totals.[35] Where detailed breakdowns of energy sources are not available, these are estimated based on the regional energy mix, with appropriate exclusions applied for countries do not draw electricity from (e.g.) nuclear or hydroelectric sources.

The energy demand associated with international aviation and marine travel is stated separately in the IEA data. We allocate these global energy use totals among the countries of the study, in the same proportion as the GHGs allocation described in Chapter 4.

Our measure of direct energy use includes all final uses of energy by each industry, including its own direct consumption of energy (e.g., burning natural gas in a boiler, diesel fuel in a generator or vehicle engine), as well as their electricity use. The electricity consumed by each industry is assumed to have been supplied by the average mix of generation technologies in use in that country and year. Indirect energy use describes the energy that is embedded in purchased inputs of goods and services.

[33] IEA, "Energy balances", in Data and statistics, accessed January 2023. https://www.iea.org/data-and-statistics/

[34] When estimating the energy use of the electricity generation sector, the sector's own-use of energy and losses in transformation are included.

[35] This is based on each country's economic accounts, and World Bank measures of energy use per unit GDP.

5.2.5 Materials use

Our estimates for materials use draw upon the UN Environment Programme (UN EP)'s global material flows database.[36] This dataset forms the basis for UN materials footprint data and similar research, that measures the extent of all countries' extraction, consumption, and trade of various raw materials:

- **Biomass:** encompassing crops and crop residues, animal grazing of biomass, wood and timber, and fishing;
- **Fossil fuels:** including all coal, oil and natural gas-derived energy products;
- **Metal ores:** ferrous and non-ferrous ores; and
- **Non-metallic minerals:** construction (e.g., stone, sand, and clay) and other industries (e.g., chemicals and fertilizer minerals, salts).

We allocate domestic materials extraction to the primary industries in our model (agriculture, forestry, fishing, mining of energy products and mining of non-energy products). This allows us to estimate indirect demand for these materials from Travel & Tourism, by modelling their supply chain interactions with these primary industries.

[36] UNEP IRP Global Material Flows Database (2022). https://www.resourcepanel.org/global-material-flows-database

6. SOCIAL IMPACT

Our analysis estimates three social dimensions of Travel & Tourism's employment impact. This analysis builds on the WTTC EIR data, so includes the direct, indirect, and induced impacts of the industry.

6.1 GENDER AND AGE SPLITS

This project measures the distribution of Travel & Tourism's employment benefits among two important demographic categories: gender and age. Our method is similar in both cases. Using the WTTC EIR employment estimates as a starting point, the industry breakdown described in Chapter 2 means Travel & Tourism's direct, indirect, and induced employment contributions are linked to GSM industries. These can then be aligned with official data on employment by industry, split by personal characteristics such as age and gender.

We estimate the female share of Travel & Tourism employment by multiplying industry employment figures by the female share of employment within each industry. These shares were estimated using official statistics from national statistics offices, Eurostat, and the ILO.

Employment by age is presented in two categories: young people (aged 15 to 24) and older adults (aged 25 and older). While not a particularly detailed breakdown, these categories facilitate comparisons across the broadest possible range of countries. The youth share of Travel & Tourism employment is estimated using the GSM employment data, along with official estimates of sectoral employment that falls within the 15-24 and 25+ age groups.

6.2 HIGH-WAGE EMPLOYMENT

We sought to break down Travel & Tourism's employment footprint by earnings to understand more about the relative quality of the jobs it creates and supports along the supply chain. However, this is challenging because harmonised international wage data is patchy at best. There are wide variations in the sources, methods, timeliness, concepts, and coverage of such data. International comparisons are also further complicated by currency effects and differences in price levels and purchasing power.

We have therefore adopted crude measure of 'high-wage' industries. Industry-average wage levels are estimated using the sources and definitions available in each country. These industry averages are then compared to the national earnings distribution: if an industry's average wage would place it roughly in the top third of earnings in that country (above the 65th percentile), it is classified as a high-wage industry. The 'high-wage' designation is therefore a binary indicator, and any Travel & Tourism-linked employment that falls in those industries is defined as high-wage.

This approach is necessarily simple due to the data challenges involved. The intention was to assess the relative quality and desirability of Travel & Tourism jobs, in a broadly consistent manner across countries. It should be noted that what high-wage means (in cash terms) is different in every country, and implies a different standard of living in every country. Indeed, our designation does not assert that this earnings level is sufficient for a worker to live well or avoid significant hardship, only that someone earning their industry-average wage would be roughly among the top third of earners in their country.

APPENDIX

Fig. 9. ISIC categories contained in the GSM and in simplified OE/WTTC results industries

Simplified category	ISIC Rev. 4 Code	Industry Detail
Agriculture & Food	01-03	Agriculture, forestry and fishing
	10-12	Food products, beverages and tobacco
Manufacturing	13-15	Textiles, clothing and accessories
	16	Wood products and parts
	17-18	Paper products and printing
	19	Petroleum refining
	20-21	Chemicals and pharmaceuticals
	22	Rubber and plastic products
	23	Other (non-metallic) mineral products
	24	Basic metals
	25	Fabricated metal products
	26	Computers, electronics and optical products
	27	Electrical equipment
	28	Other machinery and equipment
	29	Motor vehicles and parts
	30	Other transport equipment
	31-33	Other manufacturing; R&M
Utilities	35-39	Electricity, gas, water and waste services
Retail and Wholesale	45-47	Wholesale and retail trade
Transportation	49-53	Transportation and storage
Hospitality	55-56	Accommodation and food services
Other	05-06	Mining and extraction (energy products)
	07-08	Mining and extraction (non-energy products)
	09	Mining support services
	41-43	Construction
	58-60	Publishing and broadcasting activities
	61	Telecommunications
	62-63	IT and other information services
	64-66	Finance and insurance
	68	Real estate activities
	69-82	Other business sector services
	84	Public administration
	85	Education
	86-88	Human health and social work
	90-96	Arts, entertainment, recreation and other services
	97-98	Private households as employers

Fig. 10. Income category and regional classifications used in the study

Region	High income	Upper middle income	Lower middle income	Low income
Africa	Reunion Seychelles	Botswana Gabon Libya Mauritius Namibia South Africa	Algeria Angola Benin Cameroon Cape Verde Comoros Cote d'Ivoire Egypt eSwatini Ghana Kenya Lesotho Morocco Nigeria Republic of Congo Sao Tome and Principe Senegal Tanzania Tunisia Zimbabwe	Burkina Faso Burundi Central African Republic Chad DR Congo Ethiopia Guinea Madagascar Malawi Mali Mozambique Niger Rwanda Sierra Leone Sudan The Gambia Togo Uganda Zambia
Americas	Anguilla Antigua And Barbuda Aruba Barbados Bermuda British Virgin Islands Canada Cayman Islands Chile Curacao Guadeloupe Martinique Panama Puerto Rico St. Kitts and Nevis The Bahamas Trinidad And Tobago United States Uruguay US Virgin Islands	Argentina Belize Brazil Colombia Costa Rica Cuba Dominica Dominican Republic Ecuador Grenada Guatemala Guyana Jamaica Mexico Paraguay Peru St. Lucia St. Vincent & Grenadines Suriname Venezuela	Bolivia El Salvador Haiti Honduras Nicaragua	
Asia-Pacific	Australia Brunei Hong Kong Japan Macao New Zealand Singapore South Korea Taiwan	China Fiji Kazakhstan Malaysia Maldives Other Oceanic States Thailand Tonga	Bangladesh Cambodia India Indonesia Kiribati Kyrgyzstan Laos Mongolia Myanmar Nepal Pakistan Papua New Guinea Philippines Solomon Islands Sri Lanka Tajikistan Uzbekistan Vanuatu Vietnam	

Region	High income	Upper middle income	Lower middle income	Low income
Europe	Austria Belgium Croatia Cyprus Czechia Denmark Estonia Finland France Germany Greece Hungary Iceland Ireland Italy Latvia Lithuania Luxembourg Malta Netherlands Norway Poland Portugal Romania Slovak Republic Slovenia Spain Sweden Switzerland United Kingdom	Albania Armenia Azerbaijan Belarus Bosnia and Herzegovina Bulgaria Georgia Moldova Montenegro North Macedonia Russia Serbia Türkiye	Ukraine	
Middle East	Bahrain Israel Kuwait Oman Qatar Saudi Arabia United Arab Emirates	Iraq Jordan	Iran Lebanon	Syria Yemen

Fig. 11. Resolution of coverage of 'Scope 3 emissions' (GHG Protocol) and 'Supply Chain emissions' (Oxford Economics GSM)

GHG Protocol Category		Protocol designation	Included in GSM?	Note/further detail
1	Purchased goods and services	Upstream	Yes	Emissions embedded in reporter's intermediate purchases
2	Capital goods	Upstream	Yes	Emissions embedded in reporter's capital purchases
3	Fuel- and energy-related emissions not included in scope 1 or 2	Upstream	Yes	
4	Upstream transportation and distribution	Upstream	Yes	(a) Transportation & distribution of purchased products, between Tier 1 suppliers and reporter's own operations (b) Transportation and distribution services purchased by reporting company (inbound logistics, outbound logistics, external transport providers between reporters' sites)
5	Waste generated in operations	Upstream	Yes	Disposal/treatment of waste generated in reporter's operations (by external provider)
6	Business travel	Upstream	Yes	Transportation of employees for business-related activities during the reporting year (in vehicles not owned or operated by the reporting company)
7	Employee commuting	-	No	Transportation of employees between their homes and their worksites during the reporting year (in vehicles not owned or operated by the reporting company)
8	Upstream leased assets	Upstream	Yes	Applicable to companies that operate leased assets.
9	Downstream transport and distribution	Downstream	No	Downstream use/disposal of sold products
10	Processing of sold products	Downstream	No	Downstream use/disposal of sold products
11	Use of sold products	Downstream	No	Downstream use/disposal of sold products
12	End-of-life treatment of sold products	Downstream	No	Downstream use/disposal of sold products
13	Downstream leased assets	Downstream	No	Emissions from assets owned by reporter but leased to others, and not in Scope 1 or 2
14	Franchises	Downstream	No	Emissions from operating franchises not included in Scope 1 or 2
15	Investments	Downstream	No	Downstream category covering equity, debt, project finance, and managed investments. Mainly applicable to banks and other investment managers

In Fig. 12 below, **source of I-O table** describes the main source of the I-O accounts underpinning our calculations. Where this source is stated as Oxford Economics, this means that the I-O model of that country was estimated by OE. Our method uses up-to-date (2019) national accounting information as a starting point, and applies an assumption about the economic structure of the country. This assumption can take one of two forms:

- **Older country-specific source:** Where the country has some available SUTs or I-O accounts, but they are quite dated, we estimate an updated version of this model. This update is constrained to the country's economic situation in 2019 (in terms of GDP, industry output, imports and exports, final consumption, etc).
- **Proxy country used:** Where the country does not have available I-O information to our knowledge, we begin with the I-O accounts of a comparable country. This information is then adapted iteratively, to converge and cohere with the country's own economic structure in 2019. This means each I-O model is specific to the country in question (in terms of industry output, consumption and investment, imports and exports etc). Our calculations do not simply calculate multipliers from a proxy country and assign them to new geographies.

Fig. 12. Sources of I-O information

		Where models are OE-estimated:	
Country	**Source of I-O Table**	**Older Country-Specific Source**	**Proxy Country used**
United States	OECD	:	:
China	OECD	:	:
Germany	OECD	:	:
Japan	OECD	:	:
United Kingdom	OECD	:	:
France	OECD	:	:
Italy	OECD	:	:
India	OECD	:	:
Spain	OECD	:	:
Mexico	OECD	:	:
Brazil	OECD	:	:
Australia	OECD	:	:
Thailand	OECD	:	:
Canada	OECD	:	:
Netherlands	OECD	:	:
Philippines	OECD	:	:
Russia	OECD	:	:
Türkiye	OECD	:	:
Saudi Arabia	OECD	:	:
South Korea	OECD	:	:
Indonesia	OECD	:	:
Switzerland	OECD	:	:
UAE	Oxford Economics	Qatar (2010), Emirates Stats Offices I-Os (2014-15)	
Austria	OECD	:	:
Macao	Oxford Economics	:	Hong Kong
Hong Kong	OECD	:	:
Argentina	OECD	:	:
Malaysia	OECD	:	:
Greece	OECD	:	:
Singapore	OECD	:	:
Portugal	OECD	:	:
Sweden	OECD	:	:

		Where models are OE-estimated:	
Country	**Source of I-O Table**	**Older Country-Specific Source**	**Proxy Country used**
Taiwan	OECD	:	:
Iran	Oxford Economics	:	Türkiye
Norway	OECD	:	:
Belgium	OECD	:	:
New Zealand	OECD	:	:
Poland	OECD	:	:
Egypt	Egypt CAPMAS	:	:
Chile	OECD	:	:
South Africa	OECD	:	:
Vietnam	OECD	:	:
Israel	OECD	:	:
Denmark	OECD	:	:
Finland	OECD	:	:
Peru	OECD	:	:
Qatar	Oxford Economics	Qatar MDPS SUTs (2010)	
Nigeria	Oxford Economics	:	Ghana
Ireland	OECD	:	:
Pakistan	Asia Development Bank	:	:
Colombia	OECD	:	:
Czechia	OECD	:	:
Croatia	OECD	:	:
Romania	OECD	:	:
Morocco	OECD	:	:
Dominican Republic	DR Central Bank	:	:
Hungary	OECD	:	:
Iraq	Oxford Economics	:	Iran
Other Oceanic States	Oxford Economics	:	Philippines
Cuba	Oxford Economics	:	Dominican Rep.
Panama	Panama National Stats	:	:
Lebanon	Oxford Economics	:	Israel
Ukraine	Ukraine National Stats	:	:
Algeria	Oxford Economics	:	Egypt
Uruguay	Oxford Economics	:	Argentina
Bangladesh	Asia Development Bank	:	:
Sri Lanka	Oxford Economics	Sri Lanka DSC SUTs (2010)	
Kenya	Oxford Economics	:	:
Luxembourg	OECD	:	:
Jordan	Oxford Economics	:	Egypt
Kuwait	Kuwait CSB (2015)	:	:
Costa Rica	OECD	:	:
Cambodia	OECD	:	:
Bulgaria	OECD	:	:
Kazakhstan	OECD	:	:
Slovakia	OECD	:	:
Tanzania	Oxford Economics	Tanzania NBS I-O (2015)	
Puerto Rico	Oxford Economics	Puerto Rico Planning Board SUTs (2007)	
Slovenia	OECD	:	:
Ethiopia	Oxford Economics	EU Ethiopia SAM (2015-16)	
The Bahamas	Oxford Economics	:	Puerto Rico
Ecuador	Ecuador Central Bank	:	:
Tunisia	OECD	:	:
Iceland	OECD	:	:
Oman	Oxford Economics	:	Saudi Arabia
Bahrain	Oxford Economics	:	UAE
Cote d'Ivoire	Oxford Economics	:	Nigeria
Georgia	Oxford Economics	:	Russia

		Where models are OE-estimated:	
Country	**Source of I-O Table**	**Older Country-Specific Source**	**Proxy Country used**
Jamaica	Oxford Economics	JamStat I-O (2007)	
Myanmar	Oxford Economics	:	Cambodia
Guatemala	Oxford Economics	:	Mexico
Ghana	Oxford Economics	Ghana SS SAM (2015)	
Belarus	Oxford Economics	:	Russia
Azerbaijan	Oxford Economics	:	Iran
Estonia	OECD	:	:
Venezuela	Oxford Economics	:	Colombia
Cyprus	OECD	:	:
Lithuania	OECD	:	:
Cameroon	Oxford Economics	:	Nigeria
El Salvador	El Salvador Central Bank		:
Albania	Oxford Economics	:	Greece
Serbia	Oxford Economics	:	Romania
Maldives	Oxford Economics	:	Sri Lanka
Uzbekistan	Oxford Economics	:	Kazakhstan
Honduras	Honduras Central Bank	:	:
Mauritius	Oxford Economics	:	Sri Lanka
Angola	Oxford Economics	:	DR Congo
Latvia	OECD	:	:
Sudan	Oxford Economics	:	Ethiopia
Malta	OECD	:	:
Bolivia	Oxford Economics	Bolivia INE SUTs, 2014	
Nepal	Oxford Economics	:	India
Uganda	Oxford Economics	IFPRI Uganda SAM (2013)	
Aruba	Oxford Economics	:	Trinidad & Tobago
Reunion	Oxford Economics	:	Sri Lanka
Senegal	Oxford Economics	:	Cote d'Ivoire
Botswana	Oxford Economics	:	South Africa
Bosnia & Herzegovina	Oxford Economics	:	Croatia
Namibia	Oxford Economics	IFPRI Namibia SAM (2007)	
Laos	Oxford Economics	:	Thailand
Trinidad & Tobago	Oxford Economics	:	Jamaica
Madagascar	Oxford Economics	:	Mozambique
Armenia	Oxford Economics	:	Turkey
Zambia	Oxford Economics	Zambia CSO SUTs (2010)	
Fiji	Oxford Economics	:	New Zealand
Montenegro	Oxford Economics	:	Croatia
Paraguay	Oxford Economics	:	Brazil
Mali	Oxford Economics	:	Cote d'Ivoire
Libya	Oxford Economics	:	Egypt
Barbados	Oxford Economics	:	Trinidad & Tobago
Syria	Oxford Economics	:	Turkey
Yemen	Oxford Economics	:	Saudi Arabia
Zimbabwe	Oxford Economics	:	Zambia
Antigua & Barbuda	Oxford Economics	:	Trinidad & Tobago
St. Lucia	Oxford Economics	:	Jamaica
Virgin Islands (US)	Oxford Economics	:	Puerto Rico
Cayman Islands	Oxford Economics	:	Puerto Rico
Rwanda	Oxford Economics	Rwanda NISR SUTs (2011)	
Bermuda	Oxford Economics	:	Panama
Nicaragua	Oxford Economics	:	Honduras
Guadeloupe	Oxford Economics	:	Puerto Rico
Mongolia	Oxford Economics	:	Kazakhstan
DR Congo	Oxford Economics	DR Congo INS SAM (2013)	
Mozambique	Oxford Economics	UN Mozambique SAM (2015)	

		Where models are OE-estimated:	
Country	**Source of I-O Table**	**Older Country-Specific Source**	**Proxy Country used**
North Macedonia	Oxford Economics	:	Greece
Kyrgyzstan	Oxford Economics	:	Kazakhstan
Haiti	Oxford Economics	:	Dominican Rep.
Moldova	Oxford Economics	:	Ukraine
Curacao	Oxford Economics	:	Trinidad & Tobago
Martinique	Oxford Economics	:	Puerto Rico
Brunei	OECD	:	:
Cape Verde	Oxford Economics	:	Cote d'Ivoire
Niger	Oxford Economics	:	Nigeria
Benin	Oxford Economics	:	Nigeria
Belize	Oxford Economics	:	Guatemala
Seychelles	Oxford Economics	:	Sri Lanka
Malawi	Oxford Economics	:	Mozambique
Virgin Islands (UK)	Oxford Economics	:	Trinidad & Tobago
Tajikistan	Oxford Economics	:	Kazakhstan
Grenada	Oxford Economics	:	Trinidad & Tobago
Papua New Guinea	Oxford Economics	:	Philippines
St. Kitts & Nevis	Oxford Economics	:	Jamaica
Gabon	Oxford Economics	:	DR Congo
Guinea	Oxford Economics	:	Cote d'Ivoire
Chad	Oxford Economics	:	DR Congo
Togo	Oxford Economics	:	Ghana
Burkina Faso	Oxford Economics	:	Cote d'Ivoire
Republic of Congo	Oxford Economics	:	DR Congo
Lesotho	Oxford Economics	:	South Africa
St. Vincent & Grenadines	Oxford Economics	:	Jamaica
Vanuatu	Oxford Economics	:	Philippines
The Gambia	Oxford Economics	:	Cote d'Ivoire
eSwatini	Oxford Economics	:	South Africa
Guyana	Oxford Economics	:	Brazil
Anguilla	Oxford Economics	:	Trinidad & Tobago
Dominica	Oxford Economics	:	Dominican Rep.
Sierra Leone	Oxford Economics	:	Cote d'Ivoire
Burundi	Oxford Economics	:	Rwanda
Central African Republic	Oxford Economics	:	DR Congo
Solomon Islands	Oxford Economics	:	Philippines
Comoros	Oxford Economics	:	Mozambique
Suriname	Oxford Economics	:	Brazil
Tonga	Oxford Economics	:	Philippines
Sao Tome & Principe	Oxford Economics	:	DR Congo
Kiribati	Oxford Economics	:	Philippines

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