



Environmental Externalities of Tourism in Barcelona city

June 2019

BR

BARCELONA
REGIONAL
AGÈNCIA
DESENVOLUPAMENT
URBÀ



**Ajuntament
de Barcelona**



BARCELONA
REGIONAL
AGÈNCIA
DESENVOLUPAMENT
URBÀ

Carrer 60, 25-27.
Edifici Z, Planta 2
Sector A, Zona Franca
08040 Barcelona
T 932 237 400

WWW.BCNREGIONAL.COM
BR@BCNREGIONAL.COM

COORDINACIÓ

Marc Montlleó

EQUIP TÈCNIC

Nuno Margalho
Gustavo Rodriguez
Javier Morales
Ioanna Spanou
Itzel Sanromà
Gemma Conde
Pablo Hernández
Ruben Palma
Dani Lorca

AGRAÏMENTS

**Turisme de Barcelona Consortium,
Barcelona City Council**

Joan Torrella
Xavier Suñol
Albert Arias
Aina Pedret

Barcelona Energy Agency

Irma Soldevilla
Elisabet Gallardo
Sergi Delgado

Strategy for Sustainability

Irma Ventayol

**Cleaning and Waste Management
Services Directorate, Barcelona
City Council**

Jordi Figueres
Aurea Plumed

Barcelona Port Authority

Jordi Vila

**Institute of Environmental Science
and Technology (ICTA)**

Anna Rico

Inèdit Innovació, S.L.

Jordi Oliver-Solà
Julia Martinez-Blanco

We would like to thank everyone
who participated in preparing this
document.

CONTENTS

1. Presentation
2. Methodology
3. Limitations
4. Tourism and the Environment
5. Sustainable Tourism Policies
6. Evaluating the Environmental Externalities of Tourism in Barcelona
 - 6.1 Water
 - 6.2 Energy
 - 6.3 Noise
 - 6.4 Air Quality
 - 6.5 Waste
 - 6.6 Street Cleaning
7. Urban Infrastructure
 - 7.1 Public Spaces
 - 7.2 Mobility
 - 7.3 Barcelona - El Prat Airport
 - 7.4 Port of Barcelona
8. Estimating the Carbon Footprint of the Tourist Sector in Barcelona city
9. Conclusions

1. PRESENTATION

1. PRESENTATION

This document's **main objective is to evaluate the environmental externalities of urban tourism in Barcelona city, within the framework of the 2020 Barcelona Strategic Tourism Plan.**

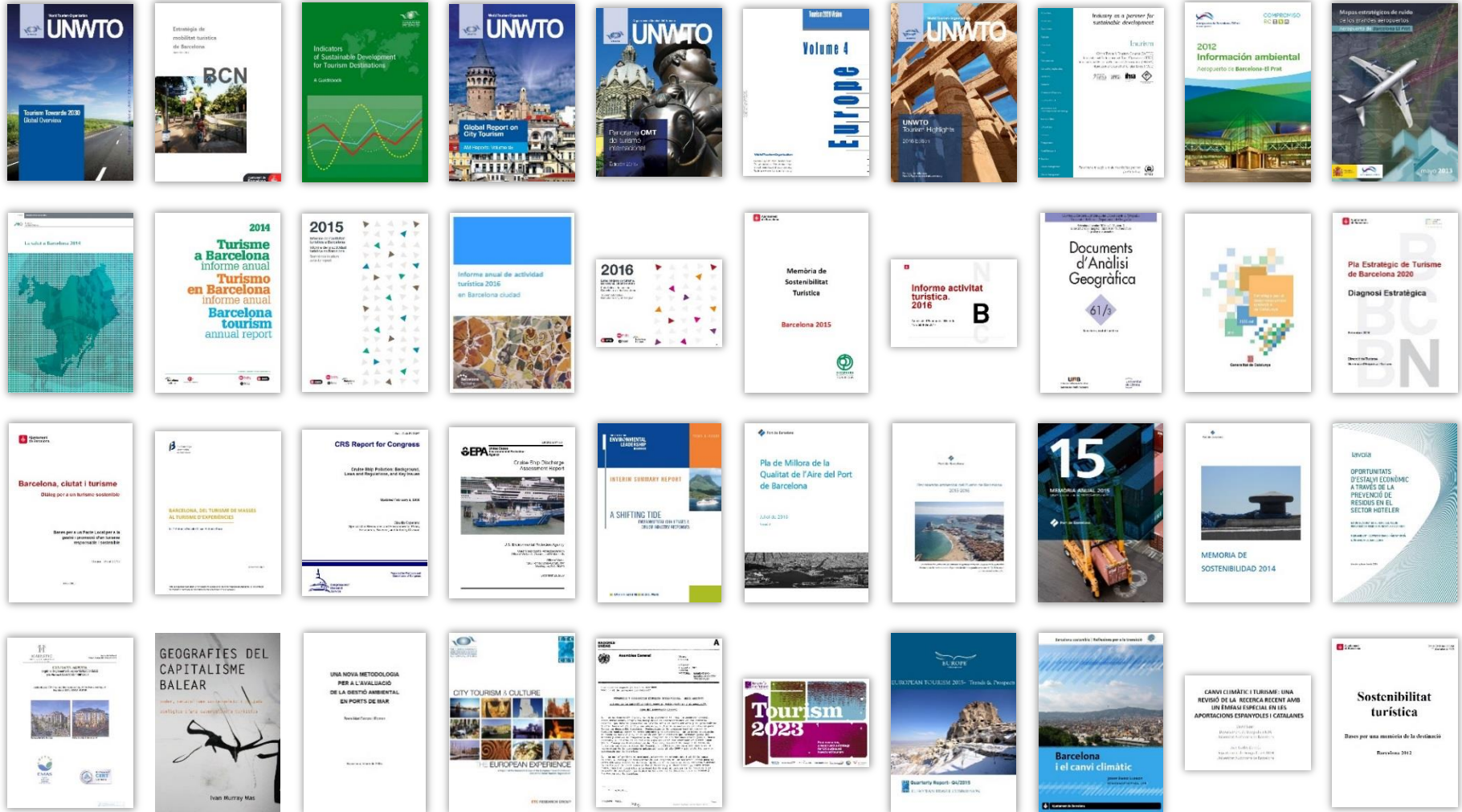
The 2020 Strategic Tourism Plan tackles a vital challenge: making the change from managing tourism in the city to managing the tourist city, making it compatible with the other needs of the cosmopolitan, complex and heterogeneous city that Barcelona is. The Plan makes strides towards a comprehensive perspective of tourism policies which takes into account management areas, locations and instruments that had not previously been considered as touristic, such as mobility, inspection, providing information, economic development at a local level, and urban planning and management.

This study is a first attempt at evaluating the environmental externalities of tourism in Barcelona. In it, we propose methodologies and estimates for the consumption of the primary resources associated with tourist activity.



2. METHODOLOGY

2. METHODOLOGY



2. METHODOLOGY

Survey on environmental aspects in the tourism accommodation sector

A survey on the environmental aspects of the tourist accommodation sector was carried out on 53 tourist-use flats and 85 tourist accommodation establishments:

- ✓ Six 5★ or gran luxe hotels
- ✓ Thirty-one 4★ or 4★ superior hotels
- ✓ Thirteen 3★ hotels
- ✓ Seven 2★ hotels
- ✓ Seven 1★ hotels
- ✓ 21 other types of lodging, including guest houses, hostels, youth hostels and collective housing
- ✓ 53 tourist apartments or tourist-use flats

Survey carried out by the Barcelona Energy Agency

in collaboration with the Turisme de Barcelona Consortium (part of the Barcelona City Council) and Barcelona Regional



AGÈNCIA D'ENERGIA
DE BARCELONA



Ajuntament
de Barcelona



BARCELONA
REGIONAL
AGÈNCIA
DESENVOLUPAMENT
URBÀ

WATER: **scientific literature** was used, and the *calculations for the per-capita consumption of water by tourists in hotels according to the category of the accommodation were performed based on the survey done by the Turisme de Barcelona Consortium.*

ENERGY: an estimation was made for the tourist accommodation sector using the information in the **2011-2020 Barcelona, Energy, Climate Change and Air Quality Plan (PECQ)** and the **2013 Barcelona Energy Balance Sheet**; this was compared with the figures obtained by the **survey** and its application in the activities census (PEUAT).



BARCELONA
REGIONAL



Ajuntament
de Barcelona

2 METHODOLOGY

ACOUSTIC QUALITY: data from **Barcelona City Council on complaints** from citizens related to noise from tourist accommodation (licensed and unlicensed) was used as an indicator of the acoustic quality of the accommodation sector.

AIR QUALITY: literature and data available from public institutions and companies was used and, on the basis of the modal distribution of internal transport associated with tourism, an estimate of the impact tourism has on air quality has been drawn up.

Port of Barcelona Air Quality Improvement Plan. Port of Barcelona, 2016.
Analysis of the Port of Barcelona's Contribution to Emissions and Immissions in 2013. Barcelona Regional, 2015.

WASTE: European literature was used, due to a lack of national data, along with information provided by the Directorate of Cleaning and Waste Management Services at Barcelona City Council.

THE CARBON FOOTPRINT OF THE TOURIST SECTOR: for the first time, an estimation for the tourist sector's carbon footprint in Barcelona city has been carried out. The methodology applied in this study is that defined in the **ISO 14040:2006** standard for **life cycle assessment (LCA)** for products, processes and systems. This methodology has been adapted to the tourism sector in Barcelona city, to be in accordance with other existing methodological framework for calculating carbon footprints in cities (GHG Protocol and PAS 2070:2013) and organisations (ISO 14064-1:2006). This study was conducted by Inèdit in collaboration with the Turisme de Barcelona Consortium and Barcelona Regional.



3. LIMITATIONS

- There is a lack of sufficient data on water consumption, energy consumption and waste generation for the sector. We must continue collecting data in order to carry out a broader evaluation of the different energy and resource flows.
- There is an absence of criteria to make a comparative assessment of the environmental externalities created by tourism.
- The nature of tourism is diffuse and synergetic.
- We are seeing an absorption of tourism by the infrastructure, services, transportation network and public facilities.
- It is difficult to differentiate usage between visitors and residents.
- Technology and globalisation have allowed tourism as a phenomenon to expand, crossing geographical, social and cultural borders.
- We must delve deeper into topics that are less studied or have less information available, such as the waste created by the tourist sector and the impacts of tourism on restaurants and on the life cycle of materials.
- Monitoring data on tourism and evaluating the policies applied to it are essential for the proper management of urban tourism.



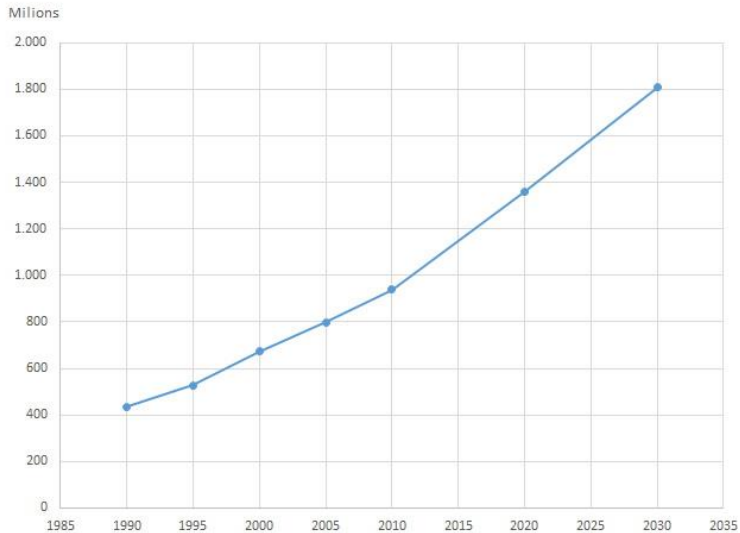
4. TOURISM AND THE ENVIRONMENT

4. TOURISM AND THE ENVIRONMENT

× **4.2** There was and will be an increased number of **international tourists worldwide** from 1990 to 2030, in accordance with the UNWTO's forecast.

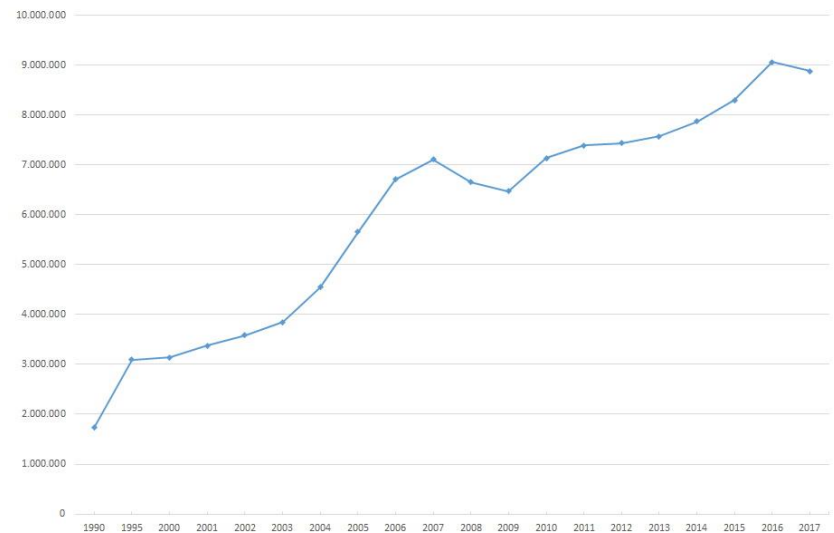
× **5.1** There has been an increase in the number of **tourists in hotels** from the 1990 levels to **8,884,550** in 2017.

Evolution of the number of international tourists, 1950-2012, and the forecast for this number up to 2030 [in millions], UNWTO



Source: OMT, 2011.

Evolution of the number of tourists in hotels in Barcelona, 1990-2017



Source: TURISME DE BARCELONA CONSORTIUM (2018). 2017 report on tourism activity in Barcelona.

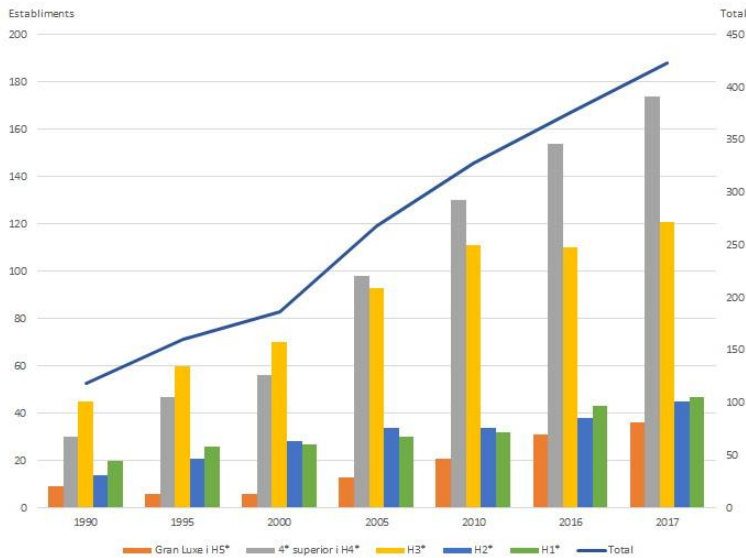
1992 is the historic year that symbolises the city's transformation, beginning just before the Olympic Games and extending well beyond when they ended, culminating in a redefinition of the new, emerging city's approach and image (Benach, 2003).

4. TOURISM AND THE ENVIRONMENT

× **3.6** Increase in the total number of **hotels** from 1990 (118) to 2017 (423).

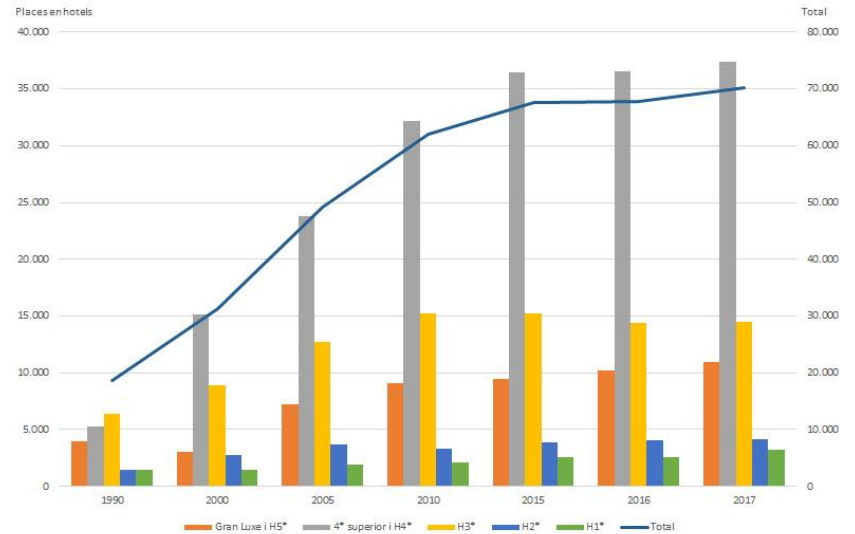
× **3.8** Increase in the total number of **hotel beds** available from 1990 (18,569) to 2017 (**70,129**).

Evolution of the number of hotels, by type, 1990-2017



Source: Turisme de Barcelona Consortium (1990-2016) and Barcelona City Council (CCEAT, 2016-2017).

Evolution of the number of hotel beds available in Barcelona, 1990-2017



Source: Turisme de Barcelona Consortium (1990-2016) and Barcelona City Council (CCEAT, 2016-2017).

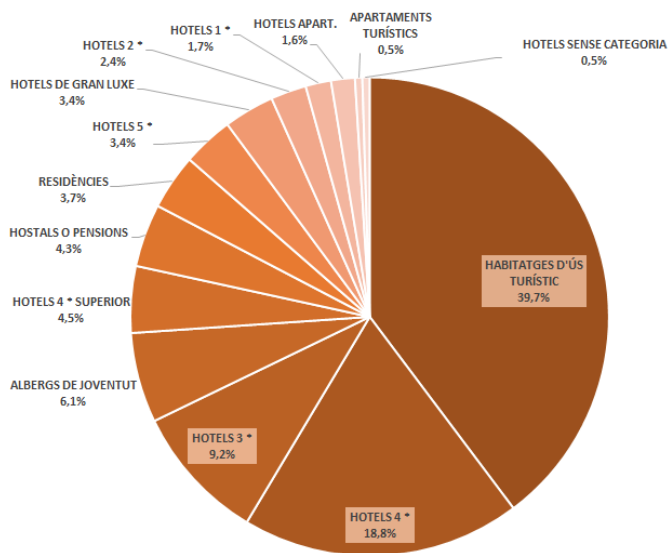
4. TOURISM AND THE ENVIRONMENT

4.1 EVOLUTION OF TOURISM

39%

Beds in tourist-use flats in comparison with total beds available in Barcelona, CCEAT (2016).

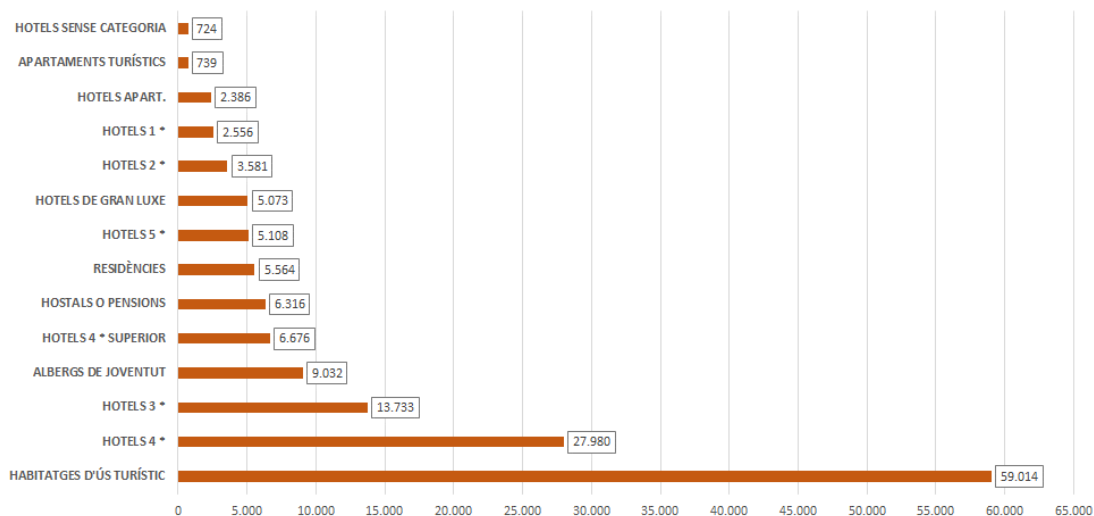
Distribution of beds available for tourists, 2016



148,482 beds

Total beds available for tourists in Barcelona according to the 2016 Census of Tourist Accommodation Establishments in Barcelona.

Number of beds available for tourists, 2016



Source: BARCELONA CITY COUNCIL (2016). CCEAT.

Source: BARCELONA CITY COUNCIL (2016). CCEAT.

4. TOURISM AND THE ENVIRONMENT

4.1 EVOLUTION OF TOURISM

48M

Five-fold (5x) increase in the number of passengers between 1990 and 2017.

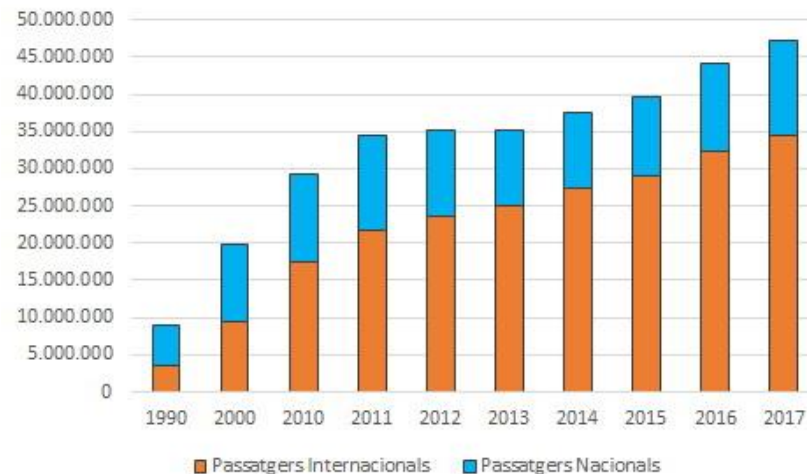
35M

Increase (by more than 10x) in the number of international passengers.

2.7M

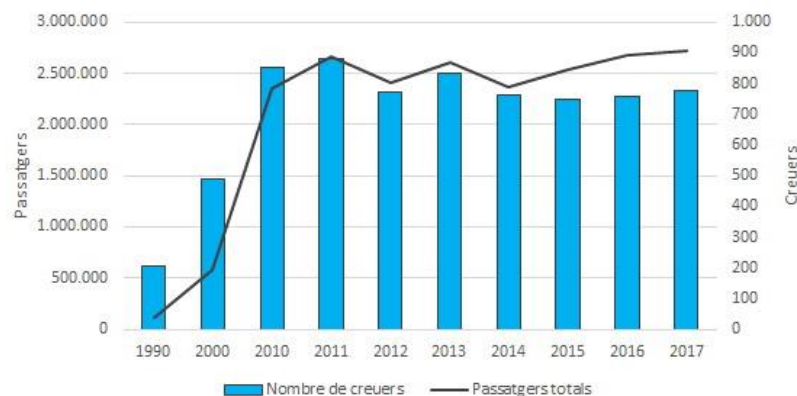
Increase (24x) in the number of cruise ship passengers in twenty years.

Evolution of the number of passengers going through El Prat Airport (1990-2017)



Source: AENA and the Department of Statistics of Barcelona City Council (2018).

Evolution of the number of cruise ship passengers (1990-2017)



Source: Port of Barcelona and the Department of Statistics of Barcelona City Council (2018).

4. TOURISM AND THE ENVIRONMENT

56,434,142

visits / year
(tourists + excursionists)

150,000

daily visits

Source: Tourist mobility strategy.

Increased water and energy consumption

Waste generation and an increase in waste collection and street cleaning costs

Increased noise pollution in areas with a high concentration of night life venues

Increase in pollution due to increased mobility associated with tourism (airport, port and internal movement)

Pressure from a fluctuating tourist population on day-to-day mobility and on the financing of the public transportation system

Tendency to congregate and form crowds in public spaces

Impact on neighbourhood life



4. TOURISM AND THE ENVIRONMENT

4.3 TOURISM AND CLIMATE CHANGE

The climate models seem to indicate:

- A shift in optimum weather for tourism to higher latitudes and altitudes
- A longer summer weather period
- A spring that comes earlier and an autumn that lasts longer

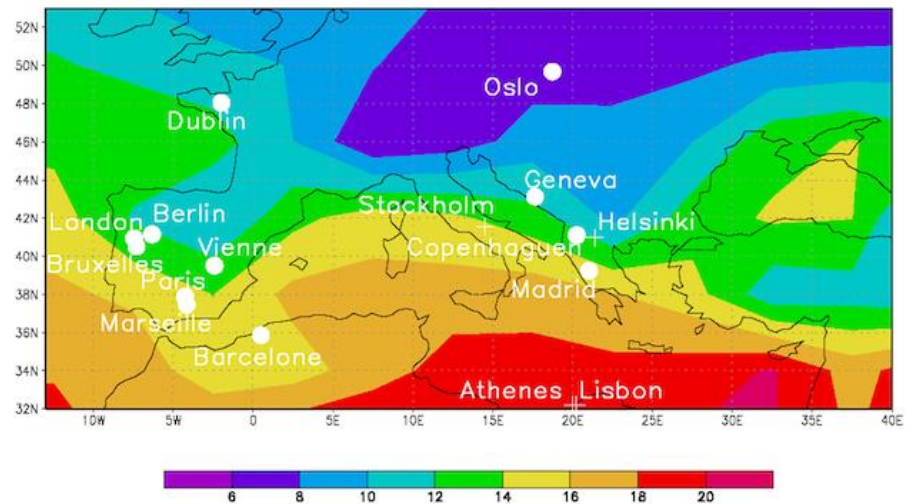
There is a two-way relationship between climate change and tourism: **tourism contributes to climate change** (CO₂ emissions, mostly associated with air travel), but it also **suffers the consequences of it**.

Climate change could trigger **a redefinition of the global tourism market**.

Possible consequences:

- **Fragmentation of the holiday period**
- **Tourism ceasing to be so related to the seasons**, with new peaks of tourist arrivals in spring and autumn, and a possible reduction in summer tourism
- More pressure on resources, especially water and energy

Location of European cities in accordance with temperature forecasts for 2070



Source: HALLEGATTE, S. [et al.] (2007), in accordance with the Hadley Centre HafRM3H model.

4. TOURISM AND THE ENVIRONMENT

4.4 ENVIRONMENTAL VALUES IN BARCELONA

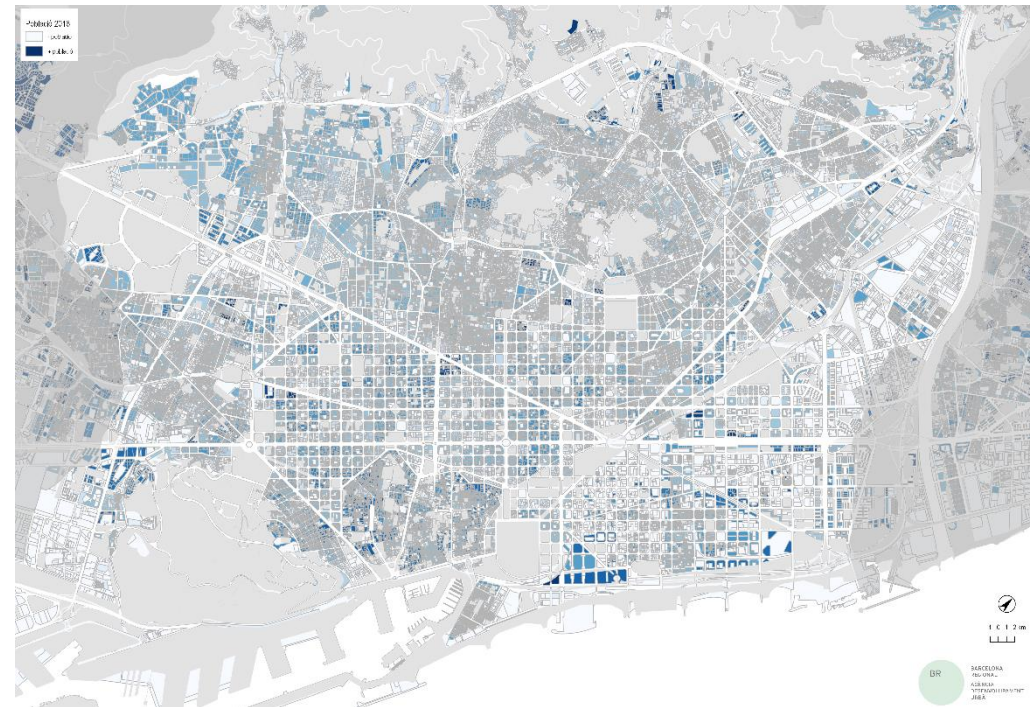
Urban context:

- Slight relief in a large portion of the city
- Compact city
- High population density
- Intense use of public spaces
- Low water usage *per capita* (107.6 L/inhabitant per day)
- High levels of NO_x
- Prevalence of movements on foot and by bicycle (45%)
- High use of public transport (35%)
- Lack of green spaces (7 m²/inhabitant)

Tourism:

- Ciutat Vella, which is a destination for tourist routes and boasts a strong touristic offer
- Concentration of beds available for tourists south of Avinguda Diagonal
- Changes in the economic model, with implications for the property market

Total population of the area, according to the Barcelona census, 2016



Source: Prepared by the authors using data from the Department of Statistics, Barcelona City Council.

4. TOURISM AND THE ENVIRONMENT

4.5 BARCELONA AND SUSTAINABILITY

Commitments to sustainability:

- 2002-2012 Citizen Commitment to Sustainability, updated for 2012-2022 (2012)
- Covenant of Mayors for Sustainable Energy (2008)
- Mayors Adapt – the Covenant of Mayors Initiative on Climate Change Adaptation (2014)
- *Compact of Mayors* (2015)
- Declaration and Agreement of the Network of Cities and People Moving towards Sustainability in Support of the Lima Declaration (2015)
- Barcelona Climate Commitment (2015)
- The Covenant of Mayors for Climate & Energy (2017)
- Barcelona-Biosphere Agreement (2017)

Commitments to sustainability



Source: Barcelona City Council.

4. TOURISM AND THE ENVIRONMENT

4.5 BARCELONA AND SUSTAINABILITY

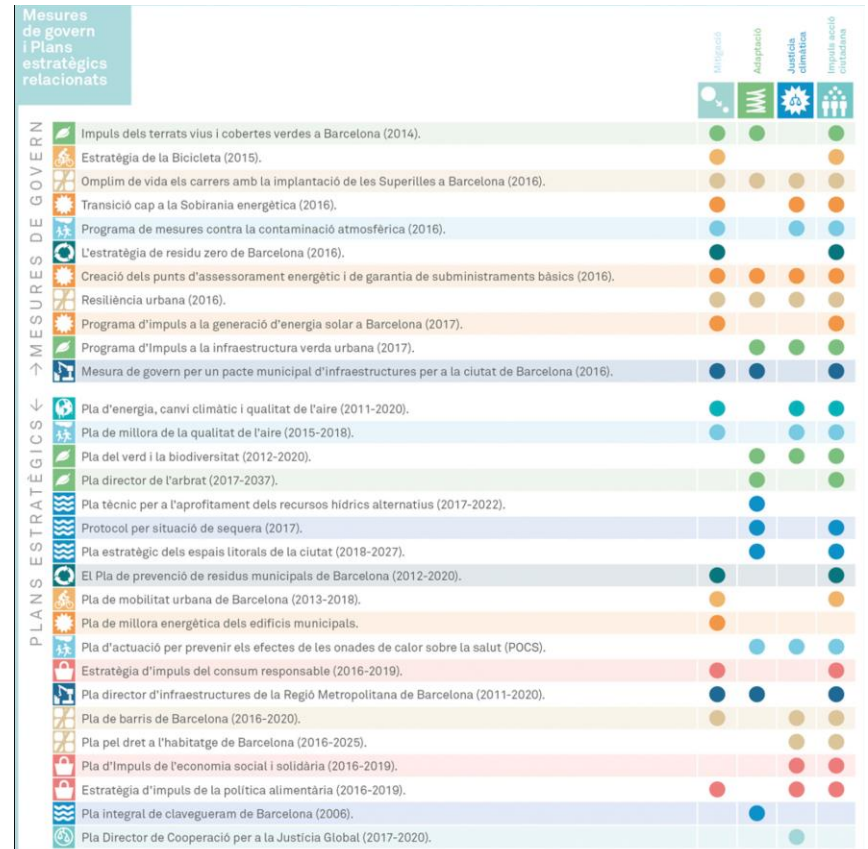
Sustainability actions

- Government measures
- Plans and programmes



The **Climate Plan** intends to set forth a comprehensive vision of the measures needed to face climate change, looking towards 2030 (or in the case of adaptation, towards 2050), which includes medium and long-term strategic goals and measures, as well as a schedule of short-term measures.

Government measures and sustainability programmes from past years

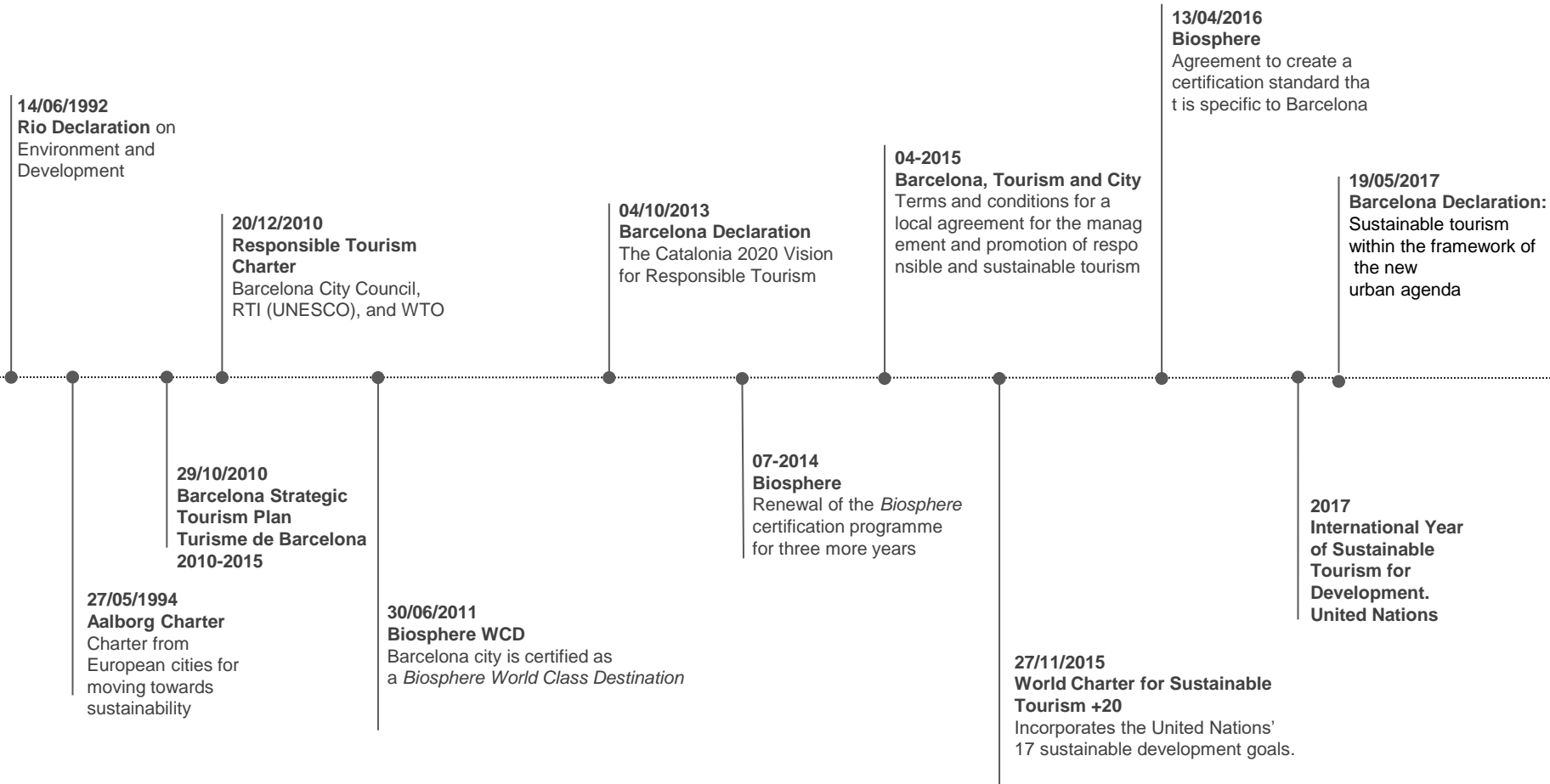


Source: Barcelona City Council.

5. SUSTAINABLE TOURISM POLICIES

5. SUSTAINABLE TOURISM POLICIES

5.1 TOURISM SUSTAINABILITY IN BARCELONA



5. SUSTAINABLE TOURISM POLICIES

5.2 TOURISM SUSTAINABILITY IN BARCELONA

Environmental certificates

In **2011**, **Barcelona** became the **first city in the world** with the **Biosphere certification**, granted by the Institute for Responsible Tourism in accordance with Global Sustainable Tourism Council criteria. This certification was also given to tourism brands in the province of Barcelona and to various destinations in Catalonia.

In Barcelona city, five tourist accommodations and three touristic services have received the Biosphere certification.



BIOSPHERE

5. SUSTAINABLE TOURISM POLICIES

5.1 TOURISM SUSTAINABILITY IN BARCELONA

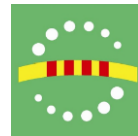
Environmental certificates

Seven tourist accommodations with official eco-labels in Barcelona

7%*

of the city's accommodation has some kind of environmental certification

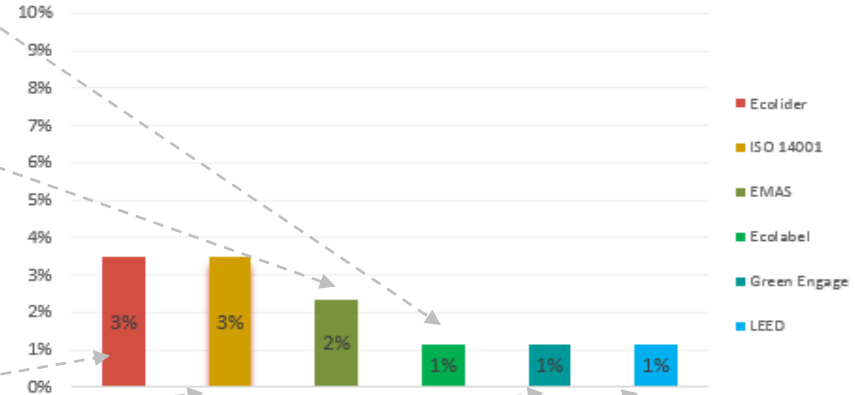
Other environmental certification labels that the city's tourist accommodations have



Generalitat of Catalonia's Guarantee of Environmental Quality Label



Proportion of hospitality establishments in the survey sample, stratified according to the environmental certificate obtained*



* From the survey for the *Environmental analysis of the tourist accommodation sector in Barcelona* report, launched by the City Council's Turisme de Barcelona Consortium (six of 86 hotels surveyed had a certification).

5. SUSTAINABLE TOURISM POLICIES

5.1 TOURISM SUSTAINABILITY IN BARCELONA

Energy certificates

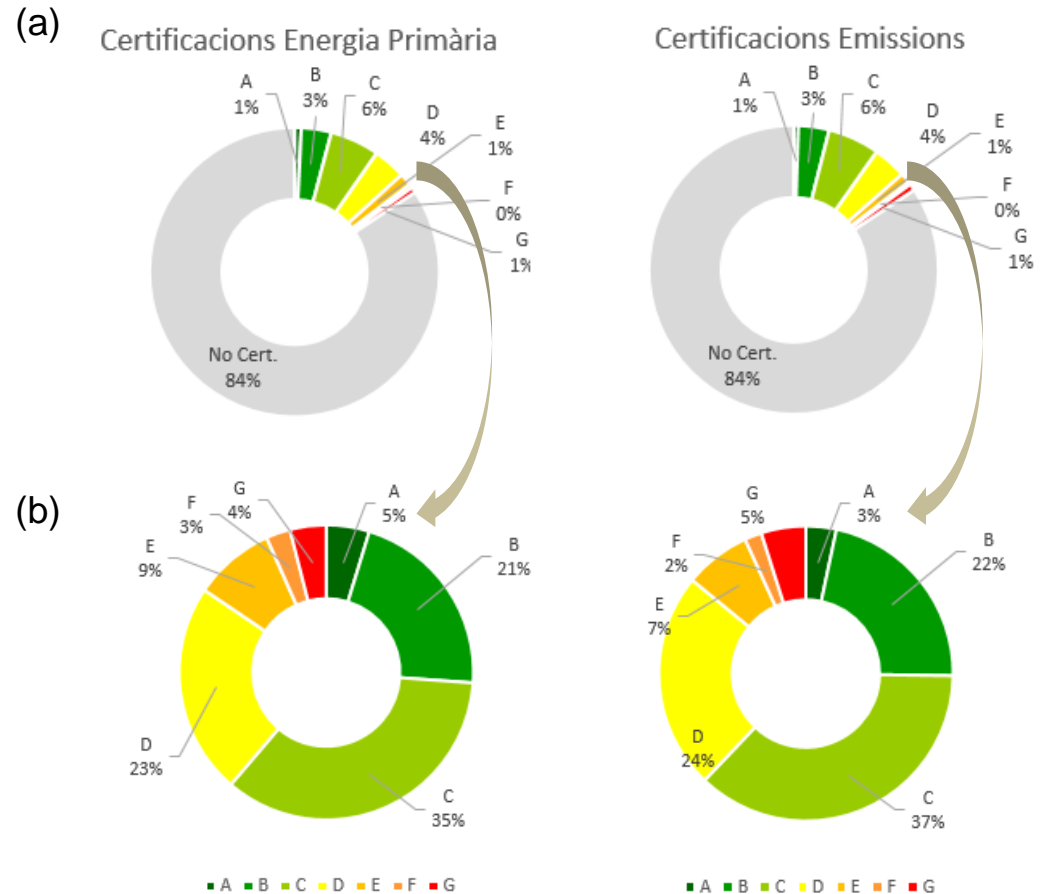
Primary energy certification and emissions, by category of the hotel surface area
 (a) regarding hotel surface area (b) regarding certified hotel surface area

15.7%

of the certified hotel surface areas(*)

14%

of the certified lodging facilities(**)



(*) Based on ICAEN certification data from June 2017.

(**) Based on the environmental survey carried out by the City Council's Turisme de Barcelona Consortium.

6. EVALUATING THE ENVIRONMENTAL EXTERNALITIES OF TOURISM IN BARCELONA

6. EVALUATING THE ENVIRONMENTAL EXTERNALITIES OF TOURISM IN BARCELONA

6.1 ESTIMATED TOTAL WATER CONSUMPTION IN TOURIST ACCOMMODATIONS ACCORDING TO LITERATURE

7,930,565m³

Estimated total water consumption in tourist accommodations in one year

8.3%

of the city's total consumption (2016)

30 days

of water consumption for Barcelona's resident population

	Places ^[1]	Consum d'aigua [l/pernoctació] ^[2]	Ocupació [places] ^[3]	Total Consum d'aigua [m ³]	
Hotels	Gran Luxe i 5*	10.181	397,1	63,8%	941.520
	4* superior i 4*	34.656	211,9	70,0%	1.876.062
	3*	13.733	166,6	76,9%	642.107
	2*	3.581	244,4	78,1%	249.475
	1*	3.280	266,1	73,6%	234.445
Aparthotels	2.386	107,5	65,3%	61.134	
Apartaments Turístics	739	107,5	49,9%	14.469	
HUT	59.014	107,5	68,2%	1.579.213	
HUT sense RTC	35.264	107,5	64,2%	888.317	
Hostals o Pensions, Albergs de Joventut i Residències	20.912	266,1	70,8%	1.438.702	
TOTAL	183.746			7.925.447	
<i>Consum d'aigua total Barcelona 2016 ^[4]</i>				95.405.523	
<i>Contribució del sector en el consum d'aigua total [%]</i>				8,3	

In italics = Estimate.

[1] - Existing beds according to the *Census of tourist accommodation establishments*, 16 December 2016 (PEUAT, 2016). Barcelona City Council.

[2] - DINARÉS, M.; SAURÍ, D. (2015). "Water consumption patterns of hotels and their response to droughts and public concerns regarding water conservation: The case of the Barcelona hotel industry during the 2007-2008 episode". *Documents d'Anàlisi Geogràfica*. Vol. 61/3, 2015, page. 623-649.

[3] - Turisme de Barcelona and the Barcelona Chamber of Commerce. *2015 Annual Report*. In the case of unlicensed tourist-use flats, this is estimated data from the Turisme de Barcelona Consortium, which performed a study using a web crawler on the websites Airbnb, Rentalia, HomeAway, and Niumba for the period between September and December 2016.

[4] - Department of Statistics, Barcelona City Council.

[<http://www.bcn.cat/estadistica/catala/dades/anuari/cap14/C1404040.htm>]

6. EVALUATING THE ENVIRONMENTAL EXTERNALITIES OF TOURISM IN BARCELONA

6.1 WATER CONSUMPTION IN TOURIST ACCOMMODATIONS ACCORDING TO SURVEY

11,456,361m³

Total consumption in tourist accommodations

12%

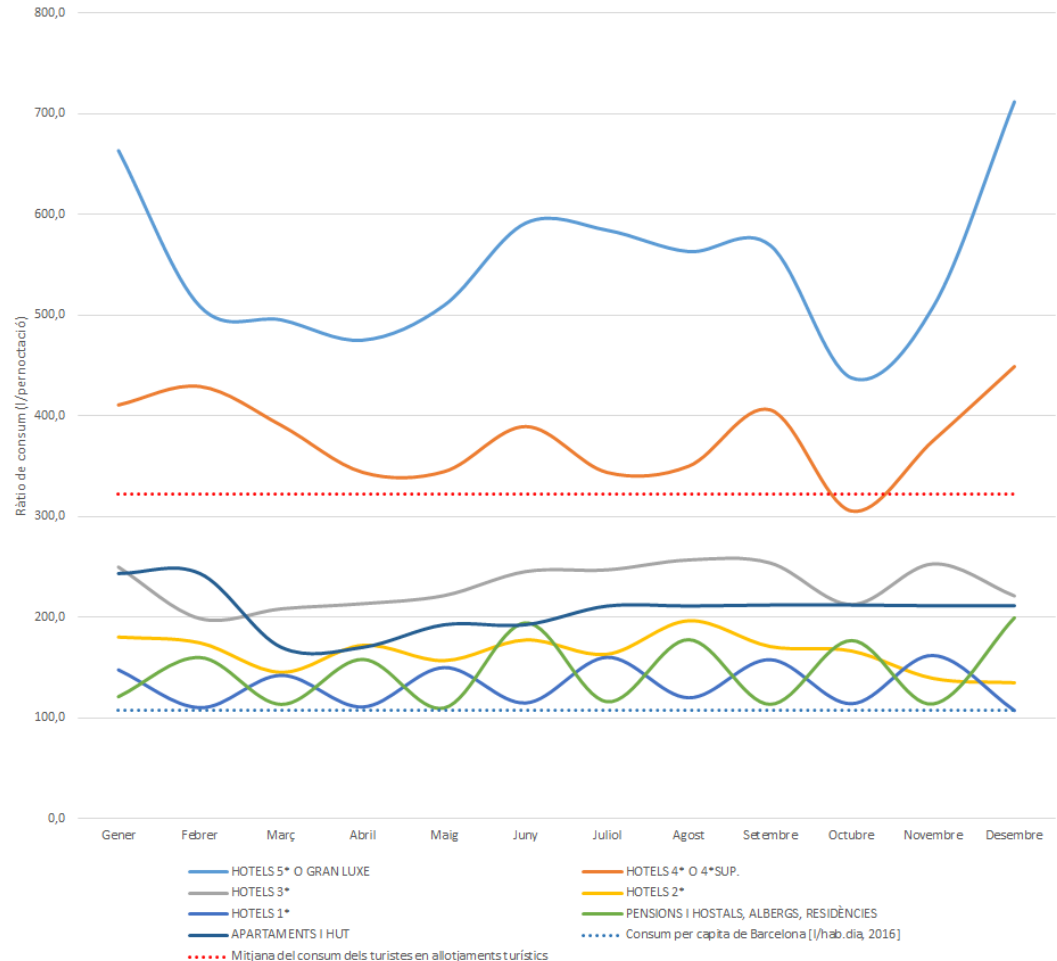
of the city's total consumption

The average consumption of a tourist is

3 times

higher than the average for a Barcelona resident.

Water consumption ratios in tourist accommodations, 2016 (L/overnight stay)



Source: Turisme de Barcelona Consorci, 2016








6. EVALUATING THE ENVIRONMENTAL EXTERNALITIES OF TOURISM IN BARCELONA

6.1 WATER CONSUMPTION IN TOURIST ACCOMMODATIONS ACCORDING TO LITERATURE

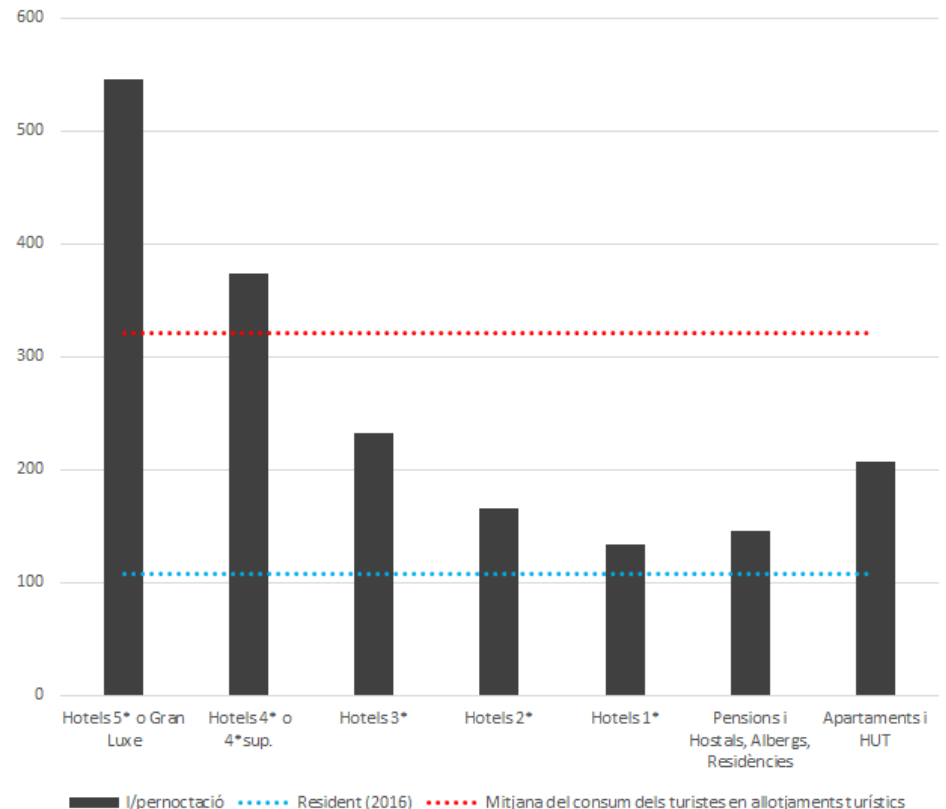
Comparison of water consumption per overnight stay, according to category

1.0  **A Barcelona resident consumes 107 L/day of water**

Daily water consumption equals:

- 1.2**  **1* Hotel★**
- 1.4**  **Youth hostel, guest house, dormitory or hostel**
- 1.5**  **2★ hotel**
- 1.9**  **Tourist apartment**
- 2.2**  **3★ hotel**
- 3.5**  **4★ hotel**
- 5.1**  **5★ or gran luxe hotel**

Water consumption ratios by type of tourist accommodations and average consumption by tourists in tourist accommodations, 2016 (L/overnight)



Source: Turisme de Barcelona Consorci, 2016

6. EVALUATING THE ENVIRONMENTAL EXTERNALITIES OF TOURISM IN BARCELONA

6.1 COMPARISON OF WATER CONSUMPTION IN TOURIST ACCOMODATIONS

Estimate according to literature

7,930,565m³

Estimated total water consumption in tourist accommodations in one year

8%

of the city's total consumption

Estimate according to survey

11,456,361m³

Total consumption in tourist accommodations

12%

of the city's total consumption

These two methodologies suggest that the total consumption in tourist accommodations could range **between 8% and 12% of the city's total consumption.**


6. EVALUATING THE ENVIRONMENTAL EXTERNALITIES OF TOURISM IN BARCELONA

6.2 ENERGY

Energy in tourist accommodations: comparison of the energy consumption **per client who stays overnight**, according to the category

1.0  The consumption for one resident is 8 kWh/person

Scaled up to tourist accommodation clients, it is equivalent to:

1.0  Youth hostel, guest house, dormitory or hostel

1.3  Tourist apartment

1.3  1★ Hotel★

1.6  2★ hotel

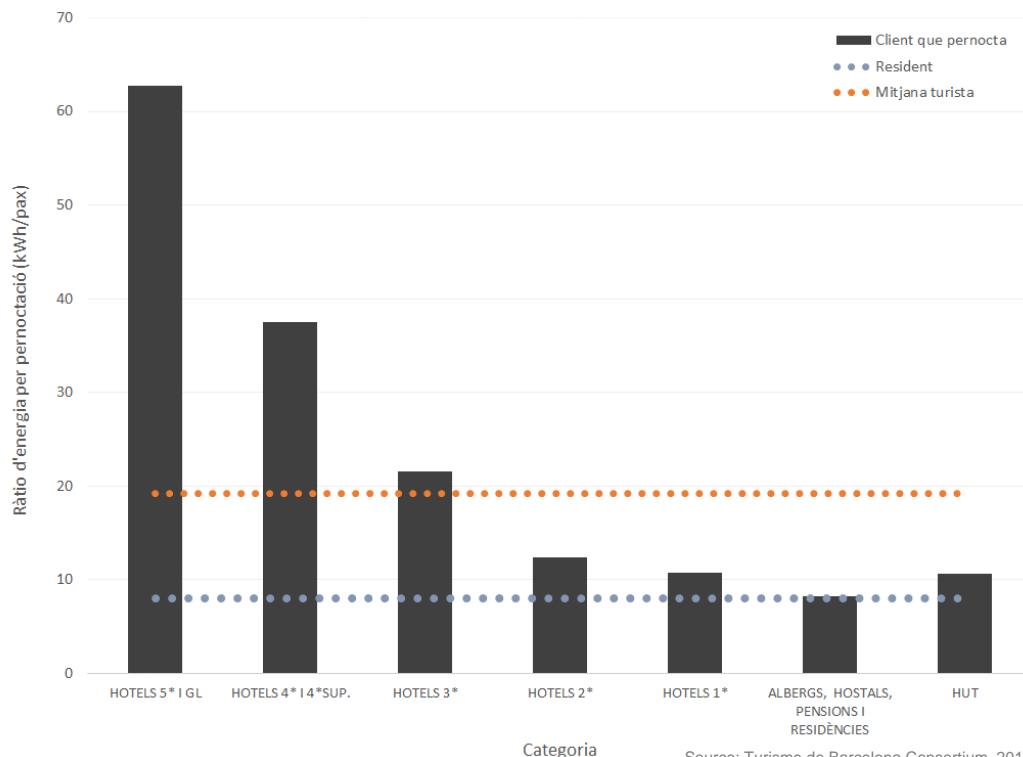
2.4  Tourist average

2.7  3★ hotel

4.7  4★ hotel

7.8  5★ and gran luxe hotel

Energy consumption ratios by tourist accommodations and average consumption by tourist accommodations (kWh/overnight stay)



Source: Turisme de Barcelona Consorci, 2016

6. EVALUATING THE ENVIRONMENTAL EXTERNALITIES OF TOURISM IN BARCELONA

6.2 ENERGY

Energy in tourist accommodations: comparison of the energy consumption **by surface** according to the category

250 kWh/m²

Average for tourist accommodations

+67%

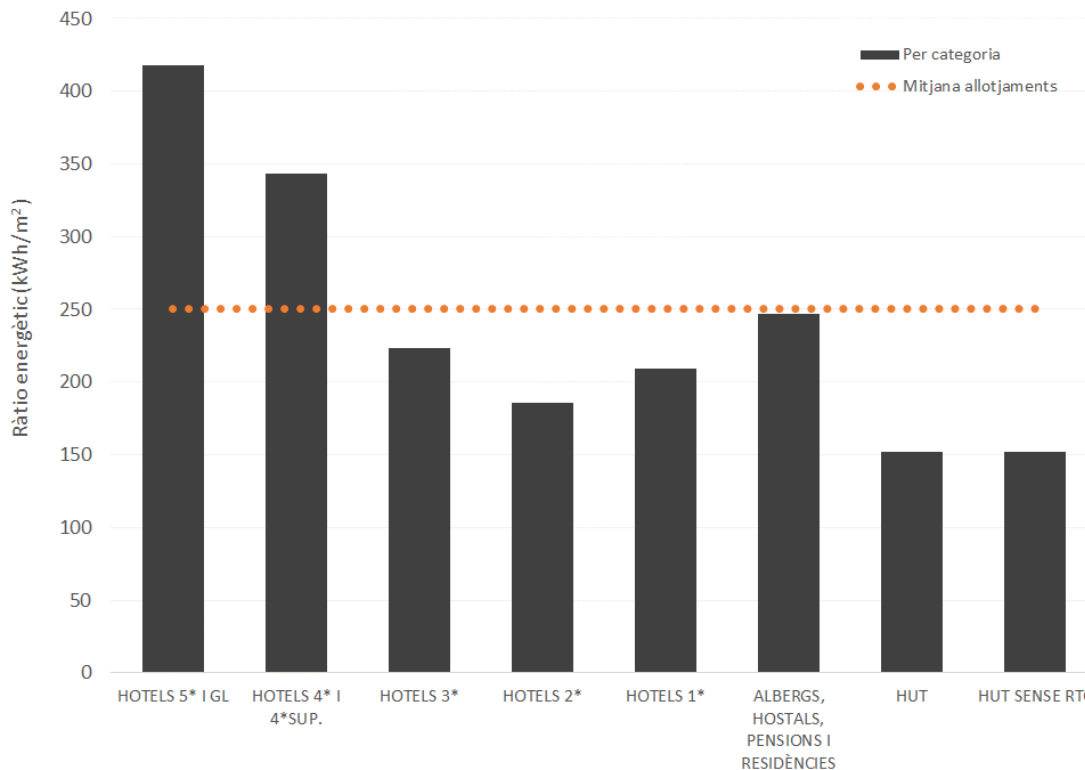
5★ and gran luxe hotels

+37%

4★ hotel

Energy consumption in tourist accommodations by category and surface area (kWh/m²)

Consum de gas i electricitat per superfície (kWh/a/m²)



Source: Turisme de Barcelona Consorium, 2016

6. EVALUATING THE ENVIRONMENTAL EXTERNALITIES OF TOURISM IN BARCELONA

6.2 ENERGY

Energy in tourist accommodations: comparison of the energy consumption according to the category

702 GWh

Final energy consumed in tourist accommodations

5.6% of Barcelona's total energy consumption

18.2% of the total consumption for the service sector in Barcelona

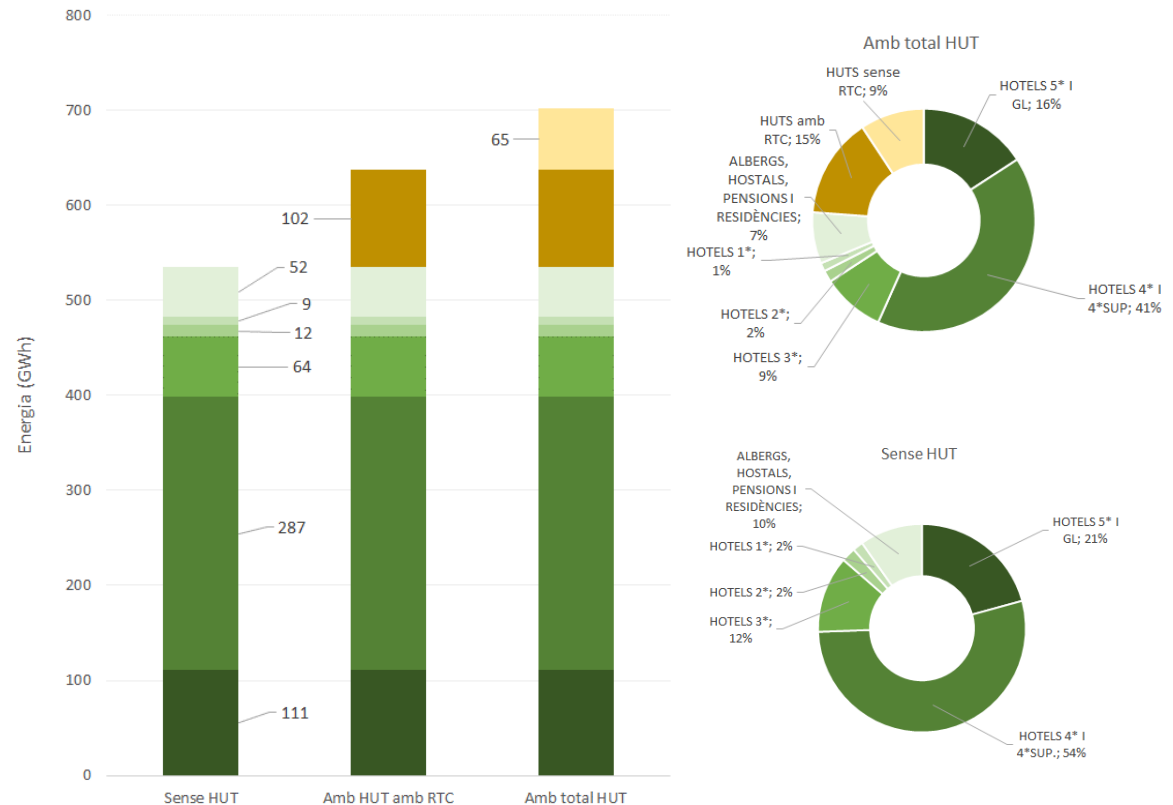
81% of the energy is consumed by three lodging categories (tourist-use flats, 4* hotels and 5* hotels).

24%*

Energy consumed in tourist-use flats

57%

Energy consumed in 4★ and 5★ hotels



*An estimation was done for unlicensed tourist-use flats.

6. EVALUATING THE ENVIRONMENTAL EXTERNALITIES OF TOURISM IN BARCELONA

6.2 ENERGY

Energy use by the POIs (points of interest) of the city, individual transportation and professional activities, distributed by source and activity

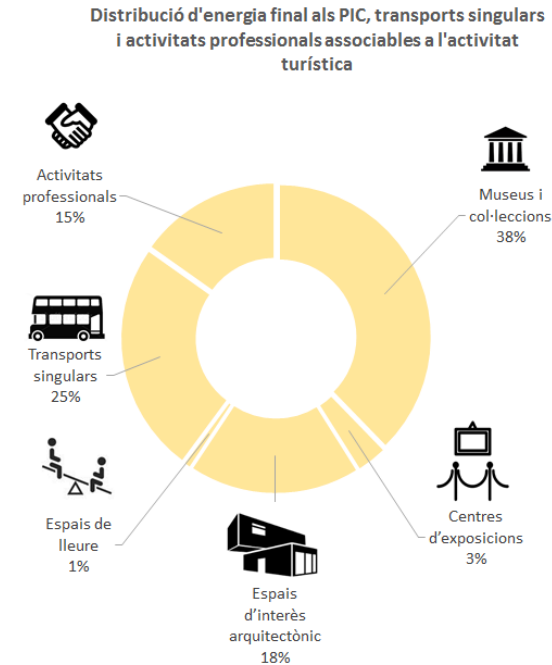
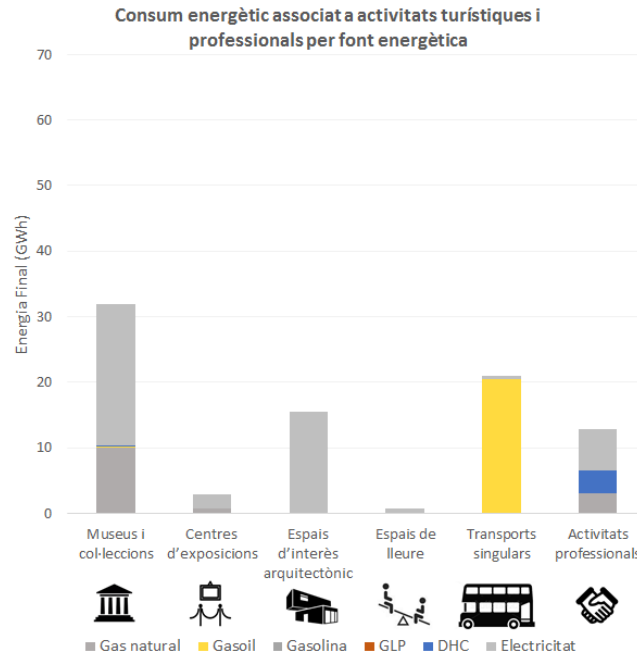
85 GWh

Final energy consumed at the POIs, individual transportation and professional activities

0.7% of Barcelona's energy consumption

38%

Energy consumption in museums and collections (the category with the highest consumption)



6. EVALUATING THE ENVIRONMENTAL EXTERNALITIES OF TOURISM IN BARCELONA

6.2 ENERGY

Energy used for internal transportation of tourists and excursions:

166 GWh

Final energy consumed by visitors using internal transportation

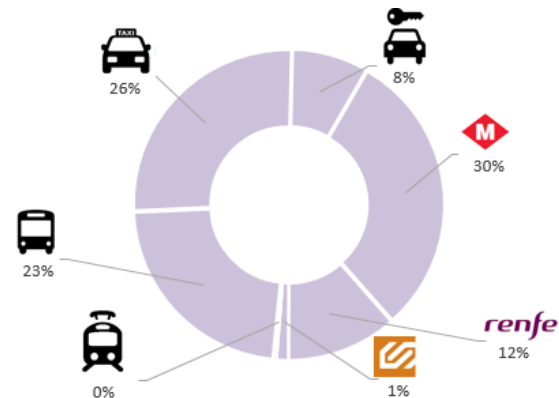
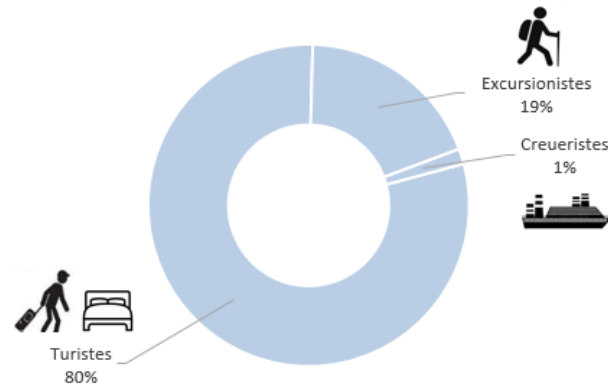
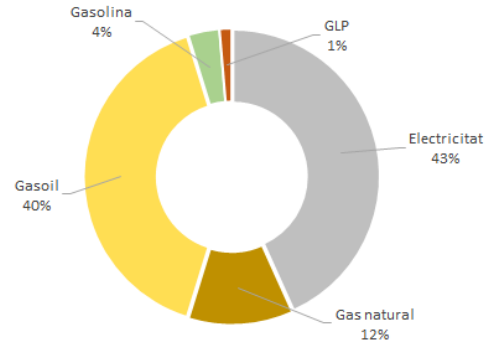
1.3% of Barcelona's energy consumption

80% of the energy consumed corresponds to tourists (visitors who stay overnight in the city).

83% of the energy is consumed by internal transportation.

43%
corresponds to
electricity.

40%
corresponds to
diesel for buses and taxis.



6. EVALUATING THE ENVIRONMENTAL EXTERNALITIES OF TOURISM IN BARCELONA

6.2 ENERGY

Estimated distribution of final energy, primary energy and GHG emissions to the different activities associated with tourism

952 GWh

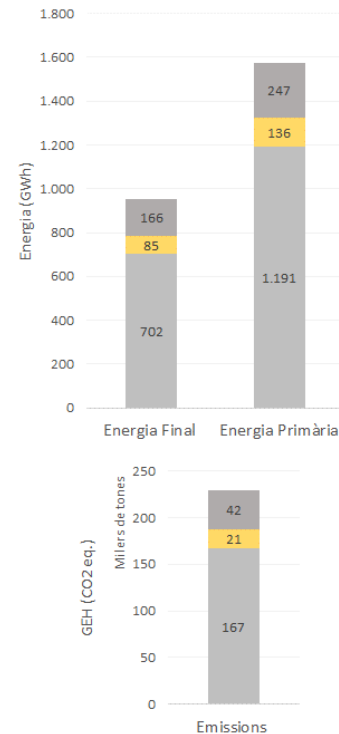
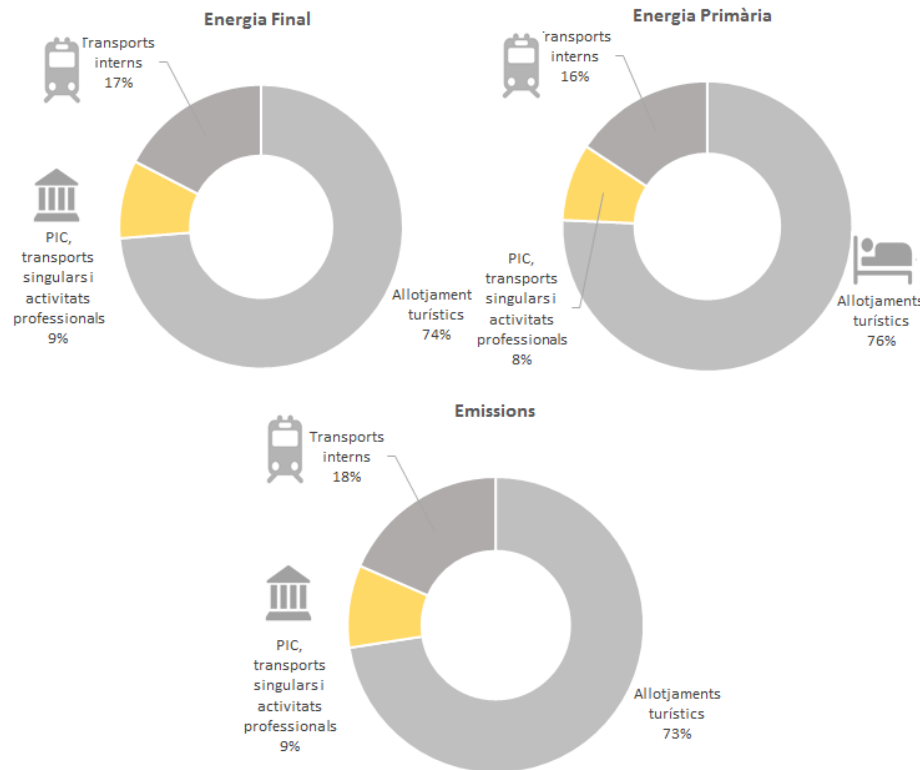
Final energy consumed by activities related to tourism in the destination

7.6% of Barcelona's energy consumption

74% of the energy consumption in tourist accommodations.

17% of the energy consumption of internal transportation and excursions.

9% of the energy consumption by POIs, individual transportation and professional activities.



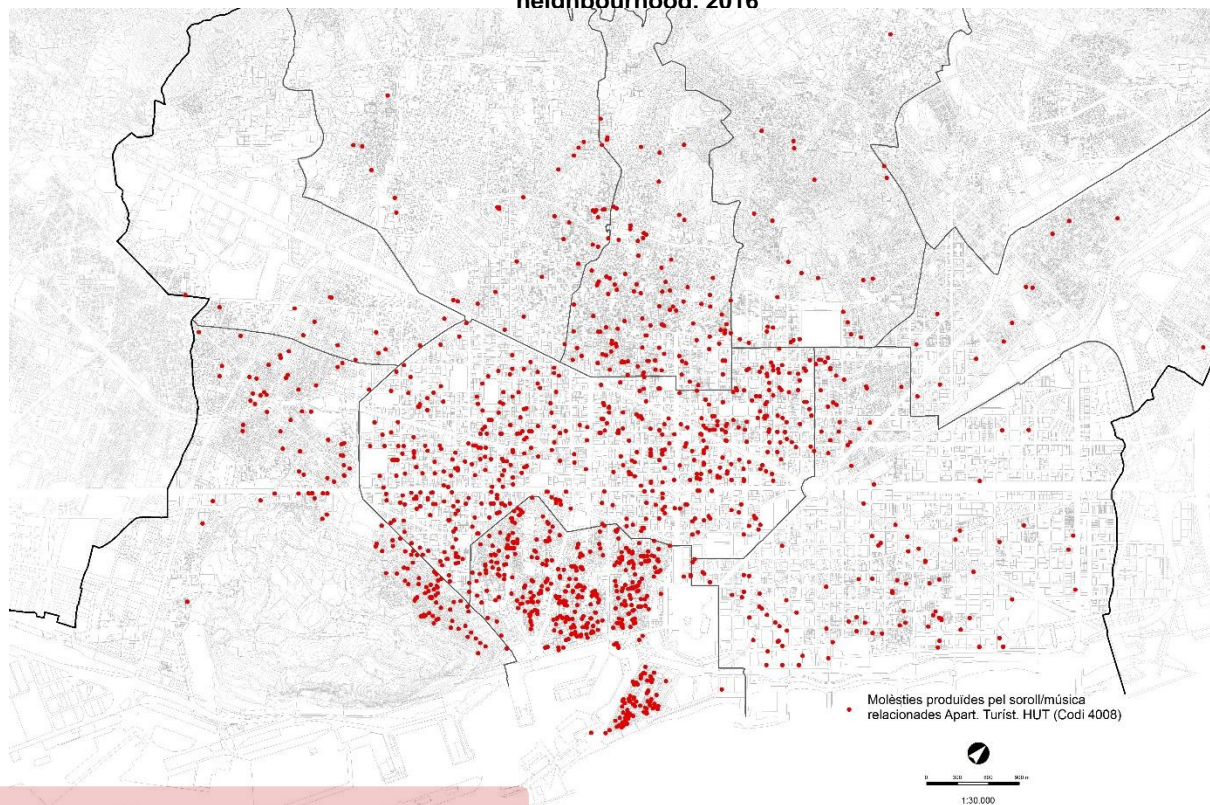
6. EVALUATING THE ENVIRONMENTAL EXTERNALITIES OF TOURISM IN BARCELONA

6.3 NOISE

2,249 Number of complaints fielded by the Guàrdia Urbana [city police] that were related to tourist-use flats

+1,758 In the number of complaints related to tourist-use flats. (Variation between 2015 and 2016. The criteria changed after 2015.)

Number of complaints received for noise/music related to tourist-use flats (code 4008) by neighbourhood. 2016



It's difficult to distinguish between tourist and non-tourist activity. There are conflicts between tourist-use flats and residential use.

Source: Guàrdia Urbana of Barcelona - Barcelona City Police, 2016

6. EVALUATING THE ENVIRONMENTAL EXTERNALITIES OF TOURISM IN BARCELONA

6.4 AIR QUALITY

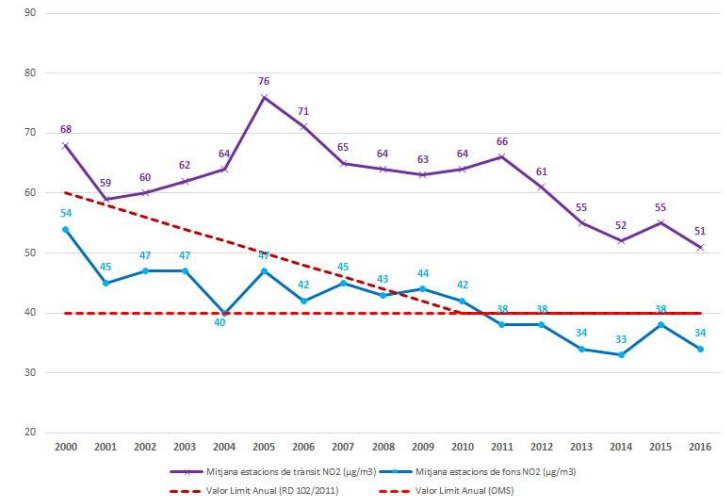
Currently, the most worrisome pollutants in the city are NO₂ and PM₁₀. While it is true that Barcelona has improved its air quality over the past years, the pollutant that requires more attention is NO₂. This is because for years now, it has been over the long-term limit values (annual averages) for NO₂, defined as 40 µg/m³ by Royal Decree 102/2011.

With regard to suspended particulates of less than 10 microns (PM₁₀), the records in Barcelona exceed the values recommended by the WHO (limit for the annual average of 20 µg/m³), although in recent years there has been a sustained decrease in the concentration of these particles, reaching **24 µg/m³** in 2016 (below the limit for the annual average of 40 µg/m³ established by Royal Decree RD 102/2011).

Evolution of the annual average for immissions of NO₂ and PM₁₀ at the XVPCA stations in Barcelona µg/m³.

Source: Atmospheric Pollution Monitoring and Forecasting Network (XVPCA). In purple, readings from the traffic stations; in blue, the annual averages for urban-area stations.

Evolution of the annual average for immissions of NO₂ recorded by the XVPCA stations in Barcelona [µg/m³]



Evolution of the annual average for immissions of PM₁₀ recorded by the XVPCA stations in Barcelona [µg/m³]



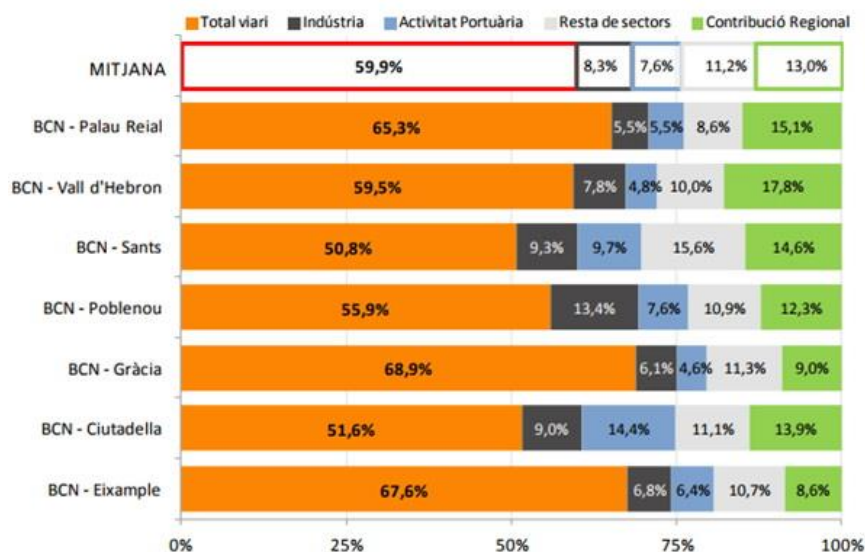
6. EVALUATING THE ENVIRONMENTAL EXTERNALITIES OF TOURISM IN BARCELONA

6.4 AIR QUALITY

The road transport sector is the biggest contributor to NO₂ immissions.

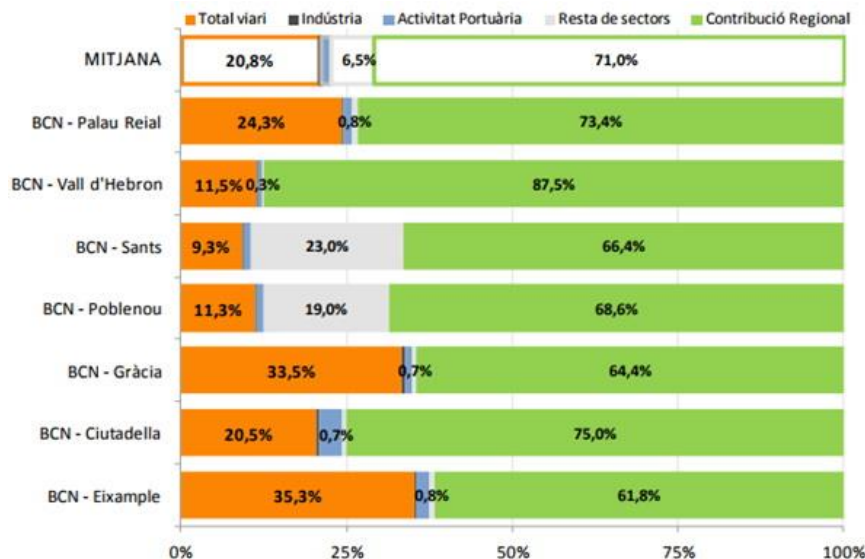
The regional contribution is a strong component (71%).

The road transport sector is the biggest contributor to PM₁₀ immissions.



Origin of NO₂ immissions by sector. Average and in different sectors of the city, 2013

Source: PMQAB, 2013



Origin of PM₁₀ immissions by sector. Average and in different sectors of the city, 2013

Source: PMQAB, 2013.

6. EVALUATING THE ENVIRONMENTAL EXTERNALITIES OF TOURISM IN BARCELONA

6.4 AIR QUALITY

Using the calculation for the fraction of veh-km used for tourism in the city, we can obtain an approximate value for how much of the pollution associated with road traffic is caused by tourists, excursionists and cruise ship goers. The result of this calculation shows us that only 0.7% of road traffic in the city is related to the tourist sector.

Therefore, we can conclude that the influence of tourist mobility on Barcelona's air quality is negligible, since it causes only **1.63% of the nitrogen dioxide (NO₂) pollution and 0.66% of the particulate matter pollution (PM₁₀)**.

Estimated vehicle-kilometres for Barcelona's transportation network, both total and those corresponding to the tourism sector

Tipus de transport	Veh-km totals (interns BCN)	Veh-km associats turisme (interns BCN)	Distribució Veh-Km viari (en %) associats al turisme (interns BCN)	Distribució Nombre de viatges totals (Sector Turístic)
Metro	70.749.219	21.439.618	36,4%	64,7%
Renfe	17.700.000	4.958.554	8,4%	3,5%
FGC	8.431.009	901.996	1,5%	1,5%
Tramvia	1.227.071	114.965	0,2%	1,3%
Bus+ Bus Turístic	44.291.462	7.969.518	13,5%	19,0%
Autocars	107.048.654	275.484	0,5%	0,8%
Taxi	70.749.219	8.738.933	14,8%	3,3%
Cotxe Lloguer	4.151.980.906	890.796	1,5%	0,4%
Cotxe particular		13.582.352	23,1%	5,6%
Total	4.472.177.540	58.872.217	100,0%	100,0%
Total viari	4.374.070.241	31.457.083	53,4%	29,1%

Source: Barcelona Regional, based on information provided by visitors and by the Tourist Mobility Strategy.

We must point out that these calculations are based on city averages, which might underestimate the more direct effects of pollution concentrations in certain areas that are closer to sources of pollution and/or where the winds are more unfavourable. Currently, the Barcelona City Council is working to update the information and provide more details on the impact of certain points of pollution on the most sensitive neighbourhoods.

6. EVALUATING THE ENVIRONMENTAL EXTERNALITIES OF TOURISM IN BARCELONA

6.6 WASTE

It is calculated that tourist accommodations generate 9.2% of Barcelona's waste.

This calculation was based on bibliographical references, due to the lack of real data, and certain approximations have been made, such as assigning a value *per capita* for waste generation in Barcelona from tourist-use flats, tourist apartments, hostels or youth hostels. For this reason, the calculated value is a theoretical approximation that will need to be validated by future studies.

Estimate for waste generated by tourist accommodations, 2016

	Places ^[1]	kg/pernoctació (estimació) ^{[a], [b] i [c]}	Ocupació (places) ^[2]	Generació de residus estimada [kg]	
Hotels	Gran Luxe i 5*	10.181	5,47	0,68	13.720.641
	4* superior i 4*	34.656	1,98	0,79	19.746.181
	3*	13.733	1,98	0,73	7.255.057
	2*	3.581	1,98	0,72	1.873.704
	1*	2.556	1,29	0,69	831.613
	Sense categoria	724	1,29	0,69	235.559
Hotels apart.	4* superior, 4*, 3*, 2*	2.264	1,98	0,65	1.063.525
	1*	68	1,29	0,65	20.812
	Sense categoria	54	1,29	0,65	16.527
Hostals o Pensions	6.316	1,29	0,54	1.599.952	
Apartaments Turístics	739	1,29	0,52	179.894	
HUT	59.014	1,29	0,65	18.061.382	
Albergs de Joventut	9.032	1,29	0,69	2.917.364	
Residències	5.564	1,29	0,69	1.797.189	
TOTAL	148.482			69.319.401	
Generació de residus total Barcelona, 2016 ^[3]				754.922.471	
Contribució del sector [%]				9,2	

En cursiva - Estimació.

[1] - Ajuntament de Barcelona, Cens d'establiments d'allotjaments turístic, 2016.

[2] - A negreta, els valors extrets de "l'Informe anual de Turisme de Barcelona i Cambra del Comerç (2015)". En cursiva gris una estimació en base el mateix informe.

[3] - AMB. Dades Ambientals, 2016.

[a] - Declaració Ambiental d'un hotel de referència de gran luxe de Barcelona, 2010 (5,47 kg/nit).

[b] - Hamel, H., Sven, E., (2006). "Environmental initiatives by European tourism business, Instruments indicators and practical examples". ECOTRANS e.V. Saarbrücken, desembre del 2006. L'estudi indica una ràtio de 1,98 kg/nit a hotels de quatre, tres i dues estrelles.

[c] - Per falta d'informació s'estima el mateix consum per capita a Barcelona el 2016 (1,29 kg/hab.dia).

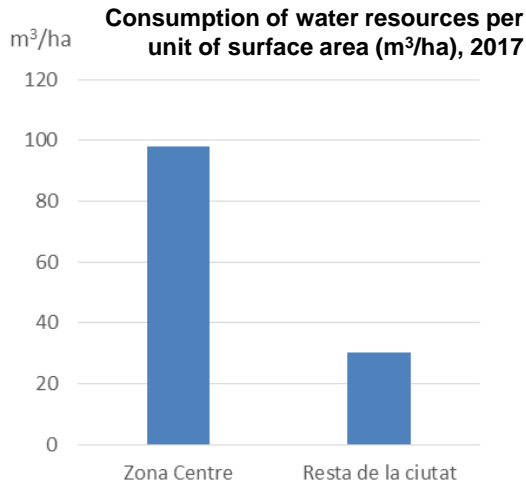
Source: adapted from the Special Urban Development Plan for Tourist Accommodation.

6. EVALUATING THE ENVIRONMENTAL EXTERNALITIES OF TOURISM IN BARCELONA

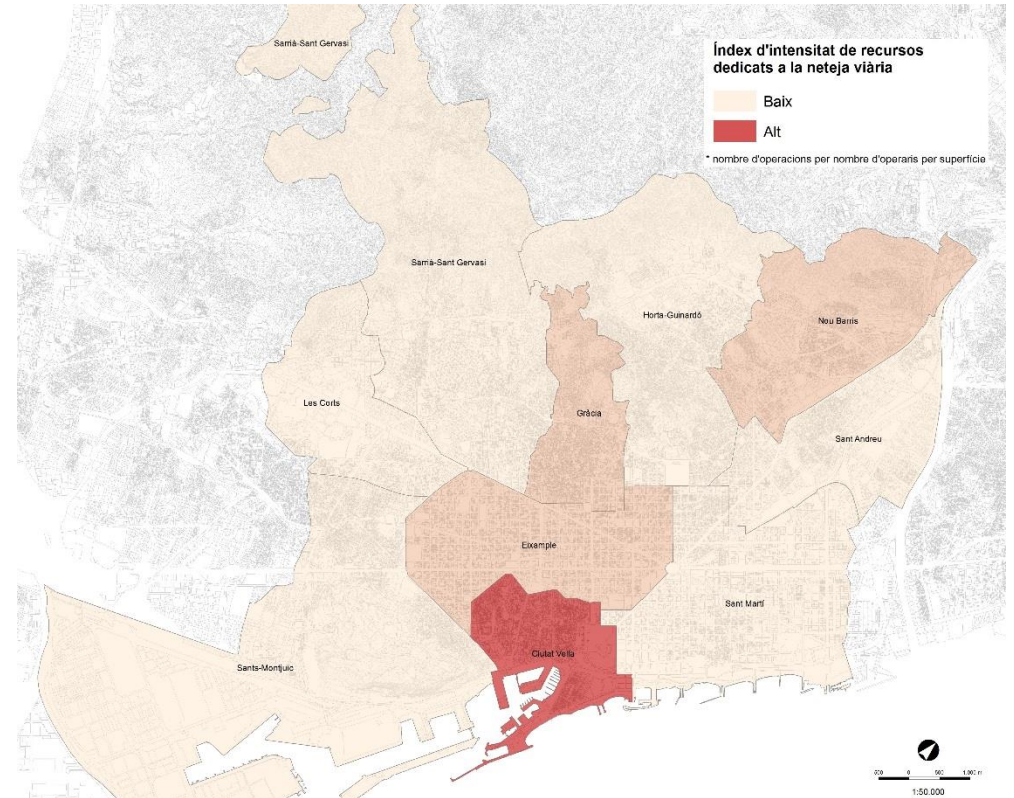
6.7 STREET CLEANING

Cleaning the streets depends on several variables, such as the type of streets, how wide they are, whether they have vegetation and how intensely the public space is used. Urban tourism can be added to these variables as one more factor that determines the city's cleaning needs.

Due to its characteristic narrow streets, high concentration of shops and high tourist pressure, Ciutat Vella requires a higher amount of resources dedicated to street cleaning.



Intensity index for resources dedicated to street cleaning, 2018

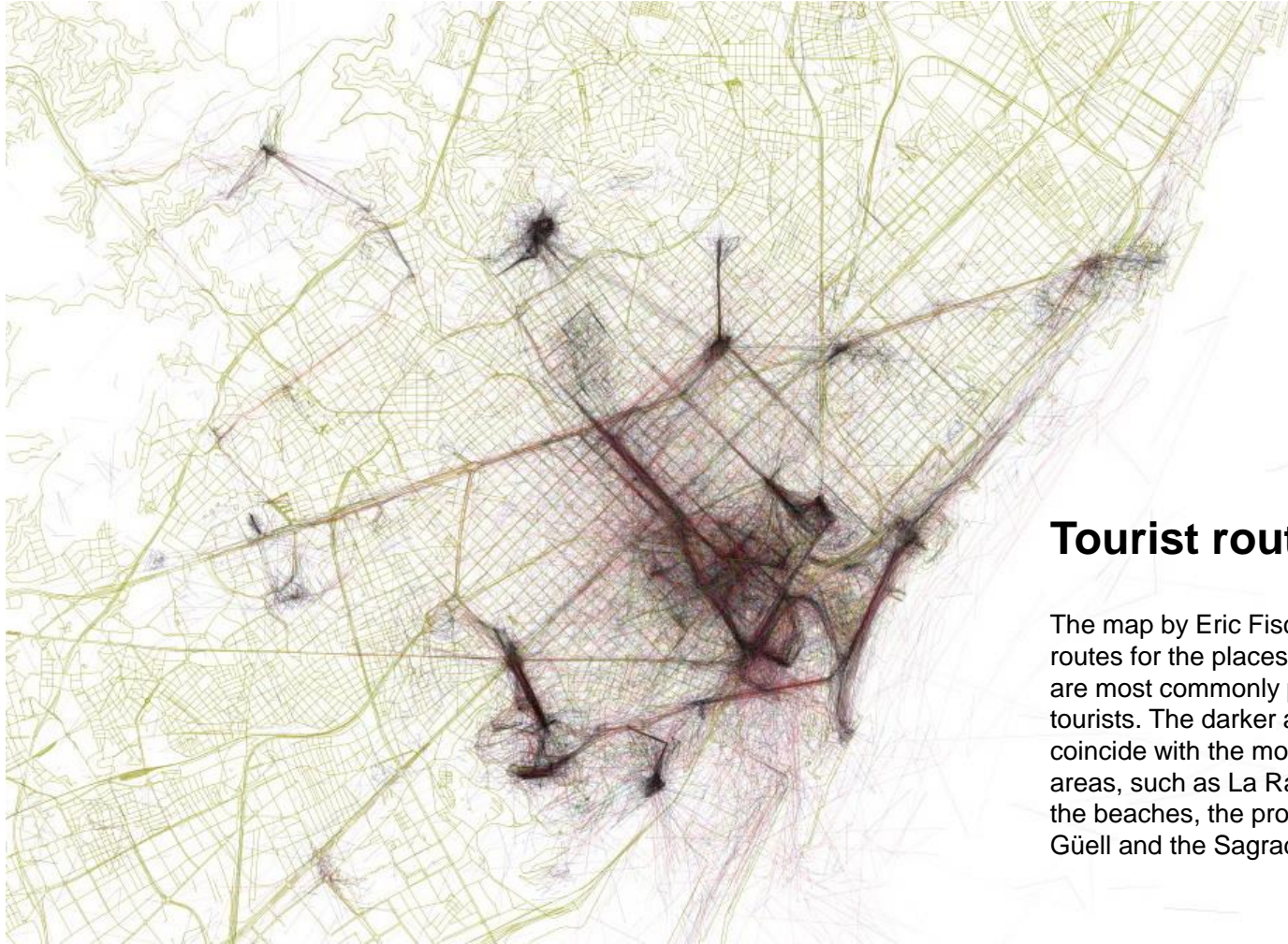


Source: Barcelona Regional, based on information provided by the Directorate of Cleaning and Waste Management Services, Barcelona City Council, 2018.

7. URBAN INFRASTRUCTURE

7. URBAN INFRASTRUCTURE

7.1 PUBLIC SPACE



Tourist routes

The map by Eric Fischer shows the routes for the places in Barcelona that are most commonly photographed by tourists. The darker areas on the map coincide with the most saturated urban areas, such as La Rambla, Ciutat Vella, the beaches, the promenade, Parc Güell and the Sagrada Família.

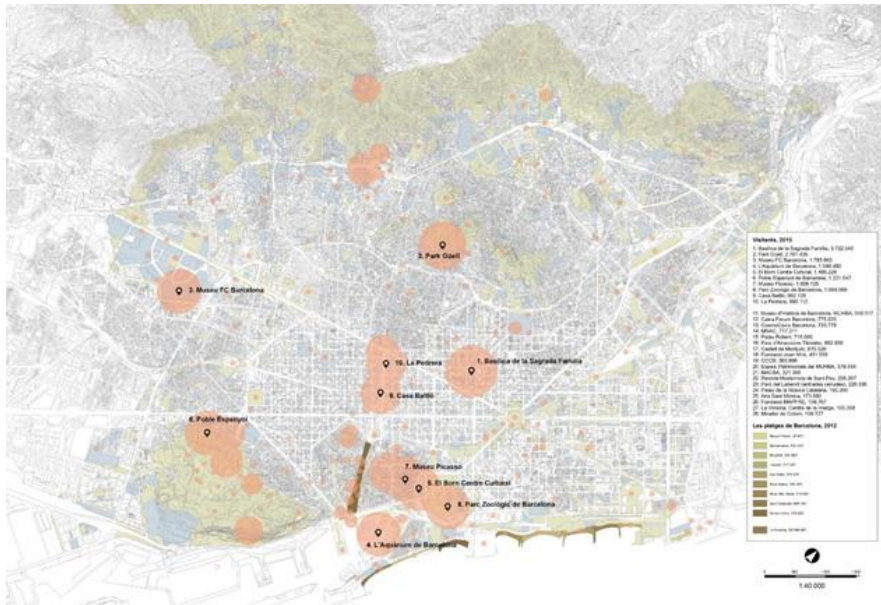
Source: Eric Fischer, 2010
<https://www.flickr.com/photos/walkingsf/sets/72157624209158632/>

7. URBAN INFRASTRUCTURE

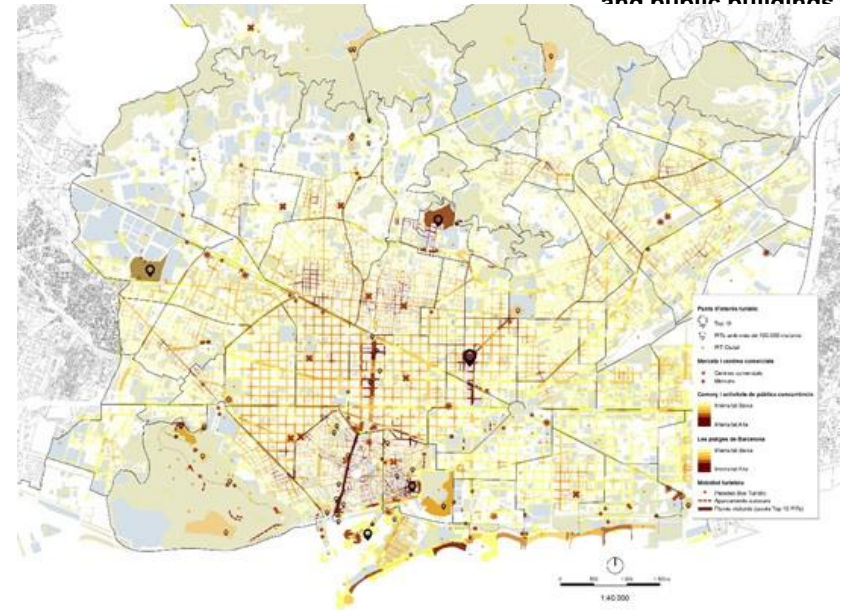
7.1 PUBLIC SPACE

Barcelona, due to its physical limits, has a high population density (15,832 inhabitants/km²), and this contributes to its high intensity of use of public spaces. Places such as **Sagrada Família, Parc Güell, the Passeig de Gràcia shopping district, La Rambla, the Gothic Quarter, the Barceloneta, the Rambla del Poblenou, Vila de Gràcia and Sant Antoni** are the areas that are most frequented by tourists.

Number of visitors to tourist attractions, beaches and the Rambla, 2015



Overlapping of the variables: points and areas of interest for tourists, stops for the Bus Turistic, individual transportation, coach parking, consequent flows of people, and the density of commercial activities and public buildings



Source: Barcelona Regional, based on data from the Turisme de Barcelona Consortium (2014) and the Activities Census (Barcelona Comerç, 2014). PEUAT, 2016.

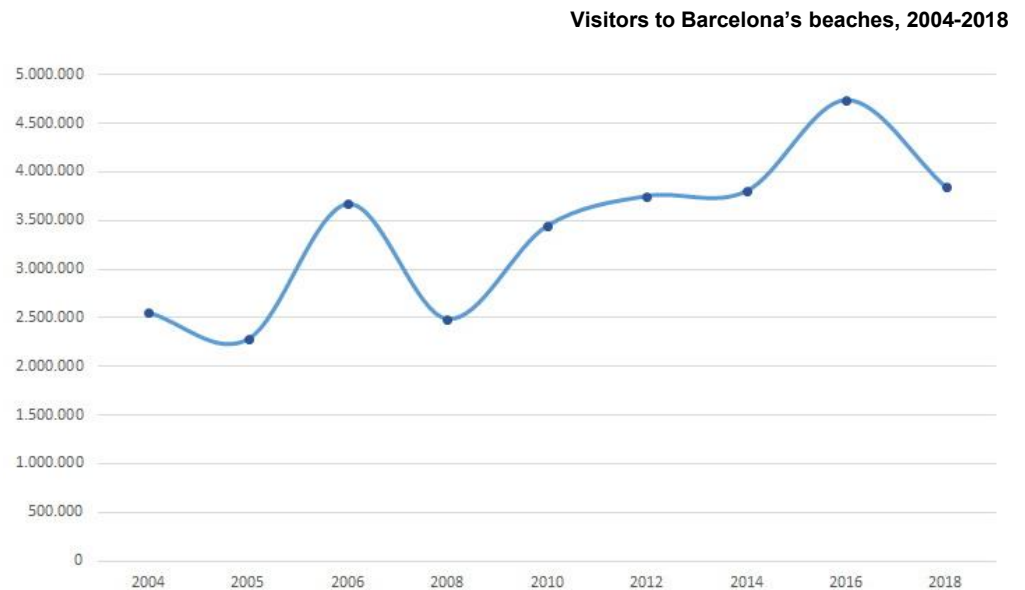
7. URBAN INFRASTRUCTURE

7.1 PUBLIC SPACE

Beaches

In 2008, the beaches received close to 2.5 million visitors, and in 2016, that figure topped 4.7 million, and then stabilised to a certain degree at a figure of around 3.5 million visitors.

The last report on how many people were visiting the beaches, carried out in 2018, showed a 19% decrease (around 900,000 people). The report states that unstable weather, the decline in the number of foreign tourists and Barcelona residents, and more negative ratings of the beaches have contributed to this decrease.



Source: Barcelona City Council, 2018.

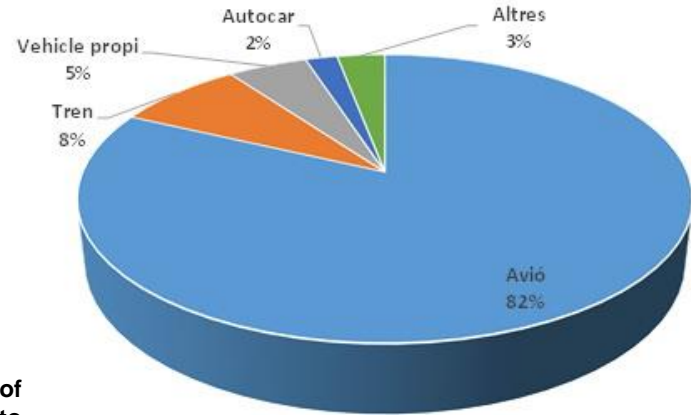
7. URBAN INFRASTRUCTURE

7.2 MOBILITY

Barcelona boasts a good range of general infrastructures and mobility services, as well as specific services geared towards tourists. These services are essential for the tourist sector, creating a favourable setting for tourist stays and lending attractiveness as a destination.

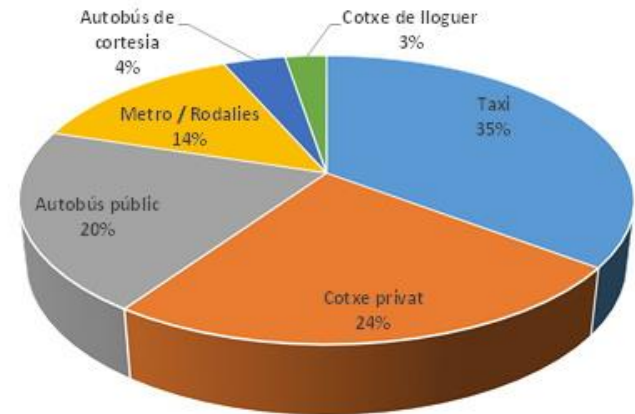
As far as the modes of transportation used to get to and leave the city, **the aeroplane is the clearly the most dominant.**

Principal mode of transportation used to get to Barcelona, 2016



Source: BARCELONA CITY COUNCIL (2016). *Survey on tourist activity in Barcelona city 2016.*

Modes of transportation to the airport used by travellers who are taking departing flights, 2015



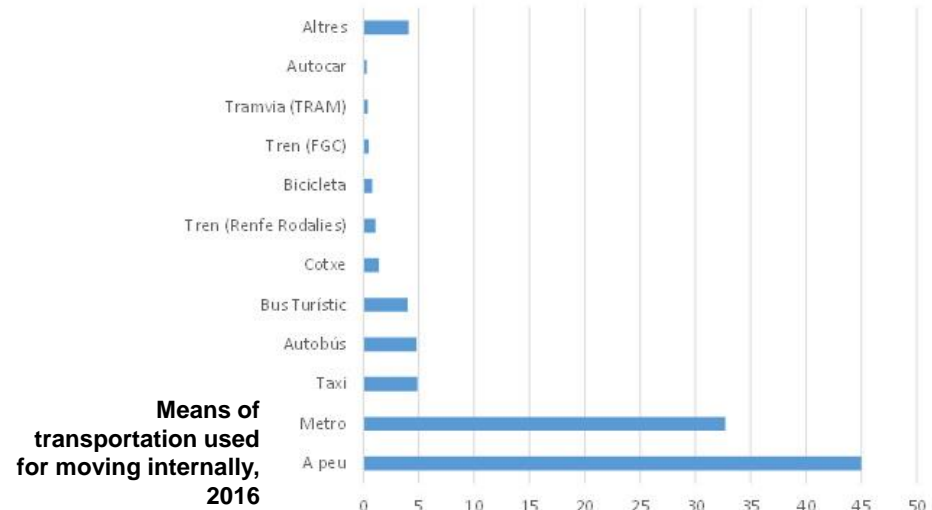
Source: AENA, 2015.

7. URBAN INFRASTRUCTURE

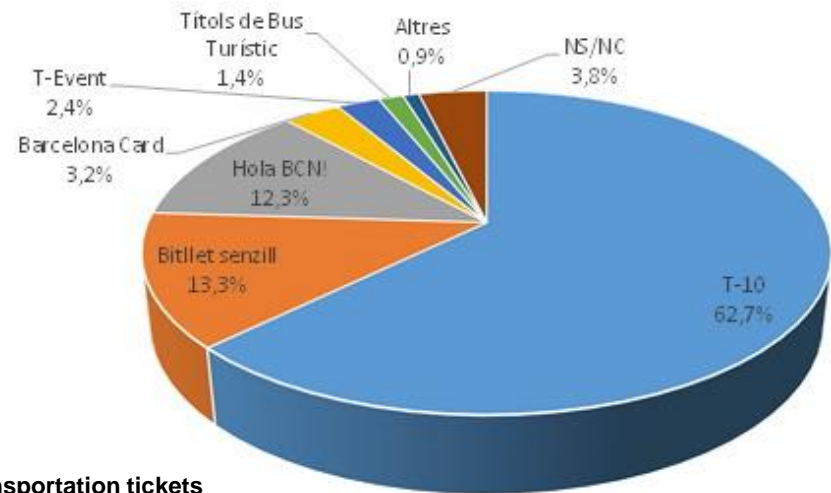
7.2 MOBILITY

The city's internal tourist mobility is characterised by a modal share dominated by public transportation and moving around on foot, with little use of motorised private vehicles.

Tourist mobility has a **specific set of problems**, since it entails a series of tourist resources that are related to mobility or which have an impact on it, such as the **Bus Turístic** and **occasional coaches**, and the **the increasing use of rented personal mobility vehicles (like electric scooters), bicycles and motorcycles**. Even though these represent a minority in how tourists get around, they generate an impact due to how they occupy public spaces and may cause coexistence issues with other means of transportation and with pedestrians.



Source: BARCELONA CITY COUNCIL (2016). *Barcelona Tourist Mobility Strategy Survey*. Barcelona: Department of Opinion Surveys.



Types of transportation tickets most commonly used by tourists (%), 2016

Source: BARCELONA CITY COUNCIL (2016). *Barcelona Tourist Mobility Strategy Survey*. Barcelona: Department of Opinion Surveys

7. URBAN INFRASTRUCTURE

7.2 MOBILITY

The fact that the two operators' routes overlap, the large number of buses in some central areas of the city and the amount of visitors they bring to the main POIs create a great strain on the environment.

Of note is how old the Barcelona Bus Turístic's fleet is, with each bus being an average of **12.4 years old**.

Routes for the Bus Turístic and the Barcelona City Tour



Source: Barcelona Regional, based on data from the Turisme de Barcelona Consorci, 2016.

BARCELONA - EL PRAT AIRPORT

7. URBAN INFRASTRUCTURE

7.3 BARCELONA - EL PRAT AIRPORT

47,284,500
passengers

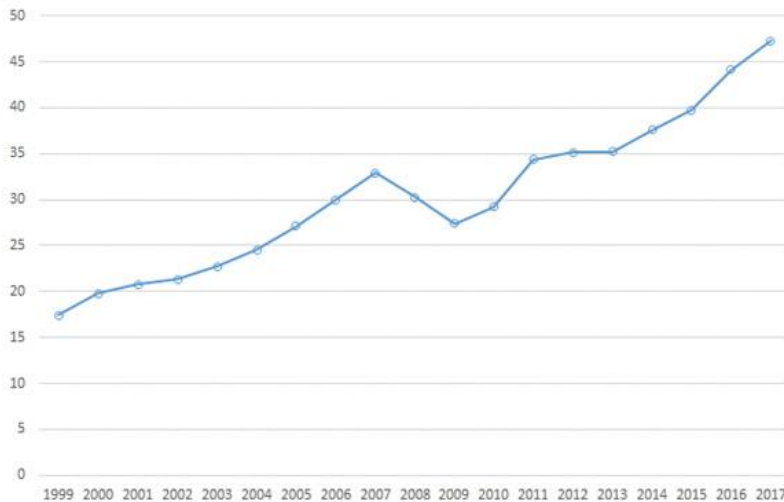
82% percentage of tourists visiting Barcelona that arrive via plane

(Source: Survey on tourist activity in Barcelona city 2016)

4 Million passengers per month from **April to October** (72% of total annual passengers)

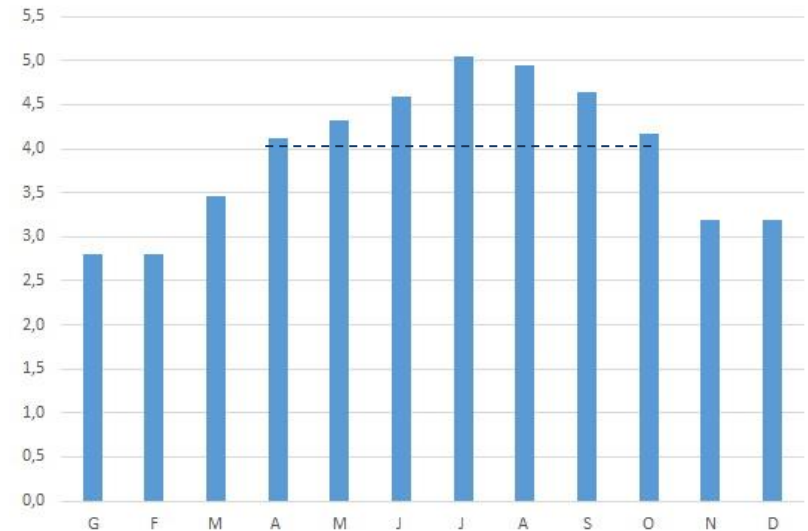
5 Million passengers in **July** (11% of total annual passengers)

Evolution of the number of passengers going through Barcelona's El Prat Airport (in millions)



AENA, 2017

Evolution of the number of passengers going through El Prat Airport per month (in millions, 2017)



AENA, S.A., 2017

7. STRATEGIC ASPECTS

7.3 BARCELONA - EL PRAT AIRPORT

73%

International
passengers

51%

European
passengers
(excluding Spain)

48%
Vueling

20%
Ryanair

8%
Easyjet

27%
Spain

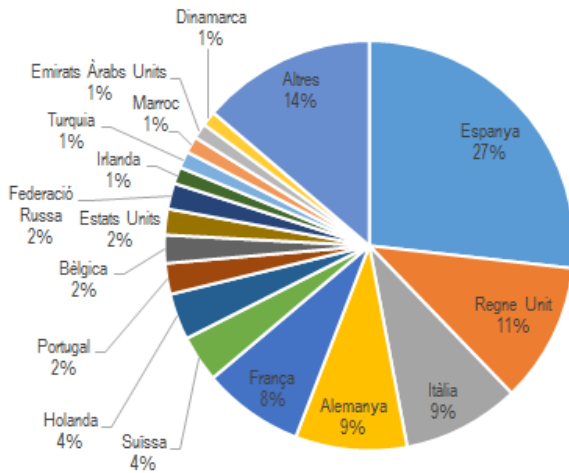
11%
United
Kingdom

9%
Italy
Germany

8%
France

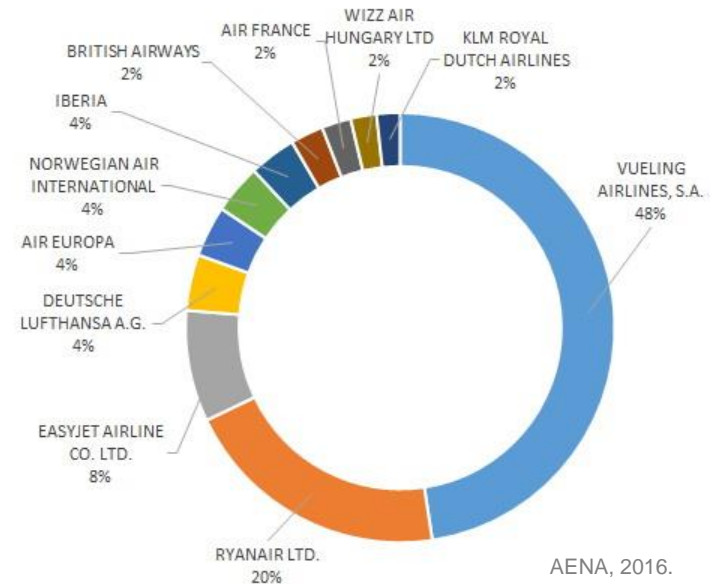
76%
of the market share

Passengers with layovers at El Prat Airport, by country (% , 2016)



AENA, 2016.

Passengers transported by airline (% , 2016)



AENA, 2016.

7. STRATEGIC ASPECTS

7.3 BARCELONA - EL PRAT AIRPORT

Main environmental impacts:

Although the most severe impacts of an airport happen during the construction phase, the main impacts they entail during the operation phase can be classified based on the different vectors.

Water: possible pollution by oil and/or heavy metals;
possible effect on the surface and ground water and the soil;
changes in the water balance in wetland areas that are of ecological interest.

Soil: soil impermeabilisation, decreased groundwater recharge capacity; contribution to an increase in saline intrusion and the acidification of soils; risk of pollution.

Habitats: destruction and fragmentation of habitats; habitat degradation due to light pollution.

Air quality: emission of polluting gases due to fossil fuel combustion; NO_x and PM emissions.

Noise: it is a source of noise pollution that affects the SPA and residential areas.

Energy: it entails high energy consumption.

Barcelona Airport



Source: Barcelona Airport, 2014.

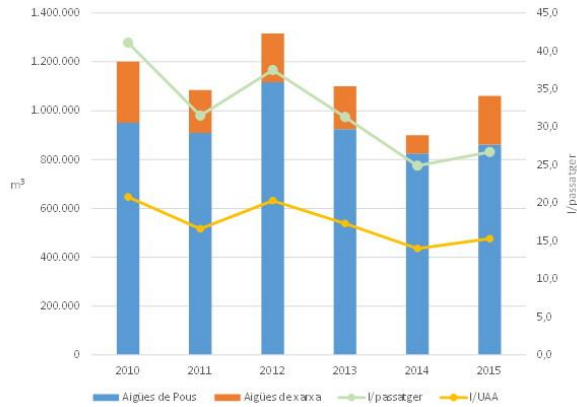
Impacts caused by the construction work to expand the airport infrastructures and those of adjacent areas.

Impacts caused by potential accidents.

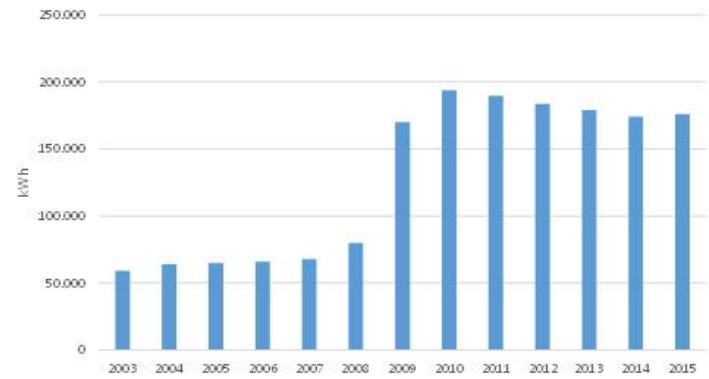
7. STRATEGIC ASPECTS

7.3 BARCELONA - EL PRAT AIRPORT

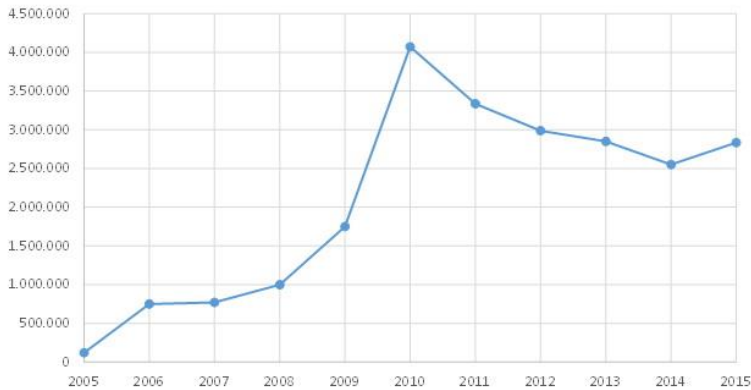
Water consumption at Barcelona - El Prat Airport (m³)



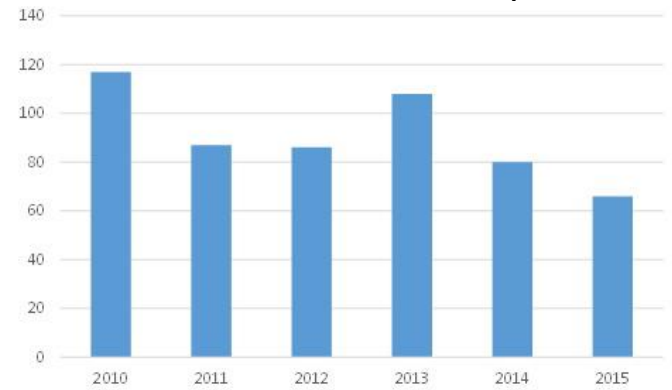
Electric energy consumption at Barcelona - El Prat Airport (kWh)



Natural gas consumption at Barcelona - El Prat Airport (m³)



Special waste generated at Barcelona - El Prat Airport, 2010-2015 (t)



Source: AENA, S.A., 2015

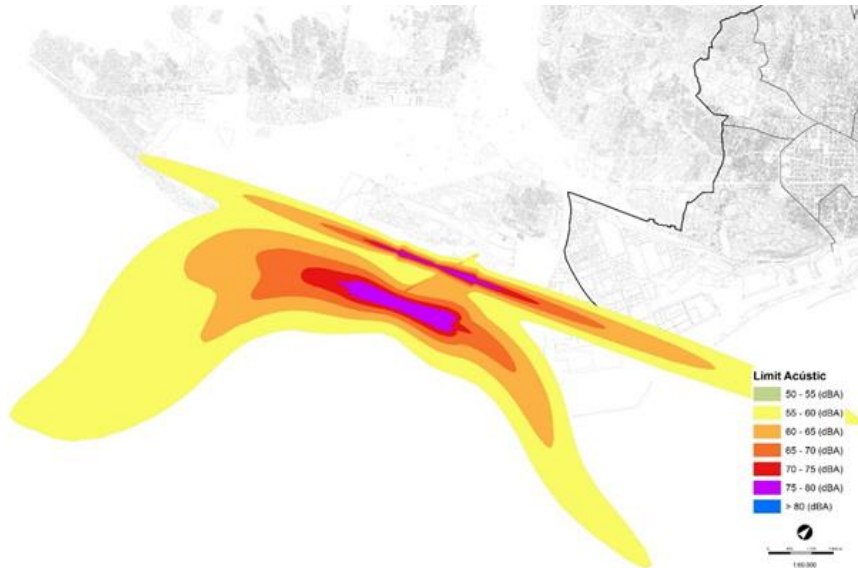
7. STRATEGIC ASPECTS

7.3 BARCELONA - EL PRAT AIRPORT

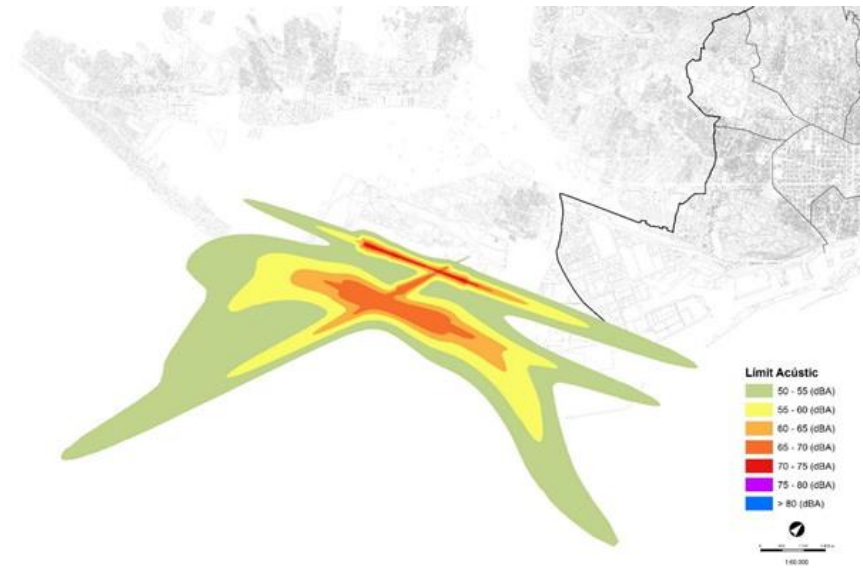
Population exposed, in hundreds (L_{den})

dB	Castelldefels	El Prat de Llobregat	Gavà	Viladecans	Total
55-60	19	1	9	1	30
60-65		1		1	2
65-70		1			1
70-75		1			1
>75		1			1

Noise map for the Barcelona Airport, daytime (7 am - 9 pm)



Noise map for the Barcelona Airport, night-time (11 pm - 7 00 hours)



Source: AENA, 2013

7. STRATEGIC ASPECTS

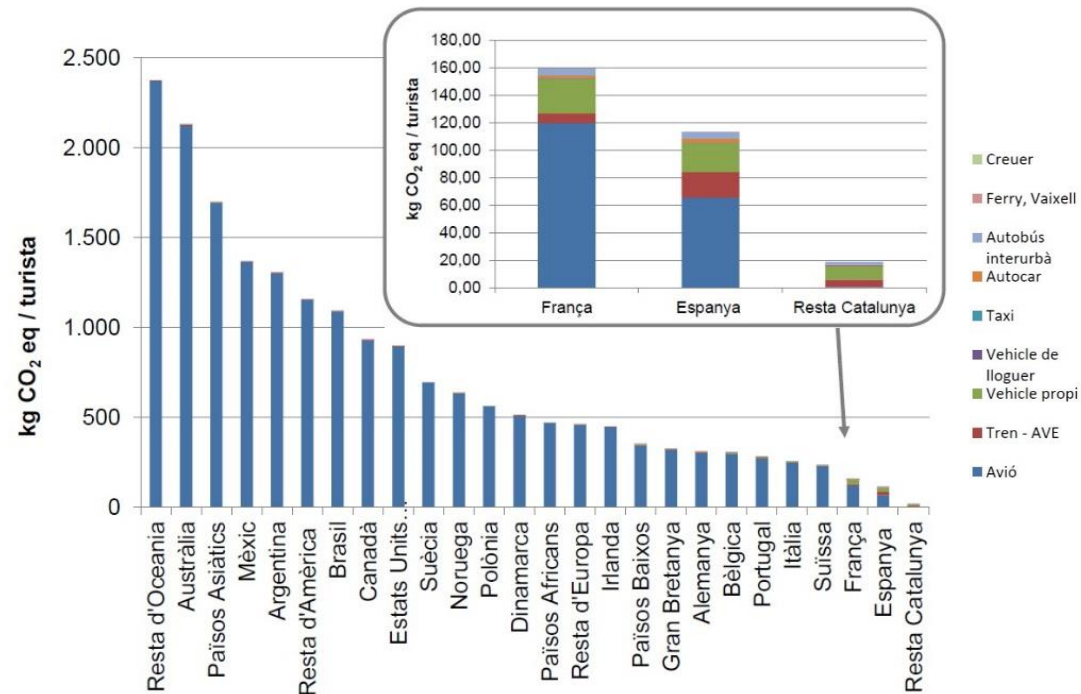
7.3 BARCELONA - EL PRAT AIRPORT

Estimating the Carbon Footprint of the Tourist Sector in Barcelona city

Travelling by plane gives rise to **85.7%** of the total carbon footprint for Barcelona's tourist sector.

Tourist
605.7 kg CO₂eq /person

Carbon footprint caused by a tourist travelling from their place of residence to Barcelona, by country of origin



Source: Inèdit, 2017.

PORT OF BARCELONA

7. URBAN INFRASTRUCTURE

7.4 PORT OF BARCELONA

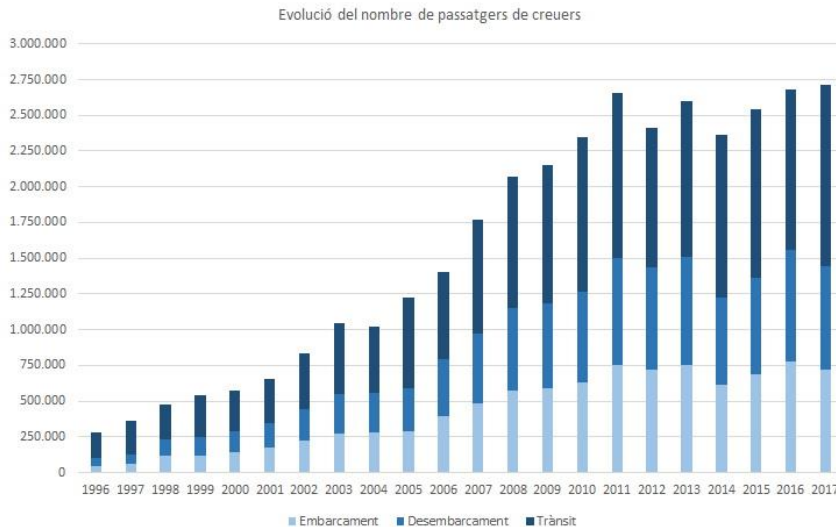
2,712,247

cruise ship passengers

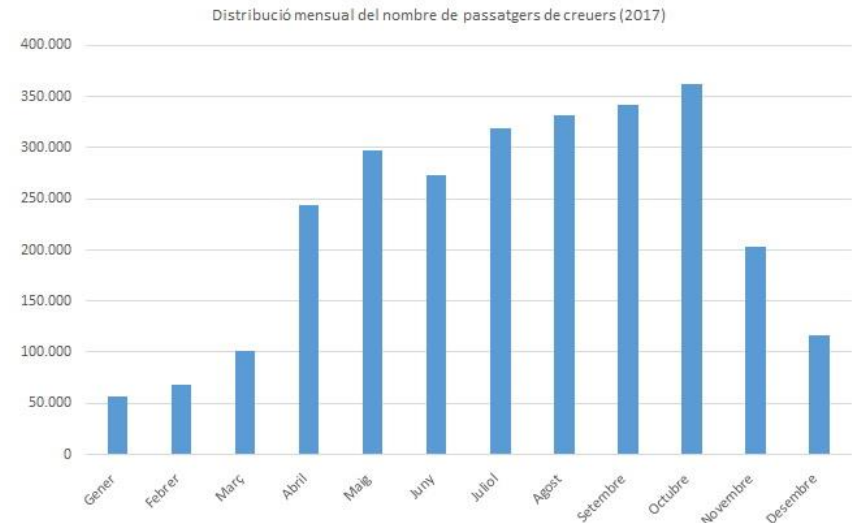
53% passengers who start and end their itinerary in Barcelona

The monthly distribution of the number of cruise ship passengers in Barcelona is affected by the same seasonality as most Mediterranean ports. The months between April and October are the busiest as regards cruise ship visitors.

Evolution of the number of cruise ship passengers passing through the Port of Barcelona 1996-2017



Monthly distribution of number of cruise ship passengers (2017)



Source: Prepared by the authors using data from the Barcelona Port Authority, found in different statistical yearbooks.

Source: Barcelona Port Authority, 2017.

7. STRATEGIC ASPECTS

7.4 PORT OF BARCELONA

Movements of cruise ship passengers, by type (2014)

Total cruise ship passenger movements: 2,364,292						
Turnaround: 1,222,487 (51.7%)						Traffic: 1,141,805 (48.3%)
Embarkations: 615,377 (26.0%)			Disembarkations: 607,110 (25.7%)			
Embark directly (without visiting BCN): 234,251 (9.9%)	Excursionists (visit without spending the night): 85,774 (3.6%)	Tourists (spend the night before embarking): 295,532 (12.5%)	Directly directly (without visiting BCN): 203,244 (8.6%)	Excursionists (visit without spending the night): 132,603 (5.6%)	Tourists (spend the night before leaving): 271,263 (11.5%)	Excursionists (stop over without spending the night): 1,141,805 (48.3%)

Source: 2016 report on tourism activity.

7. STRATEGIC ASPECTS

7.4 PORT OF BARCELONA

Main environmental impacts:

Saturation of public spaces: Large volume of visitors when cruise ships arrive, with a more significant impact on the tourist attractions in Ciutat Vella.

Air pollution: production of CO₂, CO, NO_x, SO_x, PM, gases created by burning waste, VOCs and other gases.

Generation of solid waste: paper, cardboard, glass, plastic, organic material, cartons, or other domestic or commercial waste. The Port of Barcelona has lower prices for depositing and handling waste than other Mediterranean ports, and that means that many cruise ships offload their waste in Barcelona.

Production of hazardous waste: batteries, appliances that use CFCs, fluorescent bulbs and lamps, paint, solvents and others.

Production of grey water: coming from pools, sinks, showers, washing machines and others. These produce water that contains chlorine and fluoride, as well as organic material.

Port of Barcelona



Source: BR, 2014

Impacts caused by the construction work to expand the port infrastructures.

Impacts caused by potential accidents.

7. STRATEGIC ASPECTS

7.4 PORT OF BARCELONA

The MARPOL Convention

Annexe I: Regulations to prevent oil pollution (effective date: 2 October 1983)

Annexe II: Regulations to prevent pollution from harmful liquid substances being transported in bulk (effective date: 2 October 1983)

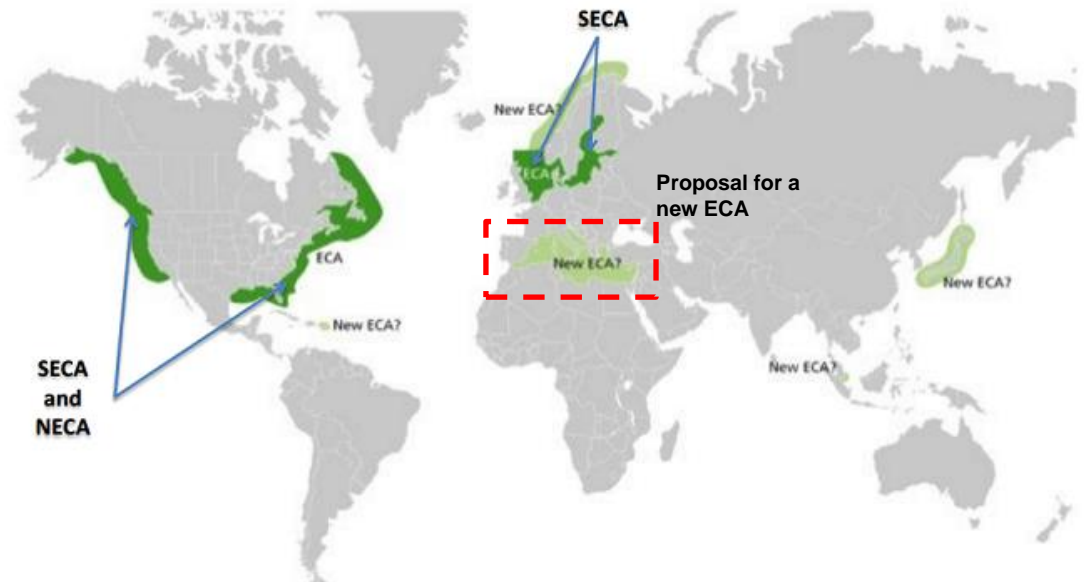
Annexe III: Regulations to prevent pollution from harmful substances being transported by sea in packages (effective date: 1 July 1992)

Annexe IV: Regulations to prevent pollution from blackwater discharged from boats (effective date: 27 September 2003)

Annex V: Regulations to prevent pollution caused by waste from boats (effective date: 31 December 1988)

Annexe VI: Regulations to prevent air pollution caused by boats (SO_x , NO_x , PM_x). These introduce the NECA and SECA zones (effective date: 19 May 2005)

NECA (*nitrogen oxide emission control area*), SECA (*sulphur dioxide emission control area*) and proposals for new ECAs (*emission control areas*)



Source: IMO, 2016.

7. STRATEGIC ASPECTS

7.4 PORT OF BARCELONA

Local contribution of the port, affecting the port:

PM₁₀: 54%-55%
 PM_{2.5}: 50%-52%

Local contribution of the port, affecting the city:

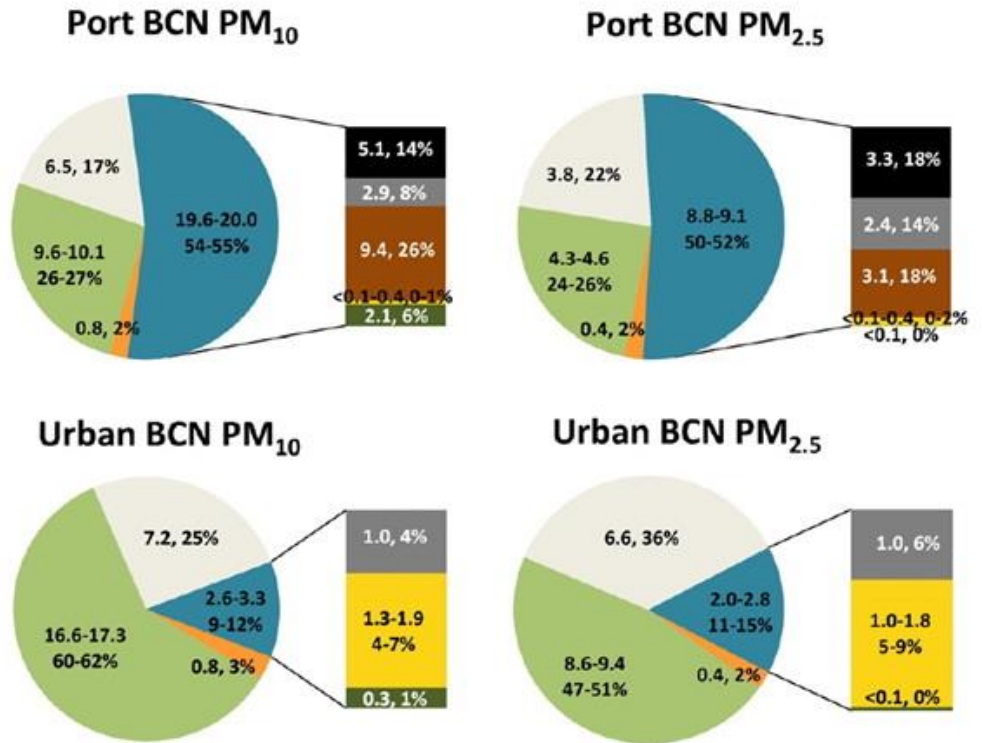
PM₁₀: 9%-12%
 PM_{2.5}: 11%-15%

Predominant winds: SE/SW

High levels of secondary pollutants due to SO₂ emissions from boats.

Origin of PM₁₀ and PM_{2.5} immissions at the port and urban area of Barcelona (µg/m³)

■ Harbour
 ■ African dust
 ■ Regional/urban
 ■ Road traffic
 ■ Fuel-oil combustion
 ■ Mineral-road dust
 ■ SO₄²⁻ and OC secondary aerosols
 ■ Secondary nitrate
 ■ Unaccounted



Source: PÉREZ, N. [et al.] (2016). "Impact of harbour emission on ambient PM₁₀ and PM_{2.5} in Barcelona (Spain): Evidences of secondary aerosol formation within the urban area". *Science of the Total Environment* 571, 2016, pp 237-250.

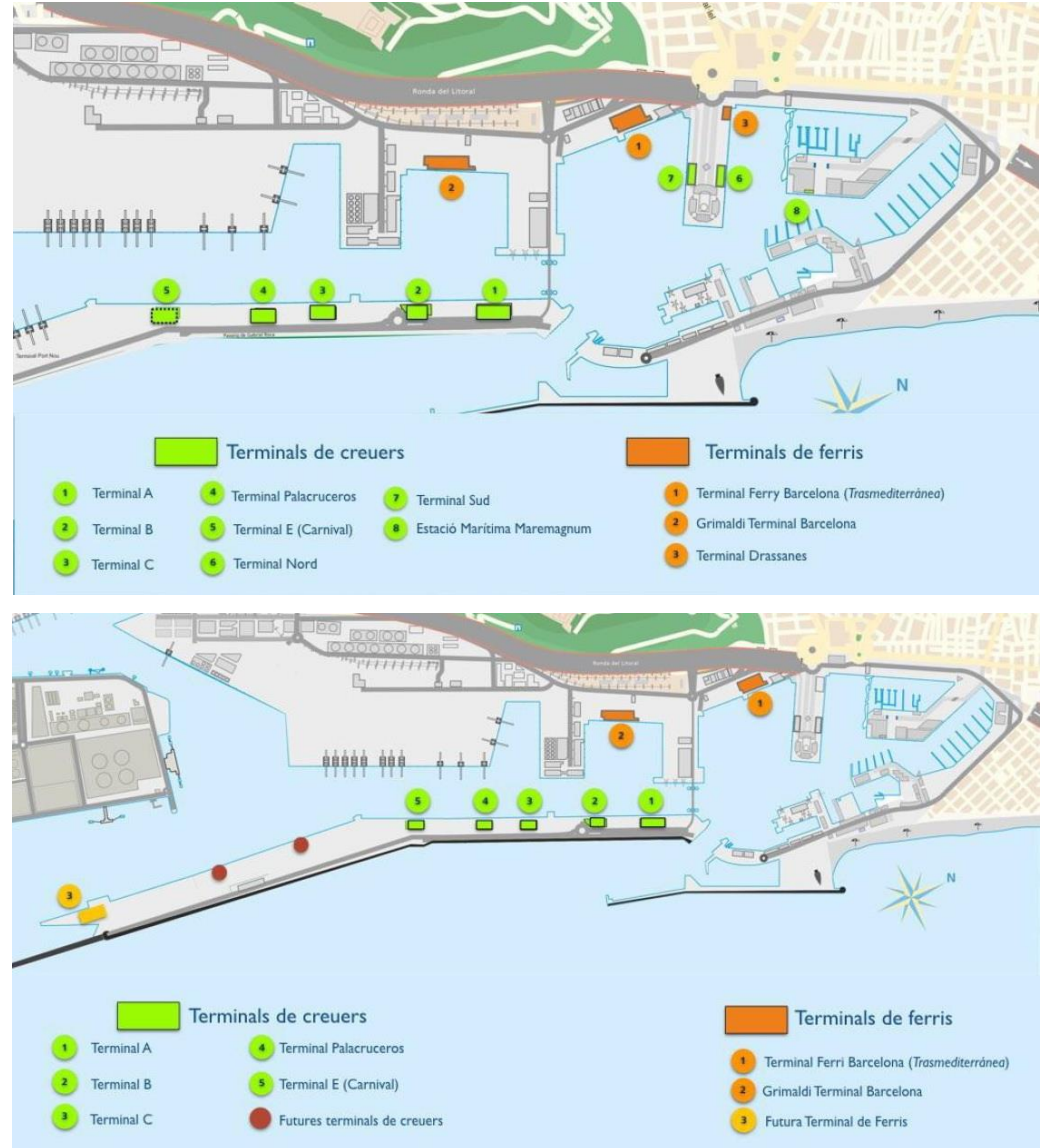
7. STRATEGIC ASPECTS

7.4 PORT OF BARCELONA

Recently, the Barcelona City Council and the Port have drafted several agreements that will allow for a greater integration of the port activity in the city.

- The docking of international cruise ships is limited to seven at a time, and they will be grouped together on the Adossat Wharf.
- Space on the Drassanes wharf and Barcelona wharf has been freed up for public use.
- The Port will create a programme to reduce the environmental externalities of cruise ship traffic and a sustainable management plan for cruise ship passenger mobility on land.
- The Nova Bocana Urban Design Plan will create 14,000 m² of new spaces for the public and will encourage their use for nautical education and technology.

Current situation and future situation (on bottom) of the Port of Barcelona



Source: Barcelona City Council, 2018.

8. ESTIMATING THE CARBON FOOTPRINT OF THE TOURIST SECTOR IN BARCELONA CITY

8. ESTIMATING THE CARBON FOOTPRINT OF THE TOURIST SECTOR IN BARCELONA CITY

8.1 METHODOLOGY

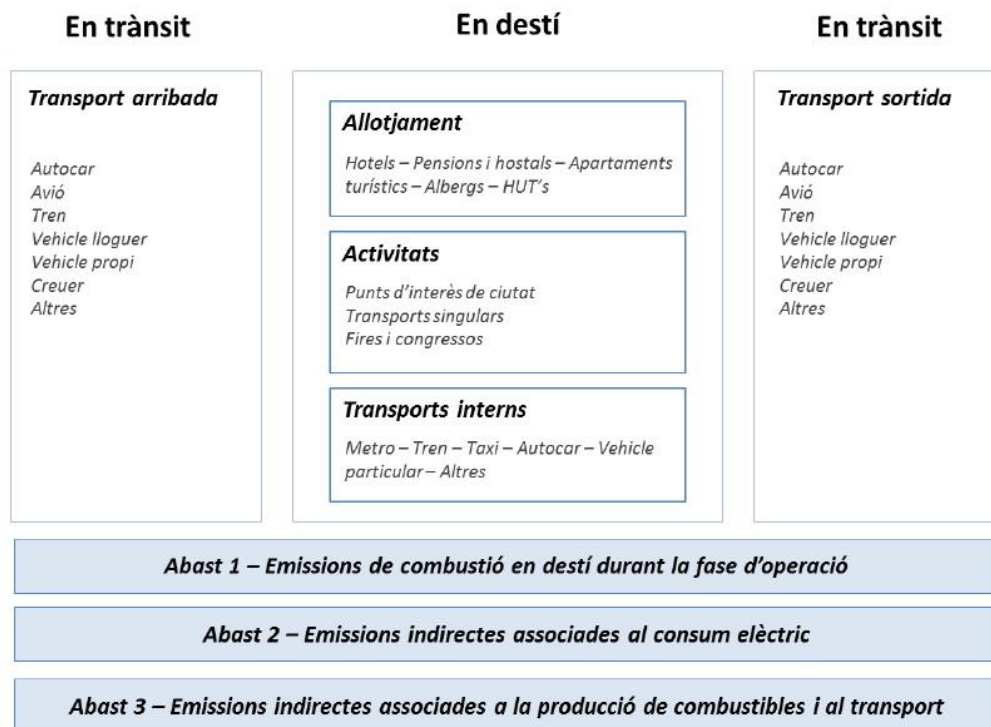
The study focuses on energy flows, because they are what comprise the most relevant impacts in the tourist sector and as regards climate change, and because there is not precise data for other types of flows and/or areas of activity.

The GHG emissions generated at every stage of the life cycle are included.

Other types of flows, such as water, food, infrastructures or materials, are not included.

Most of the data is for the year 2015.

Scope of the study estimating the carbon footprint of the tourist sector in Barcelona city



Source: Inèdit, 2017

8. ESTIMATING THE CARBON FOOTPRINT OF THE TOURIST SECTOR IN BARCELONA CITY

8.2 TOTAL FOOTPRINT

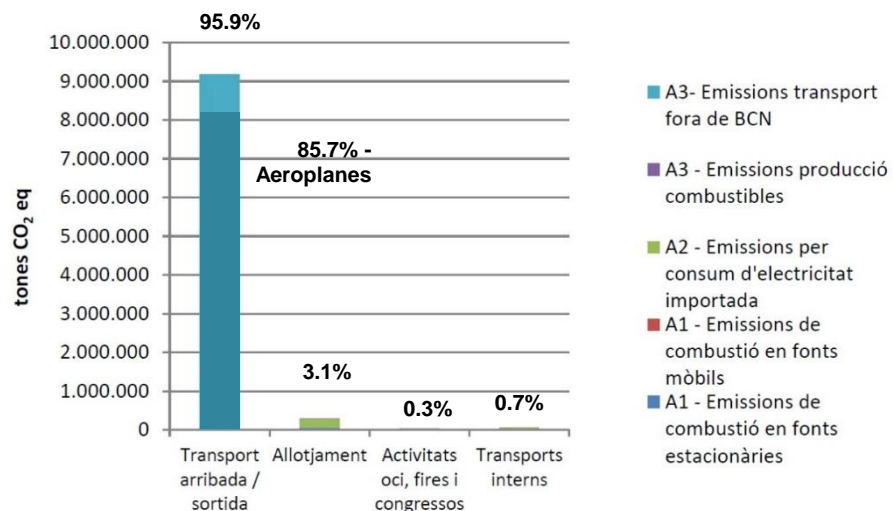
9,578,359

t CO_{2eq} / year
Total emissions per year

96.93

kg CO_{2eq} / visitor / day
Total emissions per visitor per day (tourists and excursionists)

Carbon footprint of tourism in Barcelona city



Source: Inèdit, 2017

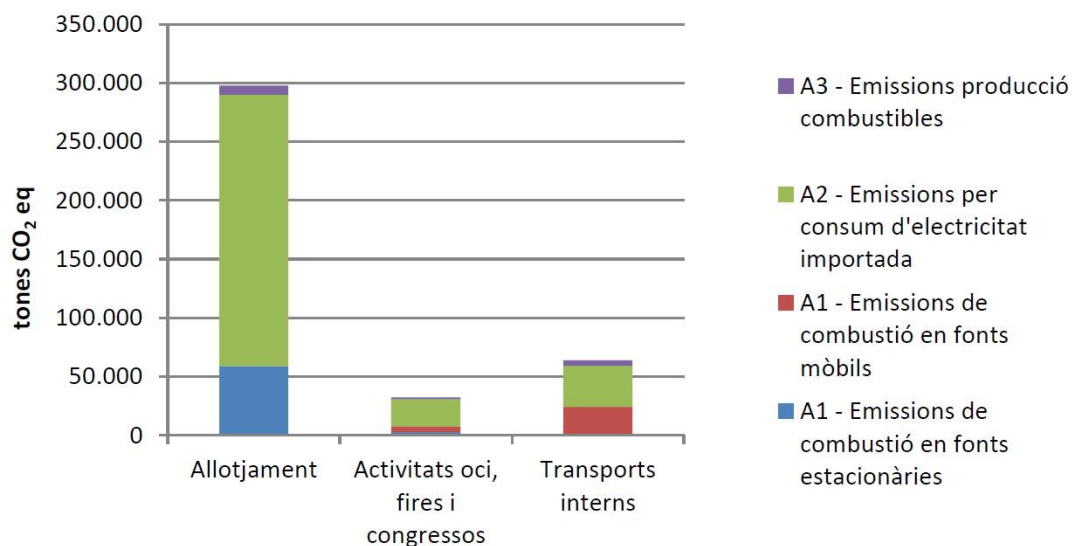
Àmbit d'activitat	Petjada de Carboni total (tones CO ₂ eq)	Impacte Relatiu (%)	Per visitant-dia, mitjana (kg CO ₂ eq)
Transport arribada i sortida	9.184.457	95,9%	92,94
Allotjament	297.891	3,1%	3,01
Activitats oci, fires i congressos	32.148	0,3%	0,33
Transports interns	63.862	0,7%	0,65
TOTAL	9.578.359	100,0%	96,293

Source: Inèdit, 2017

8. ESTIMATING THE CARBON FOOTPRINT OF THE TOURIST SECTOR IN BARCELONA CITY

8.3 FOOTPRINT IN DESTINATION

Carbon footprint of tourism in Barcelona city



393,902

t CO_{2eq} / year

Total emissions generated in destination

3.99

kg CO_{2eq} / visitor / day

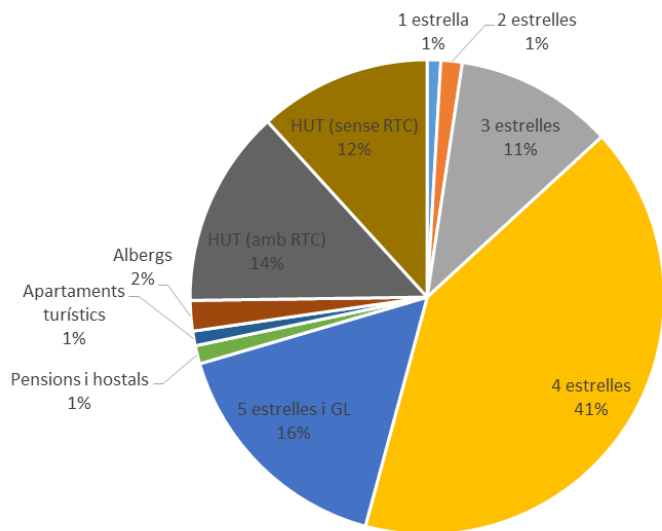
Total emissions per visitor per day (tourists and excursionists)

Source: Inèdit, 2017

8. ESTIMATING THE CARBON FOOTPRINT OF THE TOURIST SECTOR IN BARCELONA CITY

8.4 CARBON FOOTPRINT OF ACCOMMODATIONS

297,891
t CO_{2eq}
Emissions from accommodations
(3.1% of the total)



Carbon footprint of accommodations

Categoria	CO _{2eq}	%	kg CO _{2eq} /pernoctació
5 estrelles i GL	48.453	16,3	21,9
4 estrelles	122.186	41,0	13,1
3 estrelles	32.189	10,8	7,5
Apartaments turístics	2.950	1,0	4,2
HUT (amb RTC)	40.128	13,5	4,2
HUT (sense RTC)	35.007	11,8	4,2
1 estrella	2.747	0,9	3,9
2 estrelles	4.339	1,5	3,9
Pensions i hostals	3.726	1,3	2,9
Albergs	6.166	2,1	2,9

Source: Inèdit, 2017

8. ESTIMATING THE CARBON FOOTPRINT OF THE TOURIST SECTOR IN BARCELONA CITY

8.5 POINTS OF INTEREST IN THE CITY, INTERNAL TRANSPORTATION, TRADE FAIRS, FESTIVALS AND CONVENTIONS

32,135

t CO_{2eq} / year

Total emissions in destination (points of interest in the city, individual transportation, trade fairs, festivals and conventions: **0.3%** del total)

63,862

t CO_{2eq} / year

Total emissions in destination (internal transportation: metro, Renfe and FGC light rail systems, bus, taxi, etc.: **0.7%** del total)

Total emissions in destination: POIs, individual transportation, trade fairs,

Categoria	tones CO _{2eq}	%	kg CO _{2eq} / visita
Punts d'Interès de Ciutat	22.109	68,7	0,86
Transports singulars	6.194	19,3	1,36
Fires i congressos	3.832	12,0	5,9
Total	32.135	100	1,42

Source: Inèdit, 2017

Total emissions in destination from internal transportation

Mitjà de transport	tones CO _{2eq}	kg CO _{2eq} / visita
Metro	24.610	0,20
Renfe	9.029	1,43
FGC	944	0,35
Tramvia	251	0,10
Bus	6.116	0,29
Taxi	14.223	0,76
Vehicle de lloguer	589	0,76
Vehicle propi	7.580	0,75
Autocars	520	0,34
Total	63.862	

Source: Inèdit, 2017

8. ESTIMATING THE CARBON FOOTPRINT OF THE TOURIST SECTOR IN BARCELONA CITY

8.6 TOURIST PROFILES

8 ESTIMATING THE CARBON FOOTPRINT OF THE TOURIST SECTOR IN BARCELONA CITY

8.6 TOURIST PROFILES

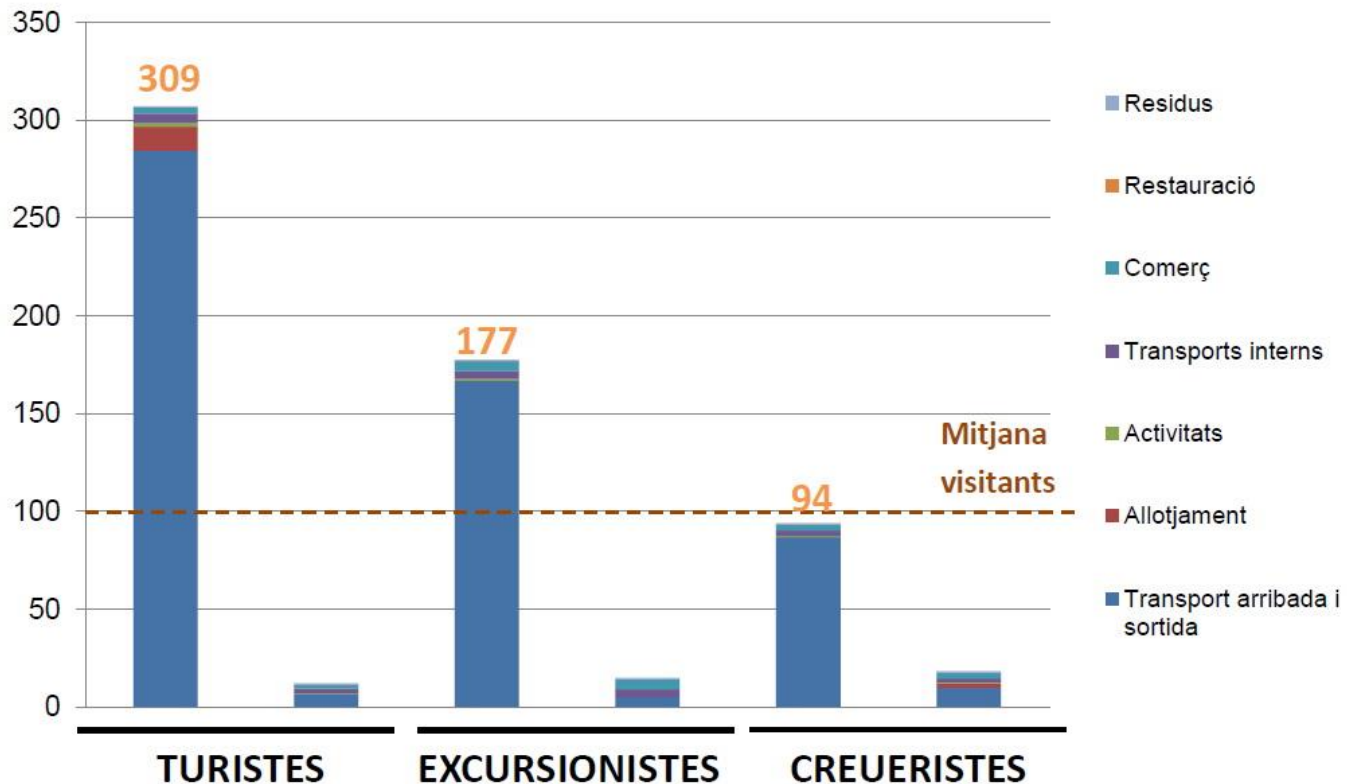
Type of visitor
 Tourist
 Excursionist
 Cruise passenger - tourist
 Cruise passenger - excursionist

Origin	Transport	Motivation	Companions	Nights staying	Accommodation
National	Air travel	Leisure	Sun	2	5★ hotel
European	Train-AVE	Businesses	Same-sex	3	4★ hotel
Asian	Train		Family 4	4	3★ hotel
North American	Own vehicle			5	2★/1★ hotel
	Cruise ship				B&B
	Bus				Friend's house
					HUT (dwellings for tourism)

8 ESTIMATING THE CARBON FOOTPRINT OF THE TOURIST SECTOR IN BARCELONA CITY

8.6 TOURIST PROFILES

Results of the maximum and minimum carbon footprint for the profiles considered (kg CO_{2eq} / dia)




Source: Inèdit, 2017

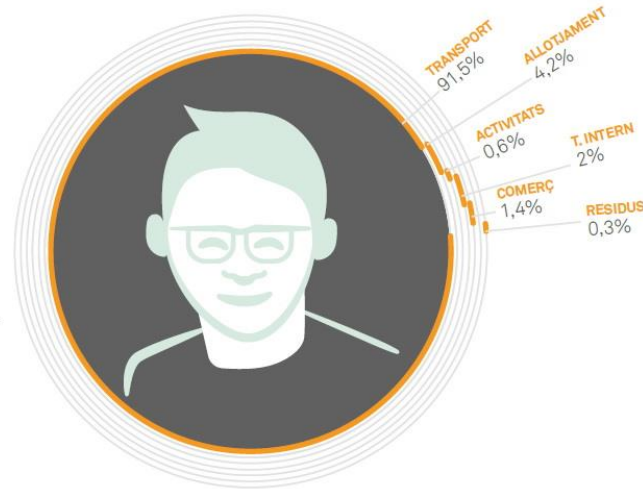
8 ESTIMATING THE CARBON FOOTPRINT OF THE TOURIST SECTOR IN BARCELONA CITY

8.6 TOURIST PROFILES

TURISTA HONG-KONG


Viatja sol per negocis. Arriba i marxa de Barcelona en avió i s'allotja durant tres nits en un hotel de 4 estrelles.

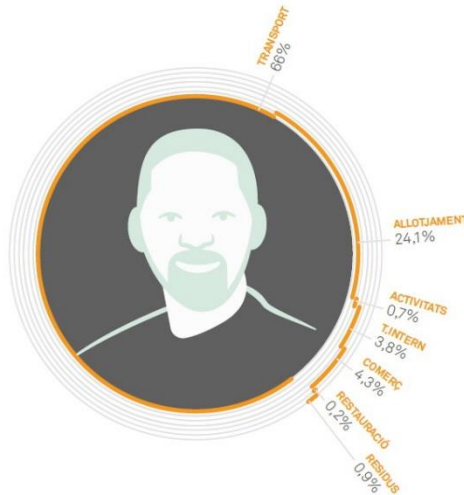
 3 nits **233**
kg CO₂eq. / dia



CREURISTA EEUU


Viatja en parella per oci. Arriba a Barcelona en avió i s'allotja durant tres nits en un hotel de 5 estrelles fins embarcar en el creuer.

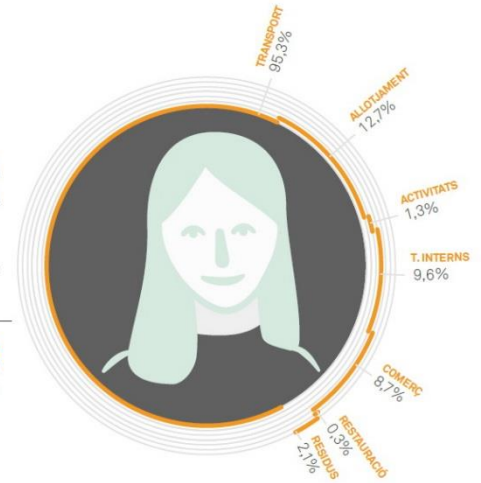
 3 nits **68**
kg CO₂eq. / dia



TURISTA FRANÇA

Viatja en parella per oci. Arriba i marxa de Barcelona en avió i s'allotja durant cinc nits en un HUT (Habitatges d'Us Turistic).

 5 nits **28**
kg CO₂eq. / dia



8 ESTIMATING THE CARBON FOOTPRINT OF THE TOURIST SECTOR IN BARCELONA CITY

8.6 TOURIST PROFILES

+1.09

kg CO_{2eq} / person / day

Difference in the total generation of a visitor to the destination, in comparison with that of a resident

Daily carbon footprint for an average visitor compared to that of a resident (kg CO_{2eq} / person / day)

Àmbit d'activitat	Visitant en destí	Resident
Allotjament	3,01	2,63
Activitats oci	0,33	0,13
Transports interns	0,65	1,50
Comerç	2,29	0,97
Restauració	0,05	0,02
Residus	0,60	0,60
TOTAL	6,93	5,84

Source: Inèdit, 2017

8 ESTIMATING THE CARBON FOOTPRINT OF THE TOURIST SECTOR IN BARCELONA CITY

8.6 TOURIST PROFILES

Approximate daily carbon footprint for tourist and excursionist accommodation in the destination, in comparison with that of a resident (kg CO_{2eq} / person / day)

Àmbit d'activitat	Turista en destí	Excursionista en destí	Resident
Allotjament	7,55	0,00	2,63
TOTAL APROXIMAT	11,47	3,92	5,84

Source: Inèdit, 2017

2.9 kg CO_{2eq} / overnight stay in guest houses, hostels, and bed and breakfasts (approx. that of a resident)

21.9 kg CO_{2eq} / overnight stay in 5-star hotels (8x that of a resident)

Barcelona city (resident)
3,420,000 tonnes CO_{2eq}

CF associated with tourism
(without counting transportation
used for arrival/departure):
684,000 tonnes CO_{2eq} (20%)

TOTAL CF associated with
tourism:
9,580,000 tonnes CO_{2eq} (×3)

9. CONCLUSIONS

9. CONCLUSIONS

Purpose

The tourist sector has grown enormously in the past 25 years, thanks to public and private strategies that have culminated in a new global city.

Climate change

There is a two-way relationship between climate change and tourism: tourism contributes to climate change (CO₂ emissions, mostly associated with air travel), but it also suffers the consequences of it.

Climate change may play a role in the destabilisation of the tourist market on a global scale.

Sustainability

In 2011, Barcelona obtained certification as a *Biosphere World Class Destination* and became the first city in the world with this distinction. This represents a milestone reached on the road to sustainable tourism in Barcelona city.

There is a low number of environmental and energetic certifications.

Water

The estimated water consumption in tourist accommodations represents between 8% and 12% of the city total.

The average consumption by a tourist triples that of a Barcelona resident (321 L/person).

We must continue the endeavour we have been undertaking in these past few years: saving water and focusing on decreasing consumption in the higher-category tourist accommodations.

9. CONCLUSIONS

Energy

The tourist sector consumes 7.6% of the city's total energy.

The sector's energy consumption is divided into: accommodations (74%), internal transportation and excursions (17%), and points of interest in the city, individual transportation and professional activities (9%).

81% of the energy consumed by tourist accommodations is used in four categories (tourist-use flats, 4*, 5* and GL hotels).

Noise

Increase in the number of complaints related to tourist-use flats.

Concentration of these complaints in Ciutat Vella and l'Eixample.

Air quality

Tourist mobility has a low impact on Barcelona's air quality.

The impact of emissions caused by the tourist sector in certain neighbourhoods that are closer to sources of pollutions and/or where the winds are more unfavourable still remains to be studied.

Waste

There is a lack of sufficient data on the waste generation associated with tourism.

It is calculated that tourist accommodations generate close to 9% of the city's waste.

Cleaning

Tourism has an influence on the consumption of resources dedicated to street cleaning.

9. CONCLUSIONS

Public space

There is strain on the tourist routes in Ciutat Vella and iconic areas of the city, such as Sagrada Família and Parc Güell.

The number of visitors to the beaches has decreased in comparison with 2016.

Tourist mobility

As far as internal means of transportation, visitors mainly move around using the metro and on foot.

More than half of tourists use the T-10 transportation ticket.

Some bus lines that connect points of interest for tourists can become saturated.

The two tourist bus operators have routes that overlap.

9. CONCLUSIONS

Airport

82% of tourists arrive by plane.

73% are international passengers.

72% of the passengers arrive between the months of April and October.

Planes cause 85.7% of the total carbon footprint for Barcelona's tourist sector.

Each tourist generates 605.7 kg CO₂eq/person.

Port

The cruise ship sector has grown enormously, and it expects to continue to do so over the next few years.

It has very significant impacts on the public spaces in Ciutat Vella, in mobility, and in the management of tourist attractions.

Cruise ships tend to prefer offloading their waste at the Port of Barcelona, due to its low cost.

The port's contribution to air pollutant immissions in the city is expected to increase.

9. CONCLUSIONS

Carbon footprint

The carbon footprint for the tourist sector in Barcelona is 9,578,359 t CO₂eq/ year.

96.93 kg of CO₂eq is emitted per visitor per day (tourists and excursionists).

Travelling by plane gives rise to 85.7% of the total carbon footprint for Barcelona's tourist sector.

Tourist accommodations generate 3.1% of the sector's total carbon footprint.

A visitor in their destination generates +1.09 kg CO₂eq per person per day than a resident.

Tourism promotion in the most distant markets has a huge influence on Barcelona's carbon footprint.



BARCELONA
REGIONAL
AGÈNCIA
DESENVOLUPAMENT
URBÀ

CARRER 60, 25-27. EDIFICI Z, PLANTA 2
SECTOR A, ZONA FRANCA
08040 BARCELONA

www.bcnregional.com
br@bcnregional.com
T. +34 932 237 400

© 2019, BARCELONA REGIONAL