



Flanders
State of the Art



Study into the characteristics and impact of cruise tourism in Flanders

REPORT 2023

VISITFLANDERS

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1 Introduction

Every year, Flanders welcomes many ocean and river cruise ships. Moreover, each port and destination also receives its own form thereof, only ocean or river cruises or a combination, depending on its location. The tourism policy note 2019-2024 describes the intention to explore the added value of ocean and river cruises. That is why, starting in 2020, VISITFLANDERS set up a study to examine in detail the characteristics and impact of both forms of cruise, in collaboration with the cities and port authorities of Antwerp, Bruges/Zeebrugge, Brussels, Ghent and Ostend and other partners.

1.1 Purpose of the study

With this study, VISITFLANDERS wants to gain more insight into the characteristics and impact of the ocean and river cruise ships that dock in the Flemish and Brussels ports and into the profile of the cruise tourists who visit Flanders. More specifically, there is a need for knowledge about:

- The characteristics of cruise tourism in Flanders with a description of the most important components: ships, cruise lines, passengers and ports.
- The economic impact generated by the expenditure of the cruise tourists, crew members and cruise lines in these destinations.
- The ecological impact generated by ocean and river cruise ships.
- The social impact of the cruise tourists on the destinations they visit.

This study is intended to generate sufficient knowledge about the impact of cruises in order for VISITFLANDERS to be able to give targeted advice regarding the further evolution of cruise tourism and in order to detect the conditions for sustainable development.

1.2 Scope of the study

This study analyses the characteristics and impact of all multi-day international ocean and river cruises that visited at least one of the following ports between 2005 and 2022: Antwerp, Zeebrugge (with destination Bruges), Ghent, Ostend and Brussels. An in-depth analysis of 2019 takes a closer look at the cruise lines and ship operators that actually visited Flanders or Brussels. The cruise lines and ship operators responsible for organising the cruises offer excursions in one of the above or other Flemish destinations (such as Damme, Leuven, Ypres, etc.). The cruise trips are made on board ocean and river cruise ships or motorised passenger vessels.

Outside the scope of this study: boat tours, day trips, event ships, pleasure craft, regular water transport (ferries and water buses), cargo cruises, ferries and the wintering of cruise ships.

In addition to figures over the longer term, the ocean and river cruises of 2019 are in each case examined in depth. In this study, 2019 also serves partly as a reference year for the economic and ecological impact of cruise tourism. Due to the influence of Covid-19, it is not possible to use the cruises of 2020 as a reference.

2 Characteristics of cruises in Flanders

2.1 Calls

This section looks at the number of calls made in Flanders and Brussels between 2005 and 2022. These are all ocean and river cruise ships that docked in Antwerp, Brussels, Ghent, Ostend and Zeebrugge as part of a cruise whereby passengers embarked and disembarked for a visit or for the start or end of their journey. Each visit of a ship is counted as a separate call. Ships may have visited several destinations during the same cruise programme.

2.1.1 Total number of calls

In 2019, a total of 1,302 ocean and river cruise calls were registered in the Flemish and Brussels-Capital Region, compared to 492 in 2005. The number of ocean and river cruises increased by an average annual rate of 8% between 2005 and 2019. The number of calls fell to 159 in 2020 because of the COVID pandemic, but largely recovered in 2022.

The figure below shows the evolution of the various cruise types in Flanders and Brussels. Each time, more river cruises were registered. In 2019, 85% of cruises concerned river cruise ships while 15% concerned ocean cruise ships.

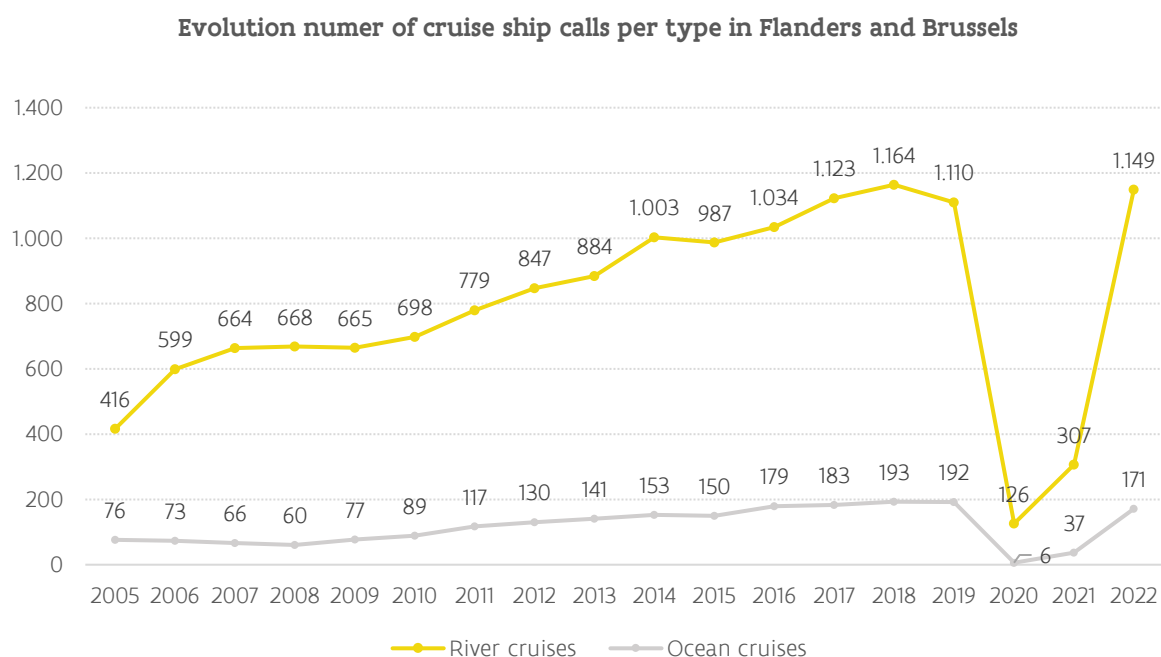


Figure 1: Evolution of number of calls per type of cruise ship in Flanders and Brussels
(source: Flemish and Brussels Port Authorities)

In proportion to the total number of ships docking in the ports in 2019, the share of cruise ships remains very limited. The Flanders Environment Agency indicates that calls by ocean cruise ships represent 0.61% of the total number of ocean-going ship calls in Flanders. In Zeebrugge, 2% of all calls are cruise ships (MBZ, 2020). In Ostend it is 0.2%, in Antwerp 1.3% and in Ghent 1.7%. In Brussels, 0.7% of all ships are cruise ships.

2.1.2 Number of ocean cruise calls per port

The total number of ocean cruises in Flanders grew significantly from 76 in 2005 to 197 in 2019. In 2020, only 7 ocean cruise ships came to Flanders in the first months. In 2022, that number grew again to 171.

Zeebrugge leads the way in the number of ocean cruise calls. The share of ocean cruise calls in Zeebrugge was 78% in 2019. Some 17% docked in Antwerp. Ostend accounted for 5% and Ghent for 1%. The port of Brussels does not receive any ocean cruise ships.

Number of ocean cruise calls per year per port

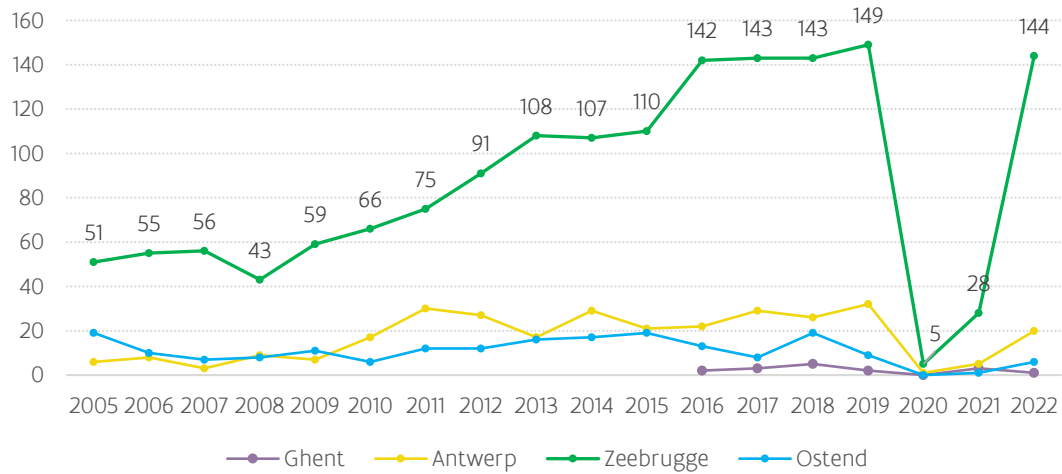


Figure 2: Evolution of number of calls from ocean cruises per port from 2005 to 2019 (source: Flemish Port Authorities)

2.1.3 Number of river cruise calls per port

In the period 2005 - 2019, Ghent and Antwerp recorded an average annual growth of 13% and 8%, respectively. No river cruises were received in Ostend in 2019. In Brussels, cruise ships calls have been registered since 2015. In the first months of 2020, a total of 126 river cruise ships passed through Flanders and Brussels. No river cruises were registered in Zeebrugge. In 2022, more river cruise ship calls were registered than before the COVID pandemic.

Number of river cruise calls per year per port

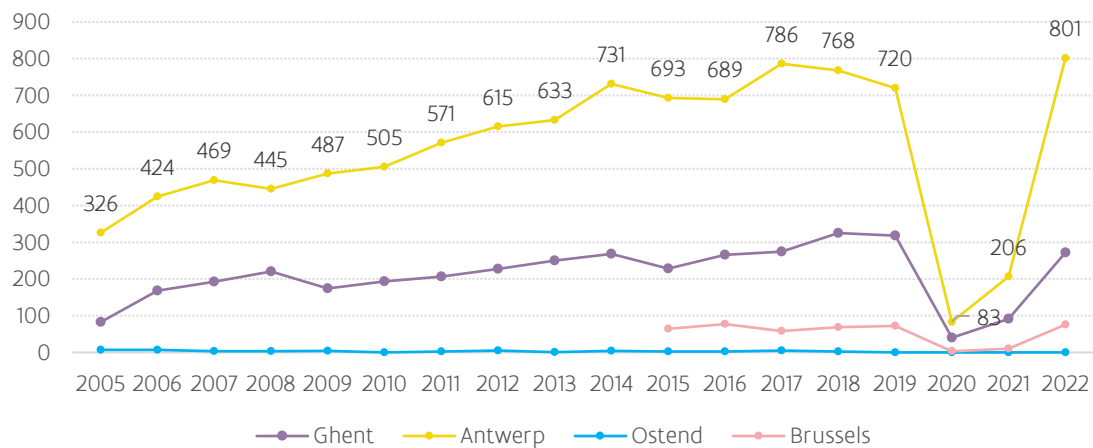


Figure 3: Evolution of river cruise ship calls 2005 - 2019 (source: Flemish and Brussels Port Authorities)

Antwerp received the largest number of river cruises. In 2019, 65% of all river cruises were registered in Antwerp. In that year, Brussels and Ghent received 6% and 29% respectively of all river cruises.

2.2 Arrivals of cruise passengers

The Flemish and Brussels ports have a low number of turn-around cruises. These are cruises that start and end their journey in a particular port. In most cases ports report calls for a visit to a tourist destination. Each passenger at each port is therefore counted only once. Thus, it is not about passenger movements of people who are arriving and departing. However, passengers may be counted several times in total, namely in each port that they visited. For example, passengers starting a cruise in Brussels and then visiting Antwerp and Ghent are counted three times.

For 2019, the ports provided an overview of the number of passengers per ship. The actual number of passengers was not always recorded. Therefore, an estimate was made based on known data.

2.2.1 Total number of passengers

In 2019, a total of 519,618 cruise passengers were registered in Flanders and Brussels, compared to 106,449 in 2005. The total number of passengers experienced an average growth of 13% between 2005 and 2019. Because of the Covid-19 pandemic, the total number of passengers fell to 33,401 in 2020 but rose sharply in 2022.

For river cruise passengers, an average growth of 10% was recorded over the period 2005 - 2019, from 38,674 to 121,054. The number of ocean cruise passengers grew by 15% on average over the same period, from 67,775 to 398,565. The decline in passenger numbers between 2018 and 2019, particularly in river cruises, may be explained by an overestimation of the actual number of passengers in the years before 2019.

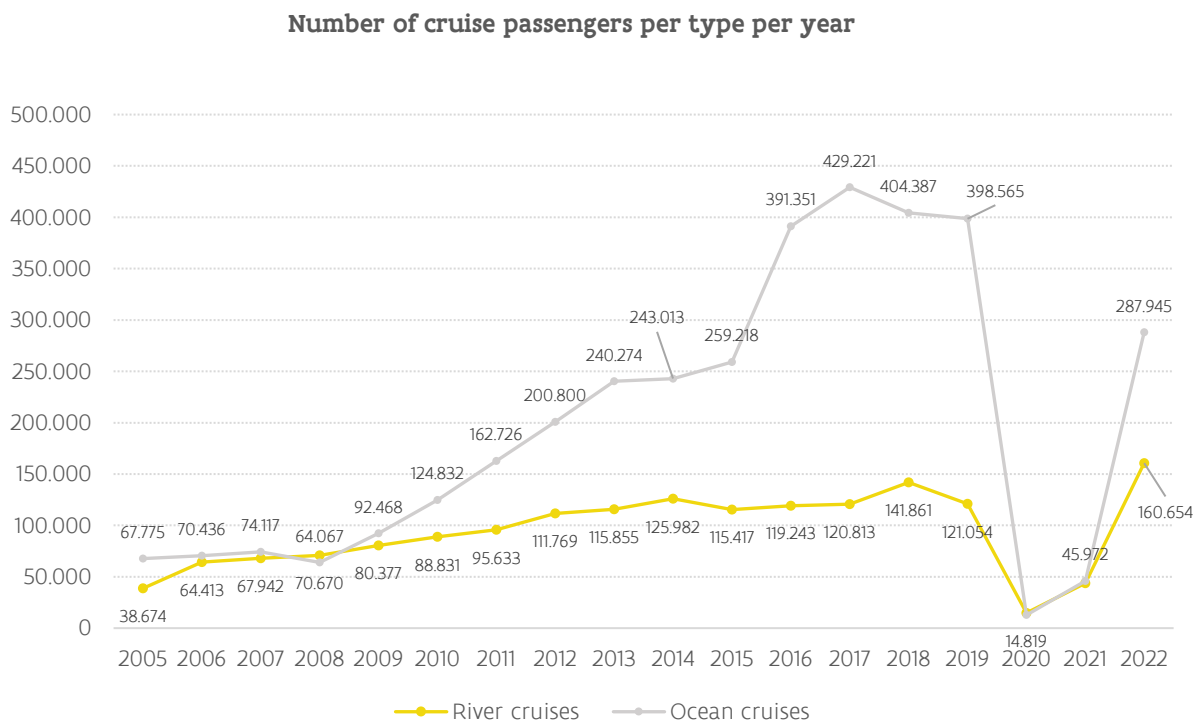


Figure 4: Number of passengers per type of cruise ship per year (source: Flemish and Brussels Port Authorities)

The number of passengers between 2006 and 2009 was more evenly distributed, with even slightly more river cruise passengers in 2008. In the years thereafter, the share of ocean cruise passengers rose and reached 78% in 2017. In 2019, 77% of all passengers were from an ocean cruise ship, while only 15% of all calls were ocean cruise ships.

70% of all cruise passengers were registered in Zeebrugge. Approximately one fifth were counted in Antwerp. The other ports each received a smaller share of passengers that year.

In particular, the average number of passengers per ocean cruise ship increased remarkably over the years, from 892 in 2005 to 2,345 in 2017. During this period, ever larger ships were being built with more and more cabins. Another possible explanation could be an increase in the occupancy of the ships as well as the choice of cruise lines with larger ships to come more often to Flanders. The number of passengers per river cruise ship has remained more stable over the years due to the limitations in length, width and height of these ships.

The average number of passengers per ocean cruise ship varies greatly between ports. In Zeebrugge, it rose to 2,788 per ship in 2017. In 2019, it was 2,443. Antwerp, Ghent and Ostend each receive ships with a lower number of passengers on board. In 2019, an ocean-going ship that docked in Antwerp had an average of 982 passengers, in Ghent 670 (based on two calls from the same ship) and in Ostend 195.

The port of Antwerp receives ships of a smaller size because of the location of the cruise pontoon. Ocean cruise ships dock in the city port of Antwerp at a bend in the Scheldt. Taking into account the tides and draft, as well as other factors, only ships of a limited size can berth there.

2.2.2 Number of ocean cruise passengers per port

The figure below shows the number of ocean cruise passengers in the ports of Ghent, Antwerp, Zeebrugge and Ostend. The port of Brussels does not receive any ocean cruise ships. In 2019, 91% of all ocean cruise passengers came from ships docked in Zeebrugge.

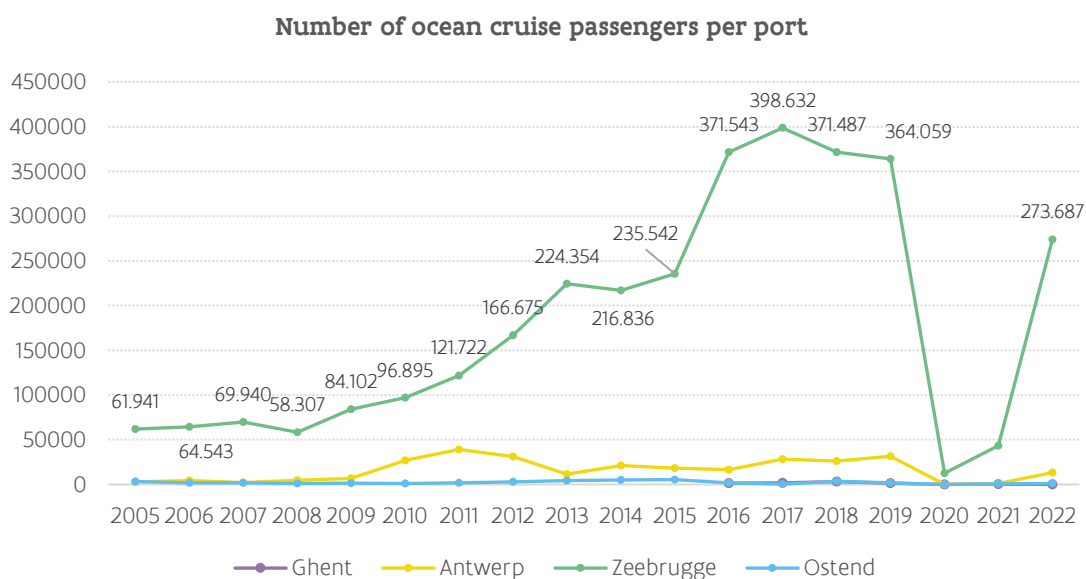


Figure 5: Number of ocean cruise passengers per port (source: Flemish Port Authorities)

2.2.3 Number of passengers of river cruises per port

The figure below shows the number of river cruise ship passengers in the ports of Ghent, Antwerp, Ostend and Brussels. No river cruise passengers were registered in Zeebrugge. In 2019, 78% of all river cruise passengers came from ships docked in Antwerp.

Number of river cruise passengers per port

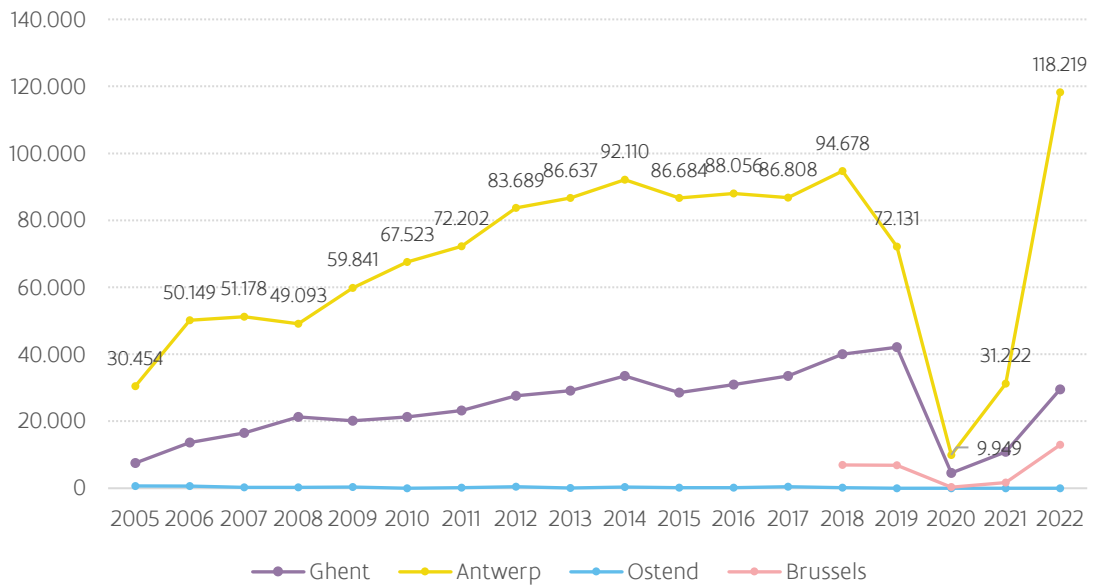


Figure 6: Number of river cruise passengers per port (source: Flemish and Brussels Port Authorities)

2.2.4 Comparison with other forms of tourism

Besides cruise tourists, these destinations welcome other visitors, such as tourists who stay overnight and day visitors. To get an idea of the ratio between these visitors, the arrivals of overnight tourists, day visitors (where possible) and the actual number of cruise passengers in 2019 were set out side by side per destination for comparison.

Not all cruise passengers are included in this comparison. Research (Artal-Tur et al., 2018) and information from the Flemish ports and tour operators show that in general on average 10% of ocean and river cruise tourists remain on board. Furthermore, not all passengers visit the destination where their ship has docked. Therefore, on the basis of the passenger survey that will be discussed later in this report, the proportion of cruise passengers who actually visit the city where they dock is taken into account. This is possible for Antwerp, Ghent and Bruges.

The number of day visitors is a multiple of the number of overnight tourists but is based on an estimate made via mobile data and may also include the arrivals of the cruise passengers themselves. That is why the number of cruise passengers disembarking and visiting the city where their ship is docked is deducted from the number of day visitors.

City	Share of overnight tourists	Share of day visitors and day holidaymakers	Share of cruise passengers	Total
Bruges	15%	82%	3%	100%
Antwerp	8%	91%	1%	100%
Ghent	10.2%	89.3%	0.5%	100%
Ostend	11.9%	88%	0.04%	100%

Table 1: share of overnight tourists, day visitors/day holidaymakers and cruise passengers per city (Source: VISITFLANDERS, City of Bruges, City of Antwerp, City of Ghent, City of Ostend)

The share of cruise tourists in the cities is limited. In Bruges, 3% of all visitors in 2019 were cruise tourists. In Antwerp this was 1%. In other cities, the share of cruise passengers was even lower.

2.3 2019 in detail

2.3.1 Seasonality

The months with the highest number of ocean and river cruise calls are not the same. As the figure below shows, a large proportion of the river cruises call in April. For ocean cruises, two periods with a higher number of calls were detected in 2019; in May/June and in August/September, together accounting for 59% of all calls made by this type of ship.

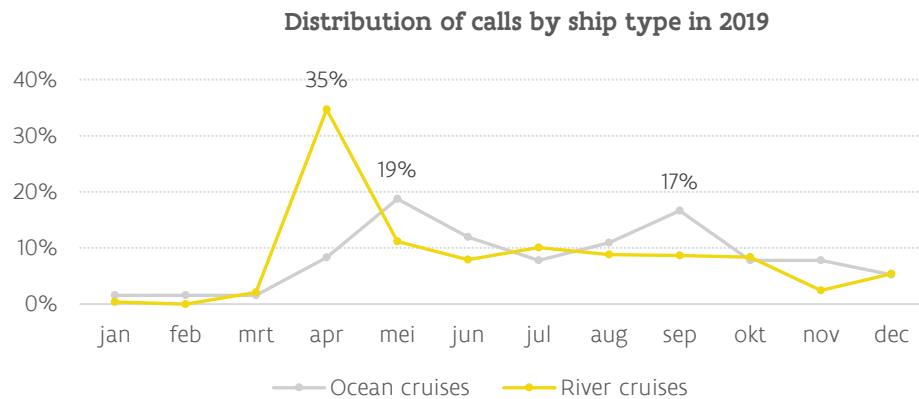


Figure 7: Calls per type of cruise ship in Flanders and Brussels in 2019
(source: Flemish and Brussels Port Authorities)

2.3.2 Passengers

In 2019, a fifth of all cruise tourists visited Flanders and Brussels in April. April, May and September together account for 48% of all passengers.

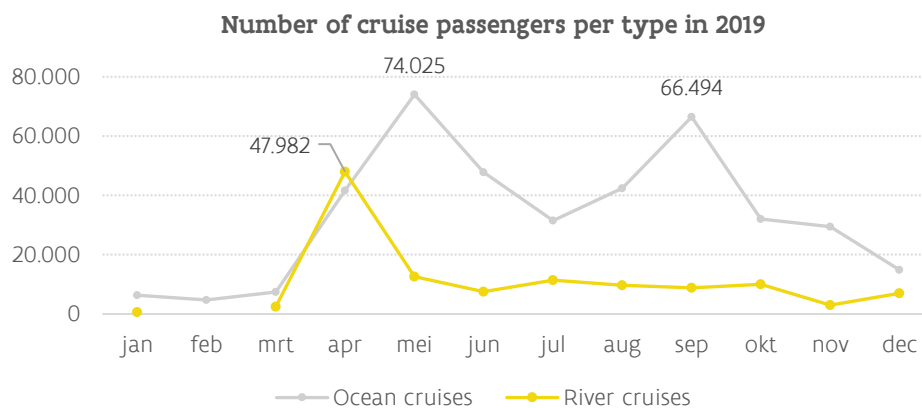


Figure 8: Number of ocean and river cruise passengers in Flanders and Brussels in 2019
(source: Flemish and Brussels Port Authorities)

2.3.3 Segmentation of cruise lines

Each cruise line has its own target audience and offer. Many factors such as the finishing of the ship, number of days, excursions, etc. help to determine the price and quality of the cruise. In order to have an idea of the types of ship that visit Flanders, a segmentation was made at the level of the cruise lines per type of cruise ship. This segmentation shows how many ships from a particular category were registered

per port. This analysis gives an indication for the ships from 2019. Cruise lines and operators that did not visit Flanders or Brussels in 2019 do not form part of this analysis.

2.3.3.1 Segmentation of ocean cruise lines

According to Rautaheimo et al. (2018) the ocean cruise market can be divided into three to four segments: Mass market, premium, luxury and niche/expedition. These segments are defined on the basis of two indicators, namely the “space ratio” (number of Gross Tonnes per passenger) and the “passenger to crew ratio” (number of passengers per crew member). These two ratios provide more information about the quality of the ship and the service.

The segmentation of ocean cruise lines shows how many cruise lines and ships of each category visit Flanders. Three quarters of all ocean cruise passengers visiting Flanders in 2019 come from the mass market segment. The luxury and premium segment together make up 22%. As the table below shows, each port received its own mix of segments. 76% of all ocean cruise passengers in Zeebrugge belong to the mass market segment, 22% belong to the premium segment. In Antwerp, this is 60%. In Ostend this is only 10%. For Ostend, 85% come from the two highest classes.

Distribution of cruise passengers by segment	Antwerp	Ghent	Ostend	Zeebrugge
Luxury	10%	0%	23%	2%
Mass Market	60%	100%	10%	76%
Premium	2%	0%	62%	22%
Without category	28%	0%	6%	0%
Total	100%	100%	100%	100%

Table 2: Distribution of cruise passengers per segment per port
(Source: VISITFLANDERS, Flemish Port Authorities)

2.3.3.2 Segmentation of river cruise lines

There are also differences in quality between the river cruise lines. Once again, a segmentation was chosen based partly on Rautaheimo et al. (2018). However, river cruise ships are limited in size and capacity. Therefore, this analysis also takes into account the day price of a river cruise, given the lack of variation in the space ratio.

The segmentation of river cruise lines shows how many passengers of each category visit Flanders. A very large proportion of cruise lines cannot be assigned to a category. The reason for this is the large number of motorised passenger vessels and, to a lesser extent, the reduced availability of prices for cruise trips in 2021. 33% of all river cruise passengers who visited Flanders in 2019 come from the budget segment. The luxury and middle class segment together make up 54%. As the table below shows, each port received its own mix of segments. 34% of all river cruise passengers in Antwerp come from the budget segment. This is 39% in Brussels and 31% in Ghent.

River cruise passenger distribution per segment	Antwerp	Brussels	Ghent
Budget	34%	39%	31%
Middle class	38%	25%	39%
Luxury	13%	7%	27%
Unknown	15%	29%	3%

Table 3: Distribution of river cruise passengers per segment per port
(Source: VISITFLANDERS, Flemish and Brussels Port Authorities)

3 Profile of cruise passengers

Every five years, VISITFLANDERS, in collaboration with the art cities of Antwerp, Bruges, Ghent, Leuven, Mechelen and Brussels, conducts an art city study that assesses, among other things, the profile, the expenditure, the satisfaction with the destination and the activities of overnight and day visitors in the cities. One-off surveys of cruise passengers in Bruges, Antwerp, Ghent and Brussels were added to the 2022 survey. The city of Ostend is not part of the art cities survey. Besides characteristics with regard to profile, travel group and expenditure, passengers were also asked about their perception of the destination they visited.

In the period from April/May to September 2022, 280 ocean cruise passengers and 175 river cruise passengers were surveyed in the ports of Zeebrugge, Antwerp, Ghent and Brussels. Passengers were spoken to on the quay near their ship just before they were due to board again after a visit to Flanders or Brussels. 228 of the 280 ocean cruise tourists were surveyed in Zeebrugge and 52 were surveyed in the city port of Antwerp. Among the river cruise tourists, the largest group consisted of passengers whose ship was docked in Antwerp (121), followed by Ghent (47) and a few passengers in Brussels (7).

3.1 Origin

The ocean cruise passengers surveyed came mainly from Germany (50%), the United States (17%) and the United Kingdom (16%). Among the river cruise passengers, Germany was also the most important country of origin (51%), followed by the US (27%) and the UK (9%). An enquiry at the port of Zeebrugge indicates that the share of British ocean cruise passengers generally tends to be higher.

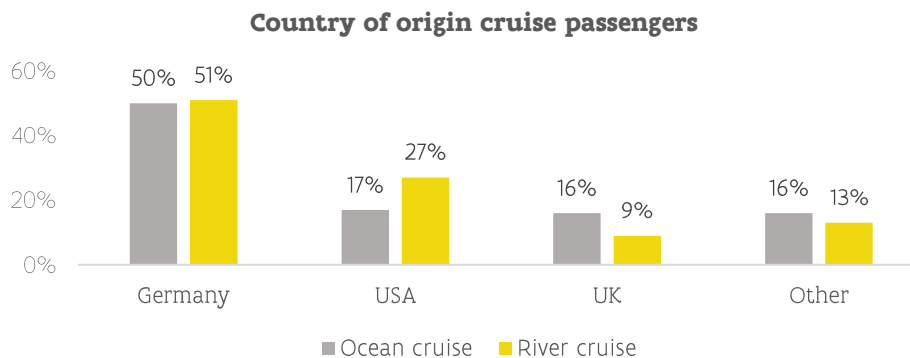
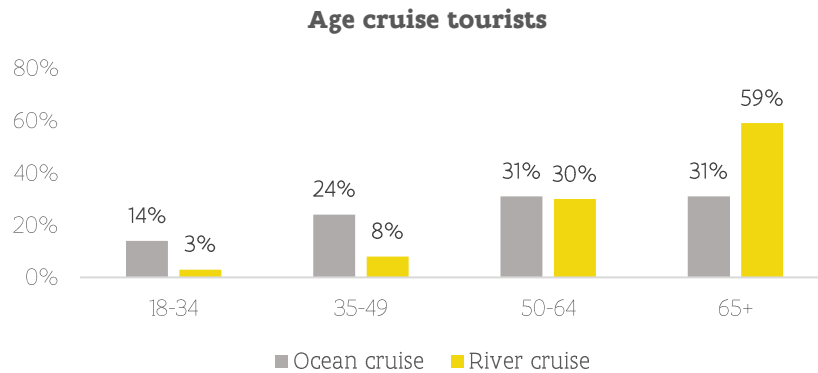


Figure 9: Q11: In which country do you live? (Source: Art Cities Survey – survey of cruise passengers, VISITFLANDERS)

3.2 Age

The average age of a river cruise tourist is 65 years. The average age of an ocean cruise passenger is 54 years, thus around 11 years younger. Almost 60% of the river cruise passengers are 65 years of age or older, compared with 31% of ocean cruise tourists. Only 11% of river cruise tourists are younger than 50, compared with 38% of the ocean cruise passengers. River cruises seem to attract an older audience than ocean cruises.



*Figure 10: Q007: How old are you?
(Source: Art Cities Survey – survey of cruise passengers, VISITFLANDERS)*

3.3 Tour group

The average travel group size of the cruise tourists surveyed is 2.5 people. 64% of cruise tourists travel in pairs and one in ten indicated that they travel alone. These figures are similar for ocean and river cruise tourists. When the group consists of more than 2 persons, in more than 80% of cases it concerned family members. Among sea cruise tourists, 13% indicated that children were travelling. This we see almost exclusively within the mass market segment (17.3% versus 2.3% in the luxury segment). River cruise tourists rarely travel with children (1%) and slightly more often than ocean cruise tourists they travel with friends.

4 Social impact of cruise tourism in Flanders

Research shows that cruise tourism, like other forms of tourism development, can have a social impact on the destination (Sharpley, 2014). According to Sanz-Blas et al. (2019) the economic activity of cruise tourism can have a negative impact on the congestion at the destinations and ports, the residents' quality of life and on visitor satisfaction. It is therefore crucial to take a closer look at these effects and find out what social impact cruise tourism has on destination Flanders.

In order to gain an insight into the social impact of cruise tourism, the following key aspects were identified that required further research:

- the impact on residents of the places where cruise ships dock.
- the perception of cruise tourists of the destination they visit and their behaviour during their excursion

4.1 Impact on residents of places where cruise ships dock

Every two years, VISITFLANDERS, in collaboration with the art cities of Antwerp, Bruges, Ghent, Leuven and Mechelen, conducts a survey of the residents that assesses the support for tourism. The survey asks about the general support for tourism, policy measures, perception of nuisance, etc. It also asks per type of visitor whether they would like to receive more or less of this group in the future. Previous studies have shown that cruise tourists are generally less desirable. In 2017, 19% of all respondents said they would like to receive fewer cruise tourists in their city. For the 2019 survey, this share rose to 48%. However, the motivation for this response remained unclear. That is why a number of assertions and questions were added to the 2021 survey in order to gain more insight into this. These additional questions were only added to the surveys of the cities where ocean and/or river cruise ships dock, namely in Antwerp, Bruges and Ghent.

Between 15 June and 31 October 2021, a representative group of 3,731 residents over the age of 18 (1,228 in Antwerp, 1,268 in Ghent and 1,235 in Bruges) were asked, among other things, for their opinion regarding cruise tourism. The study was conducted on the basis of an iVox panel and recruitment via social media and by letter.

4.1.1 Wish to receive more or fewer cruise tourists

The question of whether people want fewer, more or the same number of tourists of a particular type in their city is always asked for all cities within the residents' survey. This shows that this form of tourism is least supported by the residents in each city. This question is addressed in each residents' study, which makes comparisons with previous years possible. However, the impact of the COVID pandemic needs to be taken into account. The latest residents' study was conducted at a time when there were fewer tourists in the cities concerned.

The desire for fewer cruise tourists was similar to the results from the 2019 survey. However, there is a significant difference from the results of 2017. While 31% of residents opted for more cruise tourists in 2017, the share fell to 12% in 2019 and 13% in 2021.

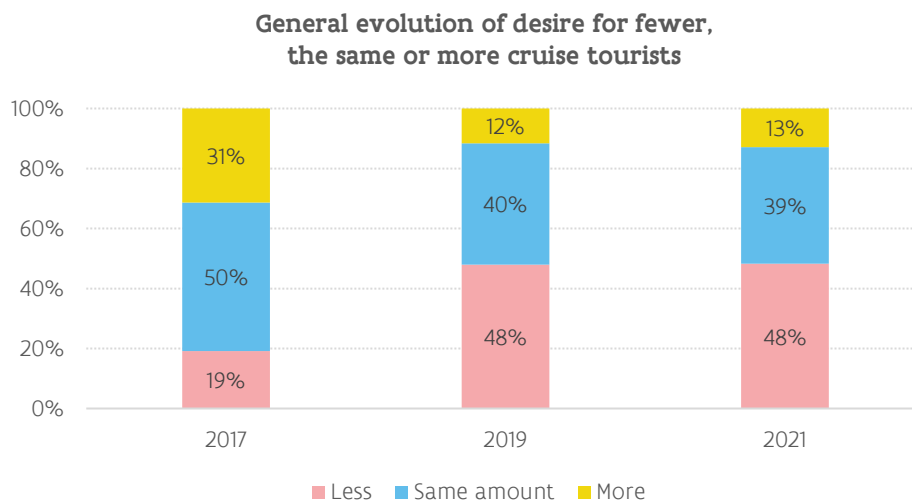


Figure 11: General evolution Q29. Can you indicate whether, in the future, city X should try to ensure that there are fewer, as many or more tourist visits as there are today - for each of the following types of tourists? (Source: residents' study 2017, 2019 and 2021)

A significant proportion of residents from the three cities expressed a wish for fewer cruise tourists. 57% of residents in Bruges want fewer cruise tourists, 10% want more. This yielded no significant differences compared to the previous residents' study of 2019, except in Antwerp. In the 2019 study, 54% of respondents said they wanted fewer cruise tourists, compared to 47% in 2021.

Desire for fewer, the same or more cruise tourists per city in 2021

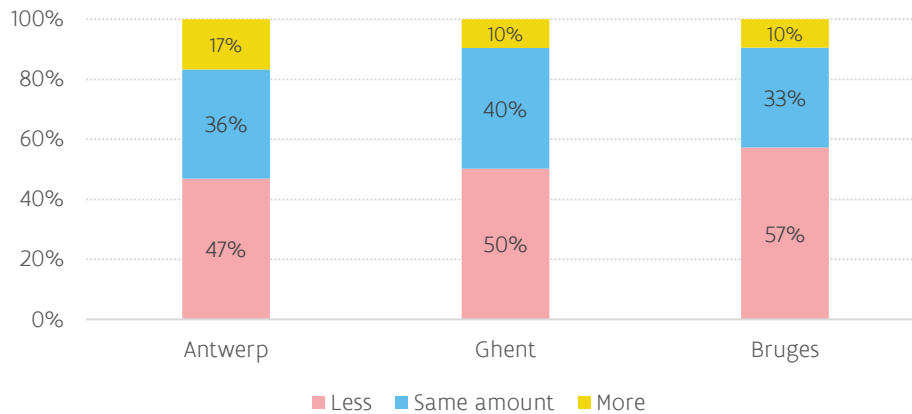


Figure 12: Q29. Can you indicate whether, in the future, city X should try to ensure that there are fewer, as many or more tourist visits as there are today? – Illumination cruise tourists (Source: residents' study 2021) n=3,731

4.1.2 Perception of crowdedness because of cruise tourists

Cruise tourists make my city too crowded

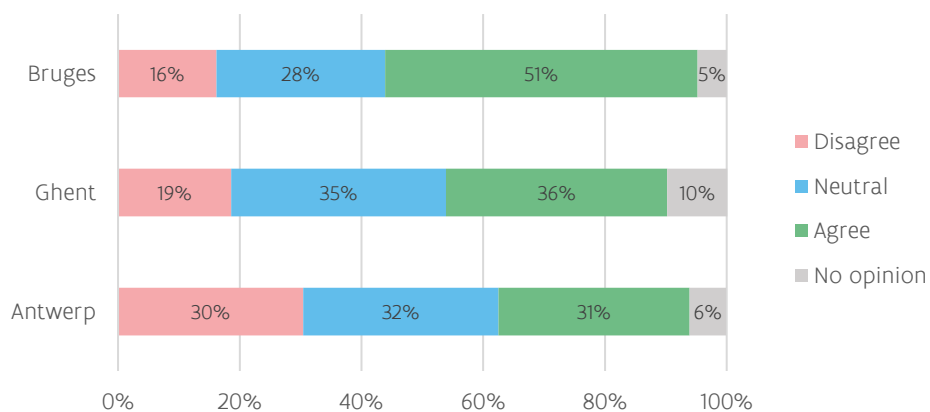


Figure 13: Q32. To what extent do you agree with the following assertions about cruise tourism in X? Because of the cruise tourists it is too busy in my city. (Source: residents' study 2021). n = 3,731

The assertion regarding crowdedness produces significant differences between the cities. 51% of the inhabitants of Bruges agree with the assertion “because of the cruise tourists it is too busy in my city”. Only 16% do not agree in Bruges. Ghent residents are also more likely than Antwerp residents to say that cruise tourists are a cause of crowdedness.

While there is a perception that cruise tourism is one of the causes of crowdedness in the city, the share of cruise passengers in the total number of visitors is very small. For example, cruise passengers in Bruges and Antwerp account for 3% and 1% respectively of the total number of visitors in 2019.

4.1.3 Perception of contribution of cruise tourists to the economy

In each city, people more often disagree than agree with the assertion that cruise tourists spend a lot in the destination itself. Only 20% of residents in Bruges agree with this assertion. 44% disagree. In Antwerp, 35% of respondents do not agree. However, 28% of those surveyed in Antwerp indicated that they do agree.

Cruise tourists consume a lot in the destination itself

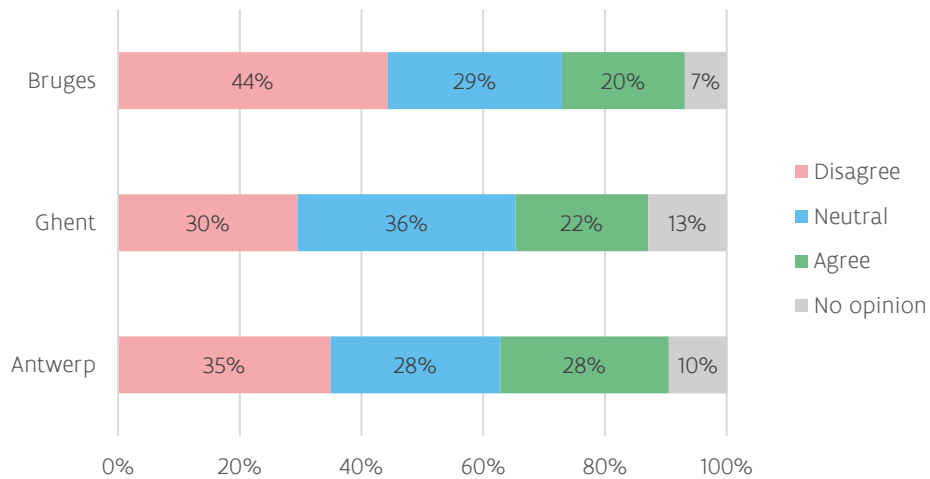


Figure 14: Q32. To what extent do you agree with the following assertions about cruise tourism in X? Cruise tourists spend a lot in the destination itself. (Source: residents' study 2021). n= 3,731

4.1.4 Perception of ecological impact of cruise ships on the city

In Bruges, 56% of the residents agree with the assertion “cruise ships have a negative ecological impact on my city”. In Ghent, it is 53% and in Antwerp 60%. Respondents from Antwerp agreed significantly more often than those from the city of Ghent.

Despite the fact that ships in Antwerp dock in the tourist centre of the city and are therefore more visible than in Bruges, no significant difference was found between the two cities. No notable differences were found between the various parts of the city. Where people live in the city has no influence on the perception of ecological impact.

The cruise ships have a negative ecological impact on my city

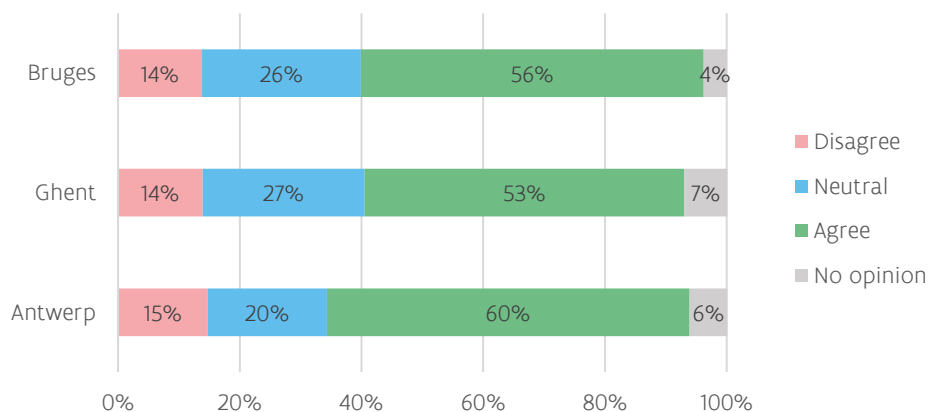


Figure 15: Q32. To what extent do you agree with the following assertions about cruise tourism in X? The cruise ships have a negative ecological impact on my city. (Source: residents' study 2021). n= 3,732

4.1.5 Comments about cruise tourism made by respondents

Finally, respondents were given the opportunity to write a comment about cruise tourism in their city. A total of 1,540 respondents, or 41% of all respondents from the cities of Antwerp (499), Bruges (505) and Ghent (536), commented. Each answer was assigned to one or more categories. A total of 2410 comments were made within seven main categories. Thus each answer could lead to a number of comments assigned to different categories. Certain categories came up significantly more often in a particular city than in the other cities. For instance, respondents from Bruges made more comments about the social impact of cruise tourism in their city, while more comments about the ecological impact and cruise infrastructure were identified for respondents from Antwerp.

4.1.5.1 Comments ecological impact category

Respondents made a total of 317 comments about the ecological impact of cruise tourism. 303 of these expressed a negative sentiment while the remaining 14 were neutral. The most common reference was to the emissions of the ships themselves. 173 comments were made by respondents from Antwerp, with the link with the city's low emission zone regularly being made.

"The new Cruise terminal and LEZ do not go together and are rather counter-productive. Cruises are hugely polluting. . . ."

"Combating CO₂ emissions is not or hardly ever discussed when it comes to tourism. Yet this is more than urgently needed. The air quality in Bruges and all other Flemish cities is still too poor. Rotterdam has cleaner air than Bruges!"

"Cruise tourism is not so good for the environment, but that has nothing specifically to do with Ghent. That is a general observation due to the energy consumption of the large cruise ships."

4.1.5.2 Comments social impact category

More than a quarter of all the comments (676 in total) belong to the category "social impact". 42% of all comments from Bruges respondents are about "social impact".

Within the sub-category "amusement park", the comments include the words amusement park, theme park and Disneyland. The majority of these comments were made by respondents from Bruges.

"They think that Bruges is an amusement park like Mini Europe. Being asked a question such as "where is the entrance and what time does it close?" is not exceptional. Bruges is still a city full of local people and not Mont Saint-Michel which effectively closes at night."

186 comments about "mass tourism" were identified. These often refer to the size of groups, the time of day when they visit the city and the general feeling of crowdedness. 97% of all comments for this sub-category are negative.

"Indeed, I think that too many of them come to Bruges at the same time; I have worked at the SNCB counter in Blankenberge myself, and you can see many coming from the cruise ships who all need a ticket for the train. All of a sudden there are hundreds of them."

4.2 Perception of cruise tourists at the destination

The data for this section were obtained from the survey of the cruise passengers and reflect the characteristics of the excursion undertaken by cruise tourists.

4.2.1 Destinations visited

	Ocean cruise passengers (n=280) per destination visited		River cruise passengers (n=174) per destination visited		
	Ocean cruise from the port of Zeebrugge (n=228)	Ocean cruise from the port of Antwerp (n=52)	River cruise from the port of Antwerp (n=121)	River cruise from the port of Ghent (n=47)	River cruise from the port of Brussels (n=6)
Antwerp	-	49 (94%)	120 (99%)	-	-
Bruges	166 (73%)	-	2 (2%)	8 (17%)	-
Brussels	3 (1%)	-	1 (1%)	1 (2%)	6 (100%)
Ghent	6 (3%)	1 (2%)	4 (3%)	40 (85%)	-
Blankenberge	41 (18%)	-	-	-	-
Other	12 (5%)	2 (4%)	-	5 (11%)	-

Table 4: C6. What destination(s) did you visit during your excursion today? – multiple answers possible
(Source: Art Cities Survey – survey of cruise passengers, VISITFLANDERS)

The destination of the excursion is closely linked to the place of docking. Almost three in four respondents whose ship was docked in Zeebrugge opted for a trip to nearby Bruges. Blankenberge is the second most popular destination (18%). Only a few went on an excursion elsewhere. The ocean cruise tourists whose ship docked in Antwerp almost all went on an excursion to Antwerp (94%).

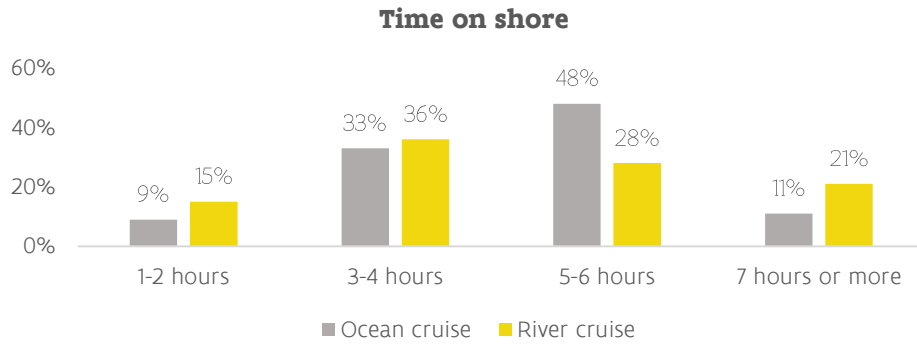
Of the river cruise tourists whose ship docked in Antwerp all but one visited Antwerp, occasionally in combination with a visit to another city. 85% of river cruise tourists whose ship docked in Ghent visited Ghent. Bruges was visited by 8 people (17%). Here too, some passengers combined several destinations.

4.2.2 Proportion disembarking and time ashore

On average, cruise tourists who go ashore spend just under five hours at the destination. The time on shore includes not only the time spent at the destination itself, but also the travelling time from their ship to the destination and back. That travel time varies depending on the place of docking and the destination chosen by the tourist. An ocean cruise tourist whose ship is docked in Zeebrugge will spend at least 30 minutes each way on the bus to Bruges, while the docking location for river cruise ships in, for example, Antwerp is located close to the city centre, so the tourists can go straight into the city.

Approximately half of ocean cruise tourists spend 5 to 6 hours on shore. Among river cruise tourists, this group is a lot smaller at 28%. However, river cruise tourists are more likely than ocean cruise tourists to spend more than 7 hours on shore (21% compared to 11%). A smaller group chooses not to make an extended excursion and spends only 1 to 2 hours on shore (9% of ocean cruise tourists and 15% of river cruise tourists).

Finally, it is notable that, on average, ocean cruise passengers from the luxury/premium segment stay ashore for slightly longer than passengers from the mass market segment (just over 5 hours). The same is true for river cruise passengers. There too, passengers from the luxury and middle-class segment stay slightly longer, on average, at the destination itself.



*Figure 16: C5: How long have you been ashore today?
(Source: Art Cities Survey – survey of cruise passengers, VISITFLANDERS)*

4.2.3 Type and reservation of excursion

Three out of four ocean cruise tourists plan their own excursions. In that case, they arrange the transport and activities themselves. 16% took part in an excursion included in their cruise package and 7% in another organised excursion.

River cruise passengers are less likely to opt for an excursion of their own (48%). 30% take part in an excursion that is part of the cruise package and another 24% opt for another organised excursion. More often than ocean cruise lines, river cruise lines offer packages which include excursions. Ocean cruise lines are more likely to offer excursions as a paying option to complement the package. This may partly explain the difference between the two groups.

4.2.4 Importance of excursion for the booking of a cruise

For fewer than one in three cruise passengers, the excursion they took in Flanders was important for the booking the cruise itself. For 73% of the river cruise passengers, the destination for the excursion in Flanders had no influence on the decision to book the cruise, or they are more likely to see it as a nice extra. This is also the case for 69% of the ocean cruise passengers. For 27%, however, the excursion was a reason or the main reason for booking the cruise trip. The destination of the excursion is not always the same as the destination where a ship docks.

For river cruise passengers from the premium and luxury segment, however, the excursion in Flanders does have greater importance for the booking of the cruise than for passengers from the budget class.

Importance of the trip in the decision to book a cruise

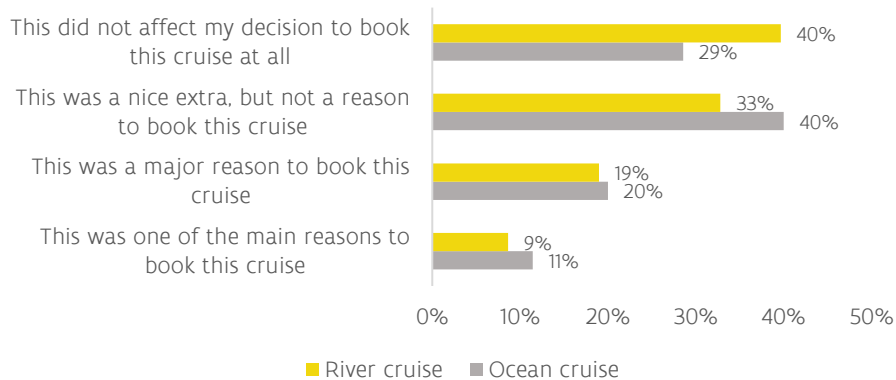


Figure 17: C11: What was the importance of this excursion in your decision to book this cruise? (Source: Art Cities Survey – survey of cruise passengers, VISITFLANDERS)

4.2.5 Activities during the excursion

Activities at the destination

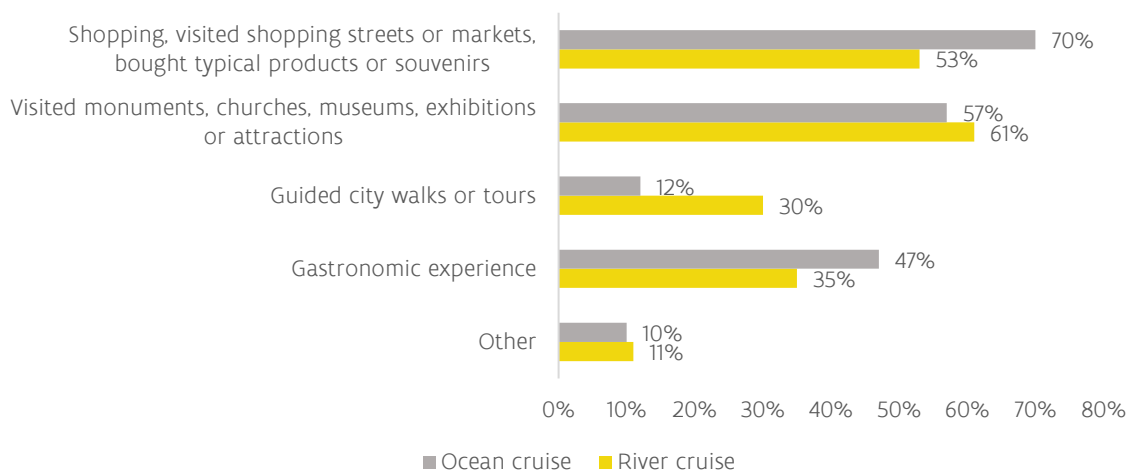


Figure 18: Q61, what activities did you undertake in the destination you visited? (Source: Art Cities Survey – survey of cruise passengers, VISITFLANDERS)

Shopping is an important activity for both groups, but especially for ocean cruise tourists (70% compared to 53% for river cruise tourists). More than half of the shopping cruise passengers bought chocolate, but souvenirs (29%) and beer (19%) are also popular.

Among river cruise tourists, a **visit to monuments, churches, museums or attractions** is the most popular activity (61%). Among ocean cruise tourists, 57% also reported having visited a monument, church, museum or attraction. Ocean cruise passengers visited parks and gardens more often than river cruise tourists (16% compared to 7%). It is important to note that there are a number of significant differences between the different segments. **For example, 73% of ocean cruise passengers in the luxury and premium segment said they had visited monuments, churches, museums or attractions.** This is the most important activity for these passengers. 64% also went shopping.

Shopping remains the most important activity for ocean cruise passengers in the mass market segment (72%), followed by gourmet experiences (51%). 47% visited monuments, churches, museums or attractions. There are no significant differences in the type of purchases made between both groups of ocean cruise passengers. Chocolate remains the most popular purchase.

Among river cruise passengers there is no difference between segments when it comes to visiting monuments, churches, museums or attractions. However, passengers from the luxury and middle-class segment are more likely to say they have shopped.

5 Economic impact of cruise tourism in Flanders

The economic impact of cruise tourism is measured via three main groups, namely cruise lines, cruise passengers and crew members.

5.1 Expenditure by cruise lines in ports

To be able to dock a cruise ship in a port, a cruise line incurs a number of costs that are settled with the port authorities, the Loodswezen (pilot services), shipping agents and other direct suppliers. During this study, these bodies were surveyed and an overview of invoiced items was produced for all ships visiting Flanders in 2019.

5.1.1 Expenditure of ocean cruise lines

5.1.1.1 Expenditure of ocean cruise lines per port

Port	Total invoiced to ocean cruise lines in 2019
Antwerp	€ 458,562
Ghent	€ 25,058
Ostend	€ 134,423
Zeebrugge	€ 4,740,911
Total	€ 5,358,953

Table 5: Amounts invoiced to cruise lines in 2019 by port authorities, Loodswezen and agents (Source: Port authorities, Loodswezen, port agents).

In 2019, ocean cruise lines collectively spent an estimated **€5,358,953** visiting Flanders with their ships. The vast majority, some 88%, was spent on visits to the port of Zeebrugge (where 78% of all ocean cruise ships call and 91% of all ocean cruise passengers were registered). 9% of all expenditure by ocean cruise lines was made in Antwerp, 3% in Ostend and 0.5% in Ghent.

A cruise line spends an average of €27,911 per ocean cruise ship on port services and for the services of the Loodswezen and port agents. For Zeebrugge, this amount is significantly higher than for the other ports. The size of the ships docking in this port plays an important role here. Larger ships have more passengers on board. As a result, cruise lines pay more tonnage and passenger duty. These duties are not collected in the same way everywhere. For example, in 2019 tonnage duties in Antwerp were virtually non-existent.

The spending on port services, on the Loodswezen and services translates into an average cost to the shipping line of €14 per passenger. In Ostend, this amount is significantly higher since this port receives smaller ships from the luxury segment, which means that the full amount is divided across a much lower number of passengers.

Port (and number of ships)	Average expenditure per ocean cruise ship in 2019	Average expenditure per ocean cruise passenger in 2019
Antwerp (32)	€ 14,330	€ 15
Ghent (2)	€ 12,529	€ 19
Ostend (9)	€ 14,936	€ 76
Zeebrugge (149)	€ 31,819	€ 13
Average	€27,911	€14

Table 6: Average revenue per ocean cruise ship and ocean cruise passenger in 2019 (Source: Port authorities, Loodswezen, port agents)

5.1.1.2 Expenditure of ocean cruise lines per segment

The expenditure of cruise lines was also analysed per segment. This shows that most of the expenditure is incurred for ships from the Mass Market segment. In 2019, 59% of all calls were from ships in this segment.

Segment	Invoiced amount per segment in 2019
Luxury	€ 372,487
Mass Market	€ 3,543,695
Premium	€ 1,250,106
Without category	€ 192,666
Total	€5,358,953

Table 7: Amount invoiced to ocean cruise lines in 2019. (Source: Port authorities, Loodswezen, port agents)

As the table below shows, the highest amounts per ship are invoiced by ships from the Mass Market and the Premium segments. When the cruise line's expenditure is calculated per passenger, it is noticeable that the average expenditure is highest in the luxury segment and lowest in the Mass Market segment. Here the total invoiced amount is divided across a lower number of passengers since most luxurious ships have fewer passengers on board.

Segment	Average expenditure per ocean cruise ship in 2019	Average expenditure per ocean cruise passenger in 2019
Luxury	€ 16,195	€ 37
Mass Market	€ 31,085	€ 12
Premium	€ 29,072	€ 16
Without category	€ 16,055	€ 20
Average	€27,911	€14

Table 8: Expenditure of cruise lines per ship and per passenger by segment. (Source: Port authorities, Loodswezen, port agents)

5.1.2 Expenditure of river cruise lines

5.1.2.1 Expenditure of river cruise lines per port

Port (and number of ships)	Total invoiced to river cruise lines in 2019
Antwerp (720)	€ 0
Brussels (72)	€ 40,083
Ghent (318)	€ 175,396
Total	€215,479

Table 9: Total amounts invoiced to river cruise lines in 2019, average expenditure per river cruise ship and river cruise passenger. (Source: port authorities)

In 2019, river cruise lines spent an estimated €215,479 on visits to a destination in Flanders. 81% of the invoiced amounts was paid to North Sea Port and is made up entirely of passenger duties. 19% was invoiced by the Port of Brussels and the largest part of this is tonnage duty, in addition to smaller expenditures on electricity, water and waste.

No cruise line expenditure was identified for the port of Antwerp in 2019. Since 2021, however, fees have been levied for river cruise ships docking there.

Port	Average expenditure per river cruise ship in 2019	Average expenditure per river cruise passenger in 2019
Antwerp	€ 0	€ 0
Brussels	€ 557	€ 8
Ghent	€ 552	€ 4
Average	€194	€2

Table 10: average expenditure per river cruise ship and river cruise passenger in 2019 per port. (Source: port authorities)

A cruise line spent an average of €194 per river cruise ship on port services in 2019, although this average is strongly influenced by Antwerp. In the ports where port duties are charged, a ship brings in more than €500 on average.

This expenditure translates into an average revenue of €2 per passenger (excluding any expenditure made by the passenger personally). For the port of Ghent this is €4, in Brussels €8 per passenger.

If the Port of Antwerp had levied fees in 2019 at the rates that they now apply, this would have yielded an estimated €120,345, or an average of €167.10 per ship or an average of €1.60 per passenger. However, account needs to be taken here of the higher number of small motorised passenger vessels calling at this port, making the average expenditure per ship lower.

5.1.2.2 Expenditure of river cruise lines per segment

The expenditure of cruise lines was also analysed per segment. This shows that the majority of the expenditure is incurred for ships from the middle class segment, followed almost immediately by the budget class.

Segment	Invoiced amount per segment in 2019
Budget	€ 73,907
Luxury	€ 50,178
Middle class	€ 77,669
Unknown	€ 13,725
Total	€215,479

Table 11: Amount invoiced to river cruise lines in 2019 by segment (Source: Port Authorities)

As the table below shows, the highest amounts per ship are invoiced by ships from the luxury segment, although the difference with the budget and middle class segment is rather small. Only a ship from the unknown segment was charged less on average. This may possibly be explained by the presence of smaller motorised passenger vessels within this class. The tonnage duty levied on these ships is lower given their limited dimensions. The cruise line's expenditure per passenger does not yield significant differences between the segments.

Segment	Average expenditure per river cruise ship in 2019 (only Brussels and Ghent)	Average expenditure per river cruise passenger in 2019 (only Brussels and Ghent)
Budget	€ 596	€ 4.1
Luxury	€ 612	€ 4.3
Middle class	€ 543	€ 4.3
Unknown	€ 335	€ 4.0
Average	€553	€4.2

Table 12: Average expenditure of river cruise lines per ship and per passenger in 2019 in Ghent and Brussels per segment. (Source: port authorities)

5.2 Direct expenditure of cruise passengers in the destination

During the one-off survey of cruise passengers made in Antwerp, Brussels, Ghent and Zeebrugge between May to September 2022, respondents were also asked about their spending during their visit to the destination. An excursion package, which may or may not have been paid for in advance or on the spot, was in each case taken into account. It is important to note that not every cruise passenger disembarks and spends money. This is factored into the calculation of total expenditure for 2019.

In Flanders, cruise ships dock from different segments. Further analysis shows that there is a significant difference between the spending of cruise passengers from the luxury and premium segment, on the one hand, and the mass market segment on the other. Each port receives a different combination of segments. These combinations have an impact on the cruise tourism revenues per destination.

No segmentation could be performed for a number of ships. For these passengers, the general average of the ocean cruise tourist and river cruise tourist is taken.

5.2.1 Average direct expenditure of sea cruise passengers 2022

An ocean cruise tourist spent an average of **€41** during their visit to Flanders in 2022. It is estimated that approximately 70% is spent directly in the destination itself. This includes spending on shopping, monuments, guided tours and food and drinks.

A premium and luxury passenger spends an average of **€66**. A passenger from the mass market segment will spend an average of **€40** in the destination. Of this, a significant proportion is spent on shopping, although this is not the main activity for luxury and premium class passengers. For them, visiting

monuments, churches, museums and attractions comes first. There are no differences between segments regarding the type of purchase. Chocolate and beer are the most popular purchases.

Transport is also a major item of expenditure. The journey from Zeebrugge to Bruges plays a major role in this.

Type of expenditure	Average expenditure of ocean cruise passenger from luxury and premium segment	Average expenditure of ocean cruise passenger from mass market segment
Excursion purchased via cruise line	€ 4	€ 4
Excursion purchased through another provider	€ 3	€ 2
Transport	€ 11	€ 7
Shopping	€ 25	€ 12
Monuments, museums, churches, attractions	€ 4	€ 2
Guided tours	€ 4	€ 2
Food, gastronomy, terraces	€ 15	€ 10
Average expenditure	€66	€40

Table 13: Average expenditure per ocean cruise passenger, per segment (Source: survey cruise passengers 2022)

5.2.2 Average direct expenditure of river cruise passengers 2022

A river cruise passenger spent an average of **€38** in 2022. About three quarters of this is spent directly in the destination itself (shopping, visits to monuments, tours and food and drink).

Here too, the difference between the two groups is large. Luxury and middle class passengers spend around **€56**. For passengers in the budget segment, this is just **€21**. The survey revealed that luxury and middle-class ship passengers are more likely to shop. This also translates into a large difference in spending on shopping. Furthermore, cruise passengers also spend a relatively large amount on food and drinks.

River cruise passengers spend significantly less on transport than ocean cruise passengers. Their ship is often docked at a location near the city centre which reduces the need for transport.

Type of expenditure	Average expenditure of river cruise passenger from luxury and premium segment	Average expenditure of river cruise passenger from budget segment
Excursion purchased via cruise line	€ 10	€ 0
Excursion purchased through another provider	€ 3	€ 3
Transport	€ 1	€ 1
Shopping	€ 25	€ 4
Monuments	€ 4	€ 2
Guided tours	€ 2	€ 2
Food, gastronomy, terraces	€ 12	€ 8
Average expenditure	€56	€21

Table 14: Average expenditure per river cruise passenger, per segment (Source: survey cruise passengers 2022)

5.2.3 Average direct expenditure of cruise passengers versus day visitors and overnight tourists

The Art Cities Survey conducted by VISITFLANDERS also looks at the direct expenditure of day visitors and overnight tourists in the art cities. In the figure below, the daily expenditures of day visitors and overnight tourists (accommodation included) from 2017, with indexation to 2022, are compared with the

average expenditures of cruise passengers of both types, regardless of segment. In this comparison, ocean and river cruise passengers spend on average just under a quarter of what an overnight tourist spends.

Average daily spending of day and overnight tourists in the art cities, ocean and river cruise passengers per segment in 2022

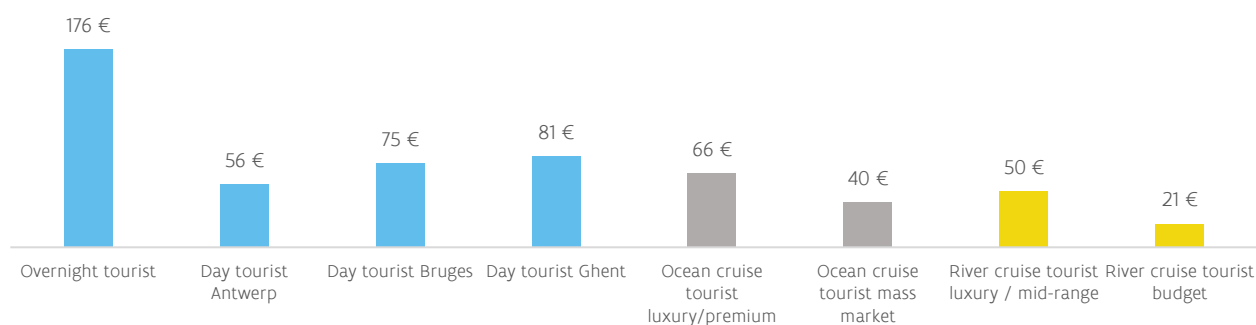


Figure 19: Average daily expenditure of day visitor and overnight tourists in the art cities, ocean and river cruise passengers per segment in 2022 (Art Cities Survey 2017 and passenger survey 2022, VISITFLANDERS)

5.3 Expenditure of crew members in the destination

Crew members of a ship visiting a destination also sometimes have the opportunity to disembark and explore a destination or to spend money there. No crew members were surveyed for this study, but knowledge about crew expenditure was extrapolated from existing studies.

According to Artal-Tur et al. (2018) 50% of crew members disembark during a stop-over. An average of 10% of this group does not spend anything on shore. Those who do spend money, spend an average of 40% of what a cruise passenger spends during an excursion. After discussing this topic with the port authorities, it was agreed to apply this ratio to the crew members of both ocean and river cruises in this study.

This expenditure was calculated on the basis of the estimate of the number of crew members per ship in 2019 and the general average expenditure of the ocean and river cruise passenger, taking into account the consumer price index 2019 but without splitting by segment, as it cannot be demonstrated that the expenditure of crew members would differ depending on the segment of their cruise line.

5.3.1 Average expenditure of crew members

Using this calculation method, a crew member of an ocean cruise ship would spend an average of €17 in 2019. A crew member of a river cruise ship would spend around €15 during an excursion in Flanders in 2019.

Port (and estimated number of crew members disembarking and spending money in 2019)	Total expenditure crew ocean cruises	Total expenditure crew river cruises	Total
Ostend (599)	€ 10,190	- €	€ 10,190
Ghent (ocean 296 + river 6,153)	€ 5,033	€ 92,300	€ 97,333
Antwerp (ocean 5,818 + river 10,044)	€ 98,899	€ 150,660	€ 249,559
Zeebrugge (59,071)	€ 1,004,208	- €	€ 1,004,208
Brussels (1037)	- €	€ 15,552	€ 15,552
Total	€1,118,331	€258,512	€1,376,842

Table 15: Expenditure of crew members ocean and river cruises (Source: VISITFLANDERS)

5.4 Total expenditure cruise tourism in 2019

Based on the data about cruise lines, passengers and crew, it is possible to estimate cruise tourism expenditure in Flanders in 2019.

5.4.1 Average expenditure cruise passengers in 2019

To get a full picture of the total cruise tourism spend in Flanders, passenger expenditure in 2019 was estimated based on the 2022 survey. For this purpose, indexed amounts are applied to the number of cruise passengers in 2019. In that year, an ocean cruise passenger would have spent an average of **€37**. For a premium and luxury passenger the average is **€58**. For a mass market segment passenger, it is **€35**.

For a river cruise passenger, the average spend in 2019 is around **€34**. Those sailing in the luxury and middle-class segment have an average spend of about **€50**. For passengers in the budget class this was **€18**.

According to research (Artal-Tur et al., 2018) and a survey of a number of port authorities, approximately 10% of passengers remain on board and therefore do not spend in the destination itself. Therefore, this average expenditure is calculated for 90% of passengers from 2019. For this calculation, the average expenditure of an ocean cruise passenger was also applied for the port of Ostend.

Total expenditure in 2019	Expenditure ocean cruise passengers			Expenditure river cruise passengers			Total expenditure cruise passengers
	Luxury/Premium	Mass Market	Without category	Luxury and Middle Class	Budget	Without category	
Ostend	€ 77,925	€ 5,622	€ 3,864	- €	- €	- €	€ 87,411
Ghent	- €	€ 42,289	- €	€ 1,231,321	€ 216,925	€ 46,533	€ 1,537,068
Antwerp	€ 206,749	€ 593,880	€ 338,438	€ 1,640,150	€ 403,245	€ 359,595	€ 3,542,057
Zeebrugge	€ 4,464,928	€ 8,782,841	€ 41,095	- €	- €	- €	€ 13,288,864
Brussels	- €	- €	- €	€ 96,837	€ 44,334	€ 64,199	€ 205,371
Total	€4,749,602	€9,424,631	€383,397	€2,968,309	€664,504	€470,328	€18,660,772

Table 16: Expenditure of cruise passengers per segment type per port in 2019.

In total, cruise passengers together spent an estimated **€18,660,772** in 2019 during their excursion in Flanders. 71% was spent by passengers from Zeebrugge, 19% by passengers whose ship docked in Antwerp, 8% in Ghent, 1% in Brussels and 0.5% in Ostend.

Each port receives its own mix of segments. As a result, the average expenditure of cruise passengers varies from port to port. The average expenditure per ocean cruise passenger is highest in Ostend. The average expenditure per river cruise passenger is highest in Ghent.

	Average expenditure per ocean cruise passenger	Average expenditure per river cruise passenger
Ostend	€ 55	- €
Ghent	€ 35	€ 39
Antwerp	€ 40	€ 37
Zeebrugge	€ 41	- €
Brussels	- €	€ 33

Table 17: Average expenditure per cruise passenger per type and per port (Source: VisitFlanders)

5.4.2 Total expenditure per port

Port	Spending ocean cruise tourism in 2019	Spending river cruise tourism in 2019	Spending cruise tourism in 2019
Antwerp	€ 1,696,528	€ 2,553,651	€ 4,250,178
Ghent	€ 72,477	€ 1,762,475	€ 1,834,952
Ostend	€ 232,023	- €	€ 232,023
Zeebrugge	€ 19,033,983	- €	€ 19,033,983
Brussels	- €	€ 261,006	€ 261,006
TOTAL	€21,035,011	€4,577,132	€25,612,143

Table 18: Total spending cruise tourism in 2019 per port and per type. (Source: VisitFlanders)

Distribution source of cruise tourism expenditure in 2019

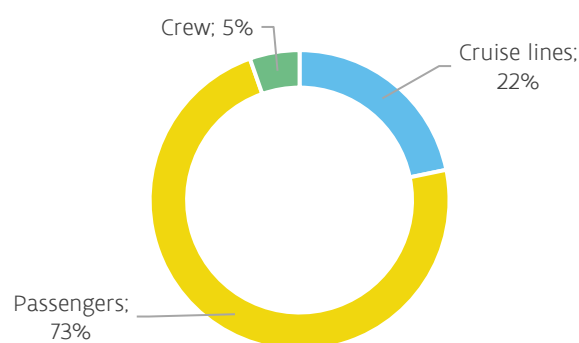


Figure 20: Breakdown of cruise tourism spending in 2019. (Source: VISITFLANDERS)

In 2019, an estimated **€25,612,143 was spent** in Flanders by cruise lines, passengers and crew members:

- 82% of all expenditure was made via ocean cruise tourism, compared to 18% via river cruise tourism.
- Almost three-quarters of this was generated by the cruise passengers themselves. Just over a fifth was collected via the cruise lines. Only for Ostend is this different. At this port, 58% of expenditure is generated by the cruise lines and 38% by the passengers themselves. 74% of all expenditure related to cruise tourism and 90% of all expenditure related to ocean cruises originates from calls in Zeebrugge. 17% of all expenditure related to cruise tourism goes via Antwerp, 7% via Ghent, 2% via Brussels and 1% via Ostend.

Port	Average expenditure per ocean cruise ship in 2019	Average expenditure per ocean cruise passenger in 2019
Antwerp	€ 53,016	€ 54
Ghent	€ 36,239	€ 54
Ostend	€ 25,780	€ 132
Zeebrugge	€ 127,745	€ 52
Average	€109,557	€53

Table 19: Average expenditure per ocean cruise ship and per cruise passenger in 2019 (Source: VISITFLANDERS)

In 2019, an ocean cruise ship that docks in Flanders brought in an average of €109,557 (direct expenditure by cruise lines, passengers and crew combined), although there are significant differences per port. These are mainly influenced by the number of passengers on board and the port duties that may or may not be charged.

Ocean cruise tourism brings in an average of €53 per passenger. It is highest in Ostend and lowest in Zeebrugge, where the expenditure is spread over a very large number of passengers.

Port	Average expenditure per river cruise ship in 2019	Average expenditure per river cruise passenger in 2019
Antwerp	€ 3,547	€ 35
Ghent	€ 5,542	€ 42
Brussels	€ 3,625	€ 38
Average	€4,124	€38

Table 20: Average expenditure per river cruise ship and per river cruise passenger in 2019 (Source: VISITFLANDERS)

A river cruise ship that docks in Flanders in 2019 brought in an average of €4,124 (direct expenditure by cruise lines, passengers and crew). River cruise tourism brought in an average of €38 per passenger. In Ghent it is €42, in Antwerp it is €35.

6 Ecological impact of cruise tourism in Flanders

The ecological impact of cruise tourism has already been extensively described in studies, mainly with regard to ocean cruise tourism in the Caribbean, the Mediterranean, the Norwegian Fjords and the coast of Alaska, among other places. The ecological impact of river cruise tourism has been less comprehensively documented in scientific studies, as Jones et al. (2016) indicate in their paper.

In this study, an attempt was made to map out a number of flows for Flanders, such as greenhouse gas emissions and waste, produced by both ocean and river cruises in order to gain a better understanding of the ecological impact of cruise tourism on Flanders.

To estimate greenhouse gas emissions from cruise ships in ports and during manoeuvring, VISITFLANDERS called on the Flanders Environment Agency. This agency of the Flemish government provided a detailed report on the emissions of nitrogen dioxide, particle matter, carbon dioxide, carbon monoxide and volatile organic compounds (VOCs) from the cruise ships that visited Flanders in 2019 when manoeuvring and when docked at the quay.

The estimation of waste is a complex matter. Only a limited amount of data could be provided by the port services. These data and a brief overview of existing research on the waste produced on cruise ships are discussed in the last part of this chapter.

6.1 Emissions to air from ocean cruise ships in ports

6.1.1 Introduction

Emissions from shipping include carbon dioxide (CO₂), sulphur oxides (SO_x), nitrogen oxides (NO_x), carbon monoxide (CO), unburnt hydrocarbons and particle matter (PM_{2.5}, PM₁₀) (Richter et al. 2004). These substances are harmful to health and have been associated with conditions including asthma, cardiopulmonary disorders and lung cancer (Pope et al. 2002).

According to Meesters et al., (2019), ocean cruise ships have a major impact on air quality not only at sea but also in the port, since their generators also have to meet the high demand for electricity at the quay. Eijgelaar et al. (2010) indicate that cruise ships account on average for 5% of shipping emissions, making cruise tourism one of the most energy-intensive forms of tourism.

In the report *Transport-related CO₂ Emissions of the Tourism Sector (2019)*, the UNWTO calculated the emissions per passenger kilometre of various modes of transport. The calculation was performed on the basis of “tank-to-wheel” emissions. These correspond with the CO₂ produced during the transport activity and do not include emissions generated by the production or distribution of energy, nor that for the production and decommissioning of vehicles. In the UNWTO comparison, cars and aircraft emit the highest number of grams of CO₂ per passenger kilometre.

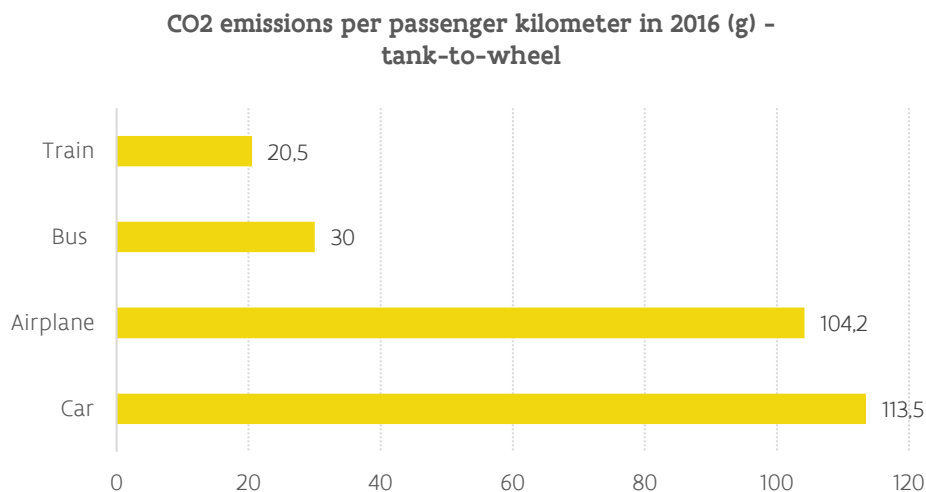


Figure 21: CO₂ emissions per passenger kilometre in 2016 (g) - tank-to-wheel (Source: UNWTO, 2019)

Cruise ships are not part of the comparison made by the World Tourism Organisation (UNWTO). However, numerous studies have been conducted that estimate the CO₂ emissions of ocean cruise ships. Howitt et al. (2010) reported an average of 390 g per passenger kilometre, also in accordance with the tank-to-wheel principle. Carnival Corporation reported CO₂ emissions averaging 312 g per passenger kilometre in 2008, based on fuel consumption multiplied by emission factors (Carnival Corporation 2009 in Walnum, 2011). Simonsen et al. (2019) calculated a CO₂ average emission of 322.5 g per passenger kilometre. According to this last study, differences per ocean cruise ship can be explained by the size and age of the ship. Comparing greenhouse gas emissions between cruise ships and other means of transport remains difficult, given the specific facilities on board a ship.

For river cruises, no data on CO₂ emissions per passenger kilometre are available. Should this information become available, the buses that follow the ship during the journey itself also need to be taken into account. These buses are not only there to transport passengers during excursions. In times of low water levels, passengers can continue their journey by bus.

As part of the European Fit for 55 regulation, in 2022, the European Parliament approved the **FuelEU Maritime** bill that contains a number of specific measures aimed at shipping. First and foremost, the emissions of greenhouse gases from ocean-going ships under any flag with a gross tonnage of 5,000 or more need to be reduced by 2% by 2025 compared to 2020. By 2050, emissions from maritime shipping must be reduced by 80% compared to 2020. By reducing the greenhouse gas intensity of the energy of ships while sailing to, from or within the European Union, the aim is to promote the use of renewable and low-carbon fuels. These fuels should represent 86 - 88% of the fuel mix for international maritime transport by 2050 (Department of Mobility and Public Works, personal communication).

Within the same Fit for 55 package, the Alternative Fuels Infrastructure directive (AFID) will be converted into regulation (**Alternative Fuels Infrastructure Regulation** or **AFIR**). Maritime Trans-European Transport Network (TEN-T) ports must provide one shore-side electricity installation by 2030 in terminals that receive cruise, container and ro-pax ships of more than 5,000 GT. 90% of the passenger and container ships that dock for more than two hours in these ports are required to be connected to the onshore electricity grid as from 2030, unless it can be demonstrated that these ships use another emission-free technology (Sustainable fuels for maritime shipping - FuelEU Maritime initiative, 2022). This

regulation applies to TEN-T ocean and core ports which, on average over the last three years, received 25 or more ships of more than 5,000 GT per year.

Only zero-emission ships will still be able to sail in Europe in 2050. At the same time, the European Commission is introducing taxes on fossil fuels and, eventually, banks and financial institutions will only be able to finance green initiatives. In concrete terms, this means that, by 2050, cruise lines will no longer be able to obtain loans for new ships that are not climate neutral.

Port of Antwerp-Bruges, together with the ports of Bremen, Hamburg, Haropa (Le Havre, Rouen, Paris) and Rotterdam, is committed to providing shore power for the largest container ships by 2028 (Port of Antwerp-Bruges, 2022). Shore-side electricity will be provided for the port of Zeebrugge as from 2026. The port of Amsterdam will provide shore-side electricity for cruise ships as from 2025 as part of its Clean Shipping Vision (Port of Amsterdam, 2022). The ports of Antwerp and Zeebrugge are applying an incentive system to reward greener ships via the Environmental Ship Index (ESI).

However, a number of power connections are already available for river cruise ships. The city port of Antwerp provides three connections to shore-side electricity for river cruise ships at the Kattendijk dock. The Brussels cruise terminal is equipped with two shore-side power cabinets.

6.1.2 Emissions to the air from cruise ships in ports in Flanders

Every year, the Flanders Environment Agency calculates the emissions from maritime shipping in Flanders using the EMMOSS model. In that model, the number of ship movements in Flanders, the number of loadings and unloadings by ship type and the number of passengers registered in ports are entered as input. The current version of the model is rather rudimentary, focusing mainly on merchant shipping, and it is not possible to reflect cruise ship emissions in the output. It was therefore decided to estimate the emissions from cruise ships separately from the EMMOSS model. The method of calculation used is identical to the one used in Denmark to estimate emissions from ocean cruise ships. The calculation was made in consultation with Morten Winther of Aarhus University in Roskilde (Jensen, S.S., Winther, M., Løfstrøm, P., Ketzler, M., Frohn, L.M., 2021)

The Flanders Environment Agency calculated the emissions of NO_x, CO, VOC (volatile organic compounds), PM and CO₂ by cruise ships in 2019. Base data are provided by VISITFLANDERS.

For NO_x emissions, restrictions have been imposed at international level on what ships may emit. The International Convention for the Prevention of Pollution of Ships (Marpol Annex VI, a convention of the International Maritime Organisation (IMO), specifies the maximum volume of NO_x that a ship may emit depending on the year in which the ship was built.

The burning of fossil fuels also releases CO and VOC (volatile organic compounds).

Emissions of PM (particle matter) are especially important due to their local character in port areas. These emissions depend on the sulphur content of the fuel. SO_x emissions are also internationally regulated via the Marpol Annex VI regulation. The North Sea is a SECA zone (Sulphur Emission Control Area), in which SO_x emissions are more strictly regulated. In such a zone, emissions from ships must correspond with emissions from the use of 0.1% sulphur fuel. This can be achieved by using a fuel that contains no more than 0.1% S while sailing, manoeuvring or docked at the quay, or switching to this fuel when entering the SECA zone. Or the ships sail on a fuel with a higher sulphur content and use scrubbers. Scrubbers are a kind of filter on a ship's chimney. They can eliminate up to 90% of the SO_x (and particle matter) from the flue gases. Or ships use an alternative fuel such as LNG.

CO₂ is a greenhouse gas that contributes to climate change. CO₂ emissions are relative to fuel consumption. Given the high cost of fuel, ships benefit from keeping their fuel consumption (and therefore their CO₂ emissions) as low as possible.

Cruise ships can use HFO (heavy fuel oil), MDO (marine diesel oil) or MGO (marine gas oil) as fuel. LNG is also an option, but none of the cruise ships that visited Flemish ports in 2019 used LNG. In the years after 2019, Zeebrugge has received cruise ships sailing on LNG.

6.1.2.1 Fuel consumption and emissions of ocean cruise ships in Flemish ports in 2019

Fuel consumption and emissions when docked (2019)

Port	registrations#	total time docked (h:m)	fuel consumption at quay while docked (tonnes)
Ghent	2	23:12	15
Ostend	9	305:00	32
Antwerp	32	582:29	383
Zeebrugge	149	1637:46	2,487
Grand Total	192	2548:27	2,917

Table 21: Number of calls, total docked time and fuel consumption at quay (2019)

Port	NO _x quay (tonnes)	VOC quay (tonnes)	CO quay (tonnes)	PM2.5 quay (tonnes)	CO ₂ quay (tonnes)
Ghent	0.60	0.03	0.10	0.01	45
Ostend	2	0.08	0.25	0.03	98
Antwerp	21	0.91	3	0.474	1,177
Zeebrugge	139	7	17	5	7,646
Grand Total	163	8	21	5	8,965

Table 22: emissions NO_x, VOS, CO, PM2.5 and CO₂ (tonnes) at quay (2019)

Fuel consumption and emissions when manoeuvring to and from the quay (2019)

Port	NO _x manoeuvring (tonnes)	VOC manoeuvring (tonnes)	CO manoeuvring (tonnes)	PM2.5 manoeuvring (tonnes)	CO ₂ manoeuvring (tonnes)
Ghent	0.03	0.00	0.01	0.00	3
Ostend	0	0.00	0.01	0.00	5
Antwerp	1	0.04	0.13	0.02	60
Zeebrugge	9	0	1	0.33	580
Grand Total	10	0.48	1	0.36	648

Table 23: NO_x, VOS, CO, PM2.5 and CO₂ emissions while manoeuvring (2019)

The ocean cruise ships that docked in the ports of Ghent, Ostend, Antwerp and Zeebrugge in 2019 emitted a combined total of 9,613 tonnes of CO₂ during manoeuvring and while docked at the quayside, or an average of 50.07 tonnes of CO₂ per call.

A total of 173 tonnes of nitrogen oxide, 8.48 tonnes of volatile organic compounds, 22 tonnes of carbon monoxide and 5.36 tonnes of fine PM2.5 were also emitted by all ocean cruise ships in 2019 in Flanders while manoeuvring and while docked at the quay.

86% of all CO₂ emissions were emitted by ships docked in the port of Zeebrugge. As mentioned earlier in this study, this port received 78% of all ocean cruise ships. The ships that docked in Antwerp accounted for 13% of the emissions. In Ostend it was 1% and in Ghent 0.5%.

The average emissions per ocean cruise ship varies from port to port. Data from the Flanders Environment Agency and research (Simonsen et al., 2019; Gössling & Walnum, 2011) show that the year of construction as well as the tonnage have an impact on the energy demand and emissions of an ocean cruise ship. Thus, the combination of these two factors has an impact on the average emissions per ship per port. For example, the port of Ostend received ocean-going ships with a maximum tonnage of 30,277 GT and an average year of construction 2001. The ships that docked in Antwerp all have a tonnage of less than 65,000 GT, but are older on average. In Zeebrugge, ships with a more recent year of construction dock but with an average tonnage of 90,294 GT.

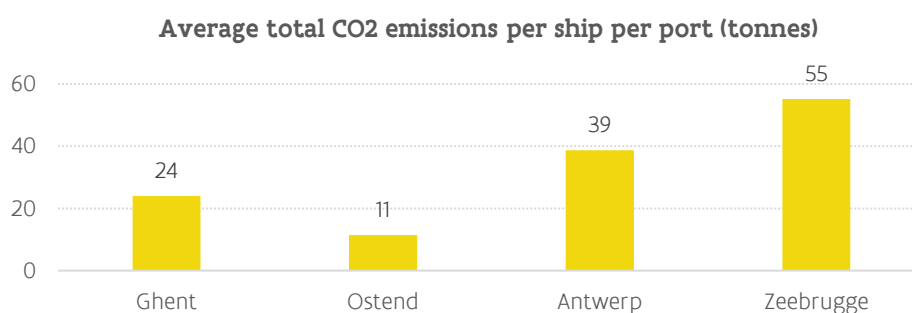


Figure 22: Average CO₂ emissions per ship per port (tonnes). (Source: VMM)

6.1.2.2 Total emissions maritime shipping in Flanders

It is difficult to comment on the share of emissions from ocean cruise ships in the total of maritime shipping emissions in Flanders because different calculation methods were used (see also introduction). The emissions from maritime shipping in Flanders are calculated using EMMOSS 3.2. The methodology will be replaced at by a new model at the VMM in 2023 (based on AIS data per year).

Although ocean cruise ships account for only 0.61% of all maritime shipping in Flanders, they are responsible for 2 to 4% of the total emissions of maritime shipping in Flanders. Research shows that ocean cruise ship emissions while docked are influenced by the energy requirements of the hotel and entertainment facilities on board.

6.1.3 Emissions to the air from river cruise ships in ports

6.1.3.1 Introduction

The Flanders Environment Agency calculates annual emissions from inland navigation in Flanders using the EMMOSS model. In this model, the number of tonne-kilometres sailed per waterway is entered as input. It is not possible to reflect river cruise ship emissions in the output. It was therefore decided to estimate the emissions from cruise ships separately from the EMMOSS model.

The Flanders Environment Agency calculated the emissions of NO_x, CO, VOS, PM and CO₂ from river cruise ships in 2019. Only the emissions when docked at the quay were calculated. Base data are provided by VISITFLANDERS.

Since the beginning of 2016, river cruise ships docking in the Kattendijkdok Westkaai on Het Eilandje in Antwerp have been able to use shore-side electricity. Whether the ships that docked in 2019 actually did so cannot be deduced from the data that we have available. The emissions calculation therefore assumes no shore-side power is used while docked at the quay (worst case).

6.1.3.2 Fuel consumption and emissions of river cruise ships in Flemish ports in 2019

Fuel consumption and emissions docked at quayside (2019)

Port	Registrations#	total time docked (h:m)	fuel consumption at quay while docked (tonnes)
Ghent	318	5678:07	117
Antwerp	720	14229:14	282
Grand Total	1038	19907:21	400

Table 24: number of registrations, total time docked and fuel consumption of river cruise ships docked at quay (2019)

Port	NO _x quay (tonnes)	NMVOS quay (tonnes)	CO quay (tonnes)	PM2.5 quay (tonnes)	CO ₂ quay (tonnes)
Ghent	3	0.310	0.509	0.108	360
Antwerp	8	0.746	1.226	0.311	866
Grand Total	12	1.055	1.734	0.419	1,226

Table 25: emissions NO_x, VOS, CO, PM2.5 and CO₂ (tonnes) for river cruise ships docked at quayside (2019)

The river cruise ships that docked in the ports of Ghent and Antwerp in 2019 produced an estimated 1,126 tonnes of CO₂ while docked at the quay, or an average of 1.1 tonnes of CO₂ per call. This calculation was made on the basis of a worst-case scenario in which shore-side electricity was not used.

The average emission of CO₂ in Antwerp is 1.2 tonnes. In Ghent, it is 1.13 tonnes. Only limited research has been done on river cruise ship emissions. Data from the Flanders Environment Agency show that the ships in Antwerp have a smaller tonnage on average than those in Ghent, but are older on average. The year of construction probably also has an impact on the energy consumption and CO₂ emissions of this type of ship. A total of 12 tonnes of nitrogen oxide, 1.055 tonnes of volatile organic compounds, 1.7 tonnes of carbon monoxide and 0.419 tonnes of particulate matter PM2.5 were also emitted by the river cruise ships in 2019.

6.1.3.3 Total emissions inland navigation in Flanders

It is difficult to comment on the share of river cruise ship emissions in the total inland navigation emissions in Flanders because different calculation methods were used (see also introduction). Emissions from inland navigation in Flanders are calculated using EMMOSS 3.2. The methodology will be replaced at by a new model at the VMM in 2023 (based on AIS data per year).

6.1.4 Emissions to the air from cruise ships in ports

Cruise ships in Flanders emitted an estimated 10,839 tonnes of CO₂ during their visit to the ports of Ostend, Antwerp, Zeebrugge and Ghent in 2019. 11% of this was generated by river cruise ships, based on the worst case scenario in which no shore-side power was used. The port of Brussels was not included in this calculation.

6.2 Waste generated by cruise ships in Flanders in 2019

6.2.1 Introduction

According to Klein (2011), a number of waste flows such as bilge water and ballast water are specific to maritime shipping as a whole. Cruise ships also produce waste flows in larger volumes, such as black water (toilet water), grey water (including water from showers, rinsing and washing), solid waste (including food residues) and gases and ashes through the incineration of waste on board.

Globally, cruise ships make up 1% of all maritime shipping. Yet according to Copeland (2008), cruise tourism generates 24% of the total amount of waste from maritime shipping. An ocean cruise ship with an average of 3,000 passengers on board would produce around 50 to 70 tonnes of solid waste per week, or 2.3 to 3.3 kg per passenger per day (Meesters et al., 2019). According to these researchers, 75 to 85% of the waste on board would be incinerated on the largest ships. Modern ships carry out a much of the waste processing on the ship itself with the aim of reducing the amount of waste and that needs to be discharged or taken off on shore. In addition, an ocean cruise passenger produces on average of between 120 and 300 litres of grey water and some 26 litres of black water per day (Klein, 2011).

The discharge of waste is governed by the International Convention for the Prevention of Pollution from Ships, known as MARPOL. This Convention regulates pollution caused by the operational discharge of substances generated by the normal operation of ships, such as cargo residues (Annexes I and II), fuel and lubricant residues (Annex I), waste water (Annex IV), garbage (Annex V) and air pollution (Annex VI). Apart from a total ban on the discharge of plastics (Annex V), discharging is usually permitted under certain conditions. For example, no discharging may take place within 3 nautical miles¹ and between 3 and 12 nautical miles from the coast discharging can take place provided an approved sanitary decomposition and disinfection system has been used (Helpdesk Water, Netherlands Government, 2022). Untreated grey water may be discharged as from 12 nautical miles from the coast and black water may be discharged in international waters as from 200 nautical miles from the coast (Epler Wood, 2017).

Fewer studies have been published on waste generation and disposal by river cruise ships, although some estimates can be found. For waste generated by inland navigation, a waste management plan was prepared implementing the guidelines within the CDNI Convention. This describes three sorts of waste. These are oil and grease-containing ship-generated waste, cargo waste and ship-operating waste.

Research by van Klink et al. (2022) shows that there is a lack of transparency regarding waste disposal in river cruise ports, for passenger, cruise line and for port. Thus, for example, crew members on board would sort the waste that they produce themselves. However, for passengers, this does not seem to be the case due to a lack of space in the cabins, which makes the placement of multiple bins impossible. Although waste on board is often separated, separate disposal in the port itself is not always possible. Disposal needs to happen every two to three days for a river cruise ship. No data are available on waste production per passenger on board a river cruise ship.

According to Vermij, H. and De Vries, K. (2020), a river cruise passenger produces about 70 litres of waste water per day. Modern ships are equipped with a system that purifies water of organic material and nutrients. According to Article 77 of the Convention on the collection, disposal and intake of waste in the Rhine and inland navigation (CDNI Convention), ships with fewer than 50 passengers on board may discharge waste water into the river without treatment. For ships with more than 50 passengers this is possible if they have a water treatment system that operates according to the required standards. Ships

¹ 1 nautical mile = 1,852 kilometres

with more than 50 passengers and without water treatment must store waste water in a tank (van Klink et al. 2022).

6.2.2 Waste disposal by ocean cruise ships in Flanders

Discussions with port services and port agents indicate that the disposal of waste in the port of Zeebrugge is limited to the categories Marpol I (oil-containing waste) and Marpol V (garbage). Moreover, removing waste from the port proves difficult due to the fact that the construction of a large number of cruise ships is not geared to the tidal variations whereby the shell door often finds itself under the quay wall.

In the port of Ostend, a fixed fee for waste disposal of between €110 and €180 per ship, depending on the tonnage, was applied in 2019. For Antwerp, no data about waste disposal by ocean cruise ships are known.

Since 2022, all ports have had a new waste reception and waste processing plan - the “waste management plan” - developed in the context of European Directive 2019/883 on port reception facilities for the disposal of waste from ocean-going ships. According to these directives, each port must provide adequate reception facilities. Each ocean-going ship must report the type and quantity of the waste to be disposed of in a timely manner. All ships entering a port must dispose of their waste unless there is sufficient storage capacity on board to store all the waste until the next port of call (Port of Antwerp, 2022). The notification of waste is or will be done via digital platforms.

6.2.3 Waste disposal by river cruise ships in Flanders

Waste disposal in each port is not an obligation for river cruise ships. There are several ways to receive waste from river cruise ships, according to our discussions with the port services. For disposal in Ghent and Antwerp, the cruise lines themselves contact a waste collector. In the port of Brussels, the cruise lines must give advance notice of how much and what kind of waste requires disposal. The disposal is invoiced by the port itself. Apart from the ships that docked in Brussels in 2019, no data are available.

A total of 12,620 kg of waste was disposed of in the port of Brussels during 23 calls. Waste was thus disposed of in 31% of all the calls, most often by ships ending a cruise trip and starting another one in Brussels. The average amount disposed of was 549 kg per call.

7 Conclusions

7.1 Characteristics of ships and cruise lines

The number of ocean cruise ship **calls** increased from 76 in 2005 to 192 in 2019, with an average growth of 8% per year. Within the bigger picture, ocean cruise tourism accounts for 0.61% of all maritime shipping in Flanders. River cruises recorded an average annual growth in calls of 8%, with 416 ships in 2005 and 1,302 ships in 2019.

Only 15% of all calls concern an ocean cruise ship, but this form of cruise tourism accounts for 77% of all cruise passengers. Of all ocean cruise calls, 78% have Zeebrugge as destination. 65% of river cruises go to Antwerp. A large proportion of the ocean cruise tourism calls take place in May, June, August and September. April is the busiest month for river cruises, corresponding to the tulip time in the Netherlands.

Together with the increase in the number of calls, the number of **passengers** also increased, to 398,565 ocean cruise passengers and 121,054 river cruise passengers in 2019. The number of cruise passengers per ocean-going ship increased significantly from 892 in 2005 to 2,076 passengers on average in 2019. The share of cruise tourists in the total of visitors in the cities is rather limited. 3% of visitors to Bruges are cruise tourists. In Antwerp, this is 1%.

75% of all ocean cruise passengers come to Flanders with a ship from the **mass market segment**. 22% come from the luxury and premium segment. Among river cruise passengers, 33% come from the budget segment and 54% from the middle class and luxury segment.

7.2 Characteristics of cruise passengers

On average, river cruise passengers are older (65 years) than ocean cruise passengers (54 years).

64% of passengers **travel in a group of two**. River cruise passengers rarely travel with children but more often with friends. 13% of ocean cruise passengers do travel with **children**, almost always within the Mass Market segment.

More than half of the cruise passengers come from neighbouring **Germany**. 27% of the river cruise passengers come from the **USA**.

7.3 The social, economic and ecological impact of cruise tourism in Flanders

7.3.1 Social impact

The **survey of residents** in Antwerp, Ghent and Bruges indicates that the **desire for fewer cruise tourists** increases significantly in 2019 compared to 2017, and this for all cities. As in previous residents' studies, a large proportion of respondents say they want fewer cruise tourists in their city. Residents from all cities are less tolerant of cruise tourists than they are of other types of tourists.

The **general perception** of cruise tourism is rather negative in Ghent, Antwerp and Bruges. For instance, cruise tourism is seen as a cause of crowdedness, although the share of cruise tourists in the entire tourist population in these cities is limited.

In Bruges, the feeling of **crowdedness** caused by cruise tourism plays an important role. This group is also more critical with regard to all the assertions presented.

In each city, more than half of the residents say that, in their opinion, cruise tourism has a **negative ecological impact** on their city.

The **survey of cruise passengers** shows that the destination of the excursion they made in Flanders often does not constitute a reason for booking the cruise.

The **average time a cruise passenger spends ashore** is just under 5 hours. Within this time, the transfer from ship to the destination of the excursion is also taken into account.

There are a number of important differences between the cruise passenger segments in terms of **onshore activities**. For cruise passengers in the luxury and premium segment, visiting monuments, churches, museums or attractions is the most important activity. For passengers in the Mass market, it is shopping. Chocolate, beer and souvenirs are the main purchases. Visiting monuments, attractions and museums is the most important activity of river cruise tourists. 30% of the river cruise tourists took part in guided walks and tours, almost always organised by the cruise line.

On average, 5 to 10% of all passengers **remain on board**. An excursion takes place most often in the vicinity of the place where the ship of the passenger is docked. Ocean cruise passengers are more likely to go out on an excursion on their own.

7.3.2 Economic impact

In 2019, an estimated **€25,612,143** was spent in Flanders by cruise lines, passengers and crew members. 73% of this was generated by the expenditure of cruise passengers, 22% by the cruise lines and 5% by crew members.

74% of all 2019 expenditure can be linked to the port of Zeebrugge. Almost half (49%) of all expenditure by cruise lines in 2019 consists of **port duties** paid to the port of Zeebrugge.

A river cruise passenger spends an average of **€38** during a visit to Flanders in 2022. For an ocean cruise passenger this is **€41**. A significant proportion of this expenditure is spent on shopping, eating and drinking. By comparison, an overnight tourist spends an average of €176 per day, accommodation included. For day visitors in Antwerp, Bruges and Ghent, this is €56, €75 and €81 respectively.

There are significant differences in expenditure per **segment**. Passenger spending from the two most expensive segments is much higher than that of passengers from the budget segment, both for ocean and for river cruises.

Taking all expenditure into account, an ocean cruise ship brought in an average of **€109,557** in 2019, or **€53** per passenger. For a river cruise ship this was **€4,124** or **€38** per river cruise passenger.

7.3.3 Ecological impact

Research shows that the CO₂ emissions per passenger kilometre of a sea cruise ship are on average higher than those of an aircraft, car, bus or train, although the comparison between these modes of transport is not straightforward due to the specific characteristics of a cruise ship.

Research by the Flanders Environment Agency showed that in 2019, ocean cruise ships that docked in Flanders emitted **9,613 tonnes of CO₂** while docked at the quay and manoeuvring, or an average of 50 tonnes CO₂ per ocean cruise ship. The average emissions per ocean cruise ship do vary from port to port. In Zeebrugge, an ocean cruise ship emitted an estimated 55 tonnes of CO₂ on average. In Ostend, it was 11 tonnes of CO₂.

Ocean cruise ships docked in Zeebrugge are responsible for **86%** of CO₂ emissions, while that port registered 78% of all sea cruise calls. In Antwerp, **13%** of all CO₂ emissions were produced.

A total of 173 tonnes of nitrogen oxide, 8.48 tonnes of volatile organic compounds, 22 tonnes of carbon monoxide and 0.36 tonnes of particle matter PM 2.5 were also generated by ocean cruise ships in 2019. Although ocean cruise ships account for only 0.61% of all maritime shipping in Flanders, they are responsible for **2 to 4% of the total emissions of maritime shipping**. This can be explained by the high demand for energy to keep hotel and entertainment facilities running while the ship is at the quayside. Ships of limited tonnage emit less than cruise ships of the largest size. Ships with newer technology to capture emissions also have a smaller impact compared with older ships (Simonsen et al., 2019)

Research by the Flanders Environment Agency also shows that river cruise ships that visited Antwerp and Ghent in 2019 generated an estimated **1,226 tonnes of CO₂** while docked at the quay, according to the worst-case scenario in which no shore-side power was used. A river cruise ship emits **an average of 1.1 tonnes of CO₂** during a visit to one of these cities.

Waste disposal is mandatory for ocean-going ships unless it can be demonstrated that they have sufficient cargo space to store waste until the next port of call. According to research, **2.3 to 3.3 kg** is produced per ocean-cruise passenger per day.

River cruise ships are not subject to any waste disposal obligation. Waste disposal was registered for 31% of all river cruise ship calls in Brussels, mainly from ships that ended a trip there and then started another one in this port. On average, **549 kg** of waste was disposed of per disposal.

8 Recommendations

This research was commissioned by VISITFLANDERS in order to gather more knowledge about the characteristics and impact of cruise tourism in Flanders and thus to be able to provide targeted advice and to undertake action with regard to its further development. This chapter makes a number of recommendations regarding the future of cruise tourism.

These are **general recommendations** for Flanders. It is up to each city/port where cruise ships dock to formulate **local recommendations** for cruise tourism based on the results of this study, the general

recommendations and their own needs and knowledge. These recommendations should therefore be read together, as they interact with each other. In addition, these recommendations need to be incorporated into measures that are taken in the context of other forms of tourism than cruises.

International research into the impact of cruise tourism recommends that national, regional or port-specific policy measures be taken, in addition to international guidelines (Simonsen et al., 2019). National or regional legislation should even gain in importance given that there are numerous possibilities for governments to create conditions for cruise ships sailing in their national waters.

Simonsen's study cites as an example the framework of conditions created by Norway at the time of the research. The Norwegian government proposed a package of three measures in 2019. Firstly, the number of passengers and/or ships in a number of ports should be limited. In addition, only emission-free (and therefore newer) ships will be allowed as soon as this is possible, but at the latest in 2026. Finally, ports must report emissions in the port via a joint Environmental Port Index (EPI). The research also describes other possibilities, such as restricting the speed of ships while sailing, since speed has a significant impact on fuel consumption (Bouman et al. 2017; Simonsen et al. 2019).

The Netherlands Board for Tourism and Congresses (NBTC), in its roadmap "The Road to Climate-Neutral Tourism" (2022), also sets out the need to monitor the future of cruise tourism and to give direction in order to prevent this type of tourism from forming a blind spot. NBTC indicates that governments can impose requirements for the maximum emissions from ocean cruise ships when sailing and while docked. According to NBTC, it is also possible to maintain the accompanying CO₂ ceiling and to establish a directive for a maximum number of ships.

Recommendations regarding ecological impact

As demonstrated by Simonsen et al. (2019) the energy requirements and emissions of cruise ships are influenced by the size, age and number of on-board hotel facilities. The largest ships with a large number of hotel functions produce the highest emissions.

Recent commitments at European level under the Fit for 55 package will ensure that the emissions of cruise ships, certainly once docked, will decrease in the coming years. Nevertheless, it is important to implement additional measures regarding, for example, the technology available to reduce emissions, the size of the ship and its year of construction.

Measures to reduce the environmental impact should also have an influence on the economic and social impact of cruise tourism.

Recommendations regarding spreading and quotas

In order to hold the pressure on city centres and the carrying capacity of these places and the residents at a liveable level, it is necessary to make choices regarding the spreading of cruises throughout the week and during the year and also about possible maximum numbers. Cruise ships calls reach their peak mainly in April/May and August/September, the so-called shoulder months. Choosing the most appropriate docking time for cruise ships can ensure a spreading of the tourists and in this way create added value for residents, visitors, entrepreneurs and for the city itself. The negative impact of the influx of cruise passengers on a Wednesday is less than on a Saturday, for example. Furthermore, we advise local cities and ports to set a maximum for the number of cruise passengers that can visit a city on a daily and weekly basis. This recommendation can be linked to the attraction of specific segments of cruises.

Segments

On the basis of the specific characteristics and their economic, environmental and social impact, a choice for ocean cruises from the luxury and premium segment is appropriate. For river cruises, this is the luxury and mid-range segment. Ships from these segments tend to have been built more recently and have newer technology on board. Furthermore, ocean cruise ships from the luxury segment are smaller. The combination of these elements would reduce greenhouse gas emissions.

Moreover, ocean cruise lines from the luxury class cater for fewer passengers. Thus, smaller groups of visitors would be visiting a destination at the same time. Luxury and premium cruise passengers are also more likely to visit a museum, attraction, church or monument and spend more in the destination itself

than mass-market passengers are likely to do. River cruise passengers from the two higher segments also spend more in the destination they visit.

A choice of segments can potentially lead to a lower ecological and social impact, especially considering the economic impact and the attractions of a destination itself. This choice also leads to a targeted marketing approach towards the right intermediaries and target groups.

Resources

Cities and ports generate significant revenue from the cruise activities. As part of making cruise activities more sustainable and in mitigating the impact on the destination and the local community, a part of port revenues should best flow back to the local destination.

Monitoring

European regulations as part of the Fit for 55 package and the introduction of other measures may bring about a continual change in the impact of cruise tourism in the coming years. It is important to regularly update current understanding of cruise tourism in Flanders and to detect the evolutions, at least on the basis of the following indicators:

- Number of ocean and river cruise ships calls per port per year and per month
- Number of passengers of ocean and river cruise ships per port per year and per month
- Emissions of ocean and river cruise ships per port per two years
- Other indicators closely related to the measures taken

This monitoring should take place in collaboration with the ports that are part of this study and with the competent government services of the Flemish government and forms the basis for regular consultations on the development of cruise tourism.

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