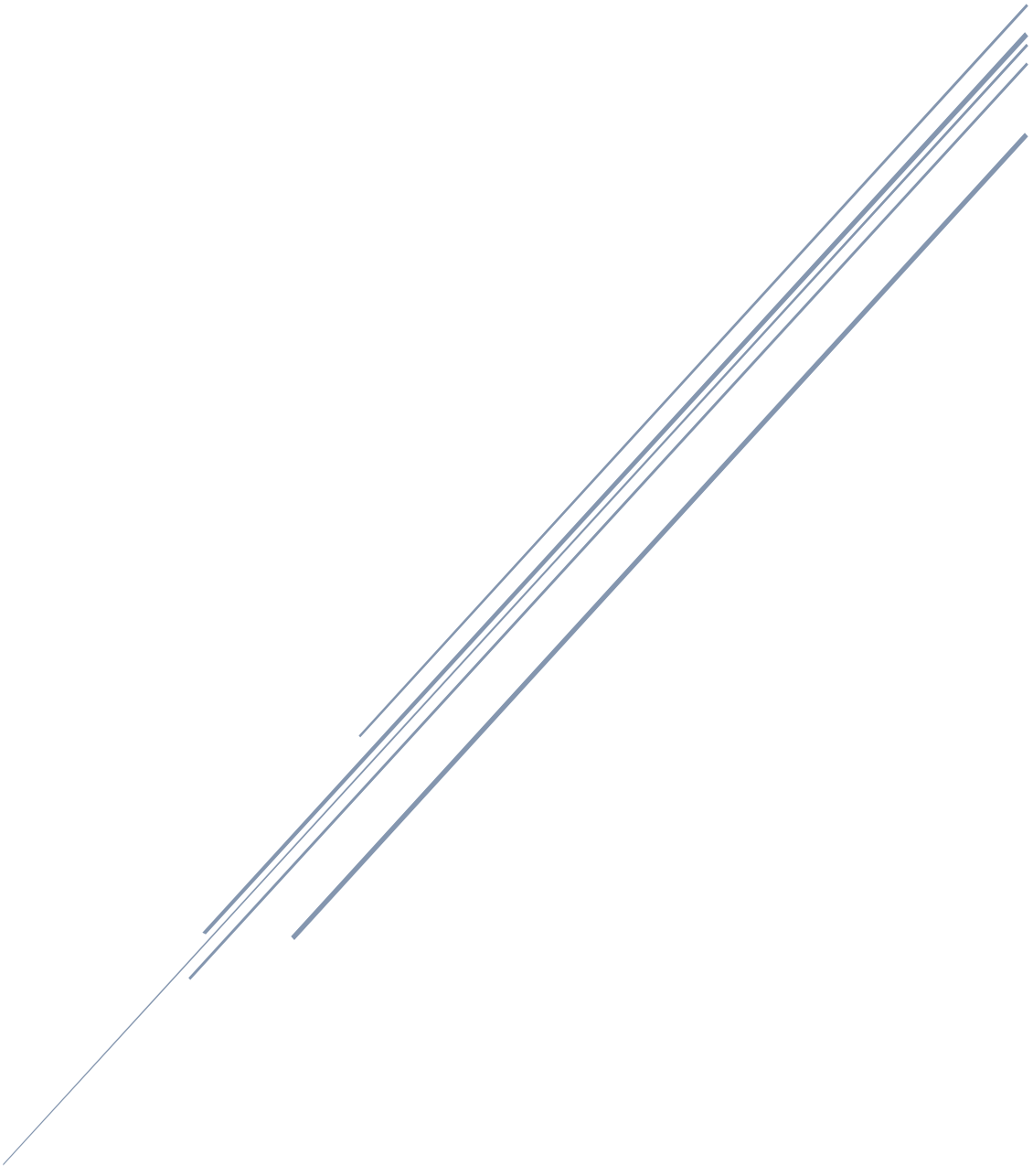
GREENHOUSE GAS EMISSIONS LINKED TO NORWEGIAN TOURISM



August 2019

Table of contents

About the report

The report was commissioned by the Norwegian Hospitality Association, which wanted an account of which greenhouse gas emissions can be regarded as linked to Norwegian tourism and Norwegians' holiday and leisure activities. Special thanks go to Torolf Holte and Øystein Ulstein Tvetene of Avinor for providing comprehensive travel statistics from the aviation industry. The results are entirely my responsibility.

Svein Thompson

Oslo, August 2019

Introduction and summary

In itself, tourism does not involve activities that are linked to major emissions of greenhouse gases. There are few activities that generate lower CO_2 emissions than strolling through the old town in Palma, salmon-fishing in Orkla or sunbathing at Ayia Anna on Naxos. The main problem involves the transport to the location where the activity takes place: The experience is emissions-free.

In this memo, we have attempted to summarise greenhouse gas emissions linked to Norwegian tourism from various sources:

- Norwegians' and foreigners' flights within Norway, Norwegians' flights out of the country and foreigners' flights into the country
- Cruise ship emissions within the Norwegian Exclusive Economic Zone
- Passenger ship emissions within the Norwegian Exclusive Economic Zone
- Use of cars, camper vans etc. for holidays and leisure trips
- Emissions from coaches
- Emissions from the accommodation and hospitality industry in Norway

We have tried to differentiate between leisure trips and business trips, and between cargo transport and passenger transport. For each of the sources of emissions, we have applied limitations and assumptions. We have mainly used public statistics, usually combined with a set of essential assumptions in order to arrive at a reasonable estimate for emissions linked to holidays and leisure trips.

Although we have included as many sources of emissions as possible, there are many sources for which we have no information. For example, we have not included car hire by Norwegians abroad, or cruise holidays made by Norwegians outside Norwegian borders.

On the other hand, we have also not included potential savings: When we are holidaying on a Greek island, we are not driving our car and emitting CO_2 in Norway, and when a German stays in a Norwegian hotel, his emissions at home will be reduced.

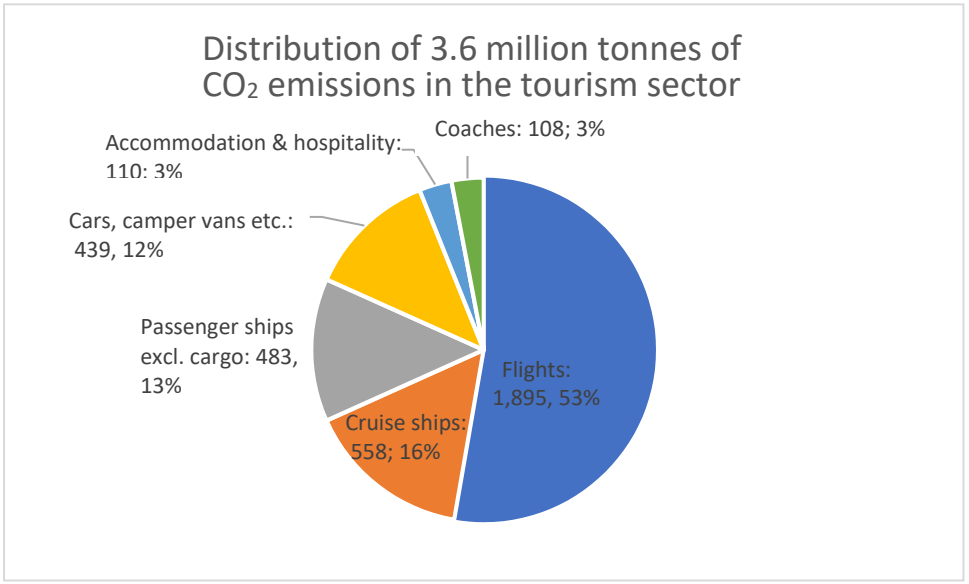


Figure 1. Total CO_2 emissions from Norwegian tourism amounted to 3.6 million tonnes of CO_2 in 2018. The dominant portion is linked to flights, but cruise ships, passenger ships and car journeys are also major contributors, with around 0.5 tonnes of CO_2 each. CO_2 emissions from accommodation and hospitality represent 3 per cent of the total emissions from tourism.

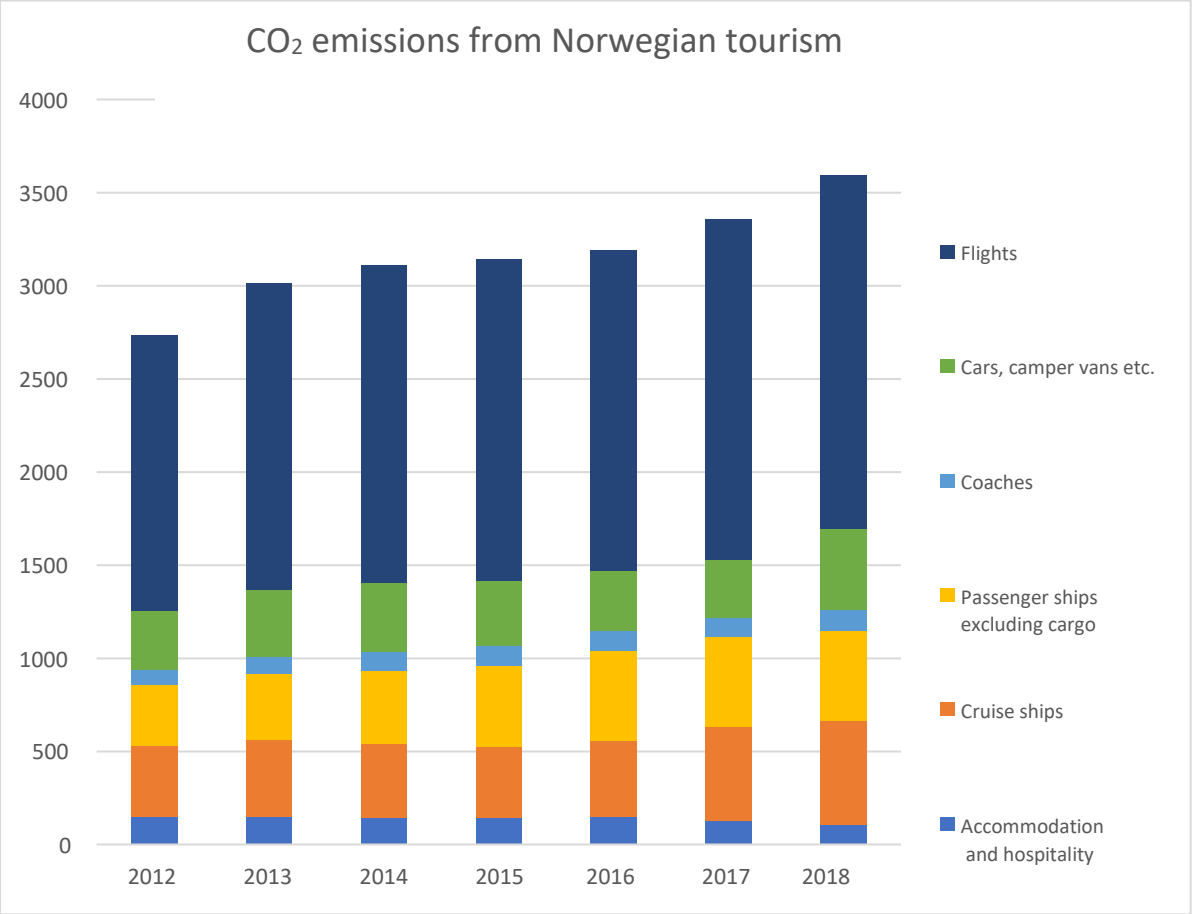


Figure 2. Emissions of CO_2 linked to Norwegian tourism have grown by 31.4 per cent since 2012, amounting to 3.6 million tonnes in 2018. All sources show a considerable growth, with the exception of emissions from the accommodation and hospitality industry itself.

As figures 1 and 2 show, flights are the biggest contributor. We have only included leisure trips here, not business trips or cargo flights. In the calculations for aviation, we have included domestic emissions within Norway and one way of international flights (Norwegians and foreigners). If every country counts both ways of a trip into and out of that country, it means that each way is counted twice. We have therefore used the established practice of only counting one way of international flights.

Leisure trips represented 70 per cent of the CO_2 emissions from flights in 2018, and business trips represented 30 per cent within Norway and out of Norway.

For a family or company wishing to work out the emissions generated by their own trips, it is different. They must count the emissions for both ways of the trip. We have performed sample calculations which illustrate the effect of choice of car, bus or plane for the same journey, and for short and long journeys.

We have also performed calculations in which we include the potential climate effects of emissions at higher altitudes. There is a great deal of uncertainty with regard to how these effects should be calculated. See more about this in the section on aviation.

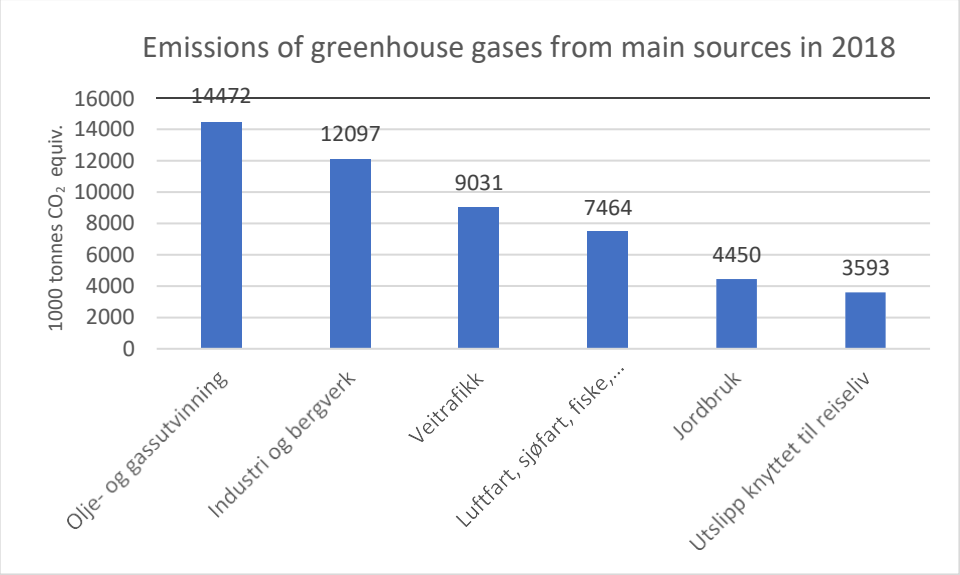


Figure 3. Emissions linked to tourism are among the major sources of emissions, which are dominated by oil and gas operations and industry. Source: Statistics Norway

In 2018, total greenhouse gas emissions linked to tourism amounted to 3.6 million tonnes of CO_2. This is relatively modest compared with emissions from the petroleum sector and industry, but growth in emissions in the tourism sector has been high. In this report, we have been able to compare figures from 2012 to 2018. During this period, total growth has been 31.4 per cent. This reflects the growth experienced by the tourist industry. According to Statistics Norway, trade in the accommodation and hospitality industry has increased by at least 29 per cent between 2012 and 2017.

The accommodation and hospitality industry in Norway is moving towards becoming a zero-emissions industry in itself, but the transport element is a major climate challenge for an industry that wants to continue growing.

In particular, the figures for visits by cruise ships to Norwegian ports have experienced dramatic growth in recent years, with a corresponding increase in CO_2 emissions. In 2018, cruise ships emitted more CO_2 than the entire Norwegian bus fleet, and the emissions figures for 2019 will be even higher. Growth in the 2012-2018 period was 46 per cent, and this growth is expected to continue in 2019.

CO_2 emissions from passenger ships have also grown appreciably since 2012, but growth has flattened out over the last three years. It is therefore extremely positive that players like Hurtigruten[1] and Color Line[2] are implementing measures to reduce emissions of CO_2 and local pollution. Growth between 2012 and 2018 was 49 per cent.

Leisure trips involving a flight have grown by 28 per cent since 2012, while emissions from business trips have fallen. Aviation is the sector in Norway that has achieved the most positive development in CO_2 emissions per passenger kilometre. The emissions per passenger kilometre have more than halved here since 2001. It was also extremely important for the industry that it was included in the EU's trading system for CO_2 emissions

[1] https://www.nho.no/samarbeid/nox-fondet/nyheter/hurtigruten-skal-ga-pa-biogass/

[2] http://www.shortseashipping.no/News/4394/Color-Line-tar-i-bruk-det-f%C3%B8rste-landstr%C3%B8manlegget-i-utenlandsk-havn

in 2012. Three out of four tonnes of CO_2 from aviation are regulated by the EU trading system, which in practice means that one additional flight within the EEA[3] area will not result in an increase in CO_2 emissions. For Norway, however, which has also set itself national climate targets, it is also important to reduce emissions from aviation, the processing industry and oil sector, even though these are already regulated by the EU and EEA Agreement. More information about the trading system is included in a separate section.

The growth in CO_2 emissions from coaches between 2012 and 2018 is estimated to be 30 per cent. Much of the growth comes from foreign coaches that operate in Norway in the summer, meeting the demand created by the growth in incoming traffic (cruise ships and flights) to Norway.

Coaches are the form of transport with the lowest CO_2 emissions per passenger kilometre. A modern 52-seater coach will generate emissions per passenger kilometre of 18 grams of CO_2. Coaches also have a huge potential for reducing CO_2 emissions even further by refuelling with biodiesel.

On a return journey from Oslo to Bergen, as a coach passenger you will emit 17 kilos of CO_2, while as a plane passenger or motorist in a car with one passenger, you will emit 102 and 63 kilos of CO_2 per person, respectively. If you travel to Bergen alone, you will emit less by plane than by car.

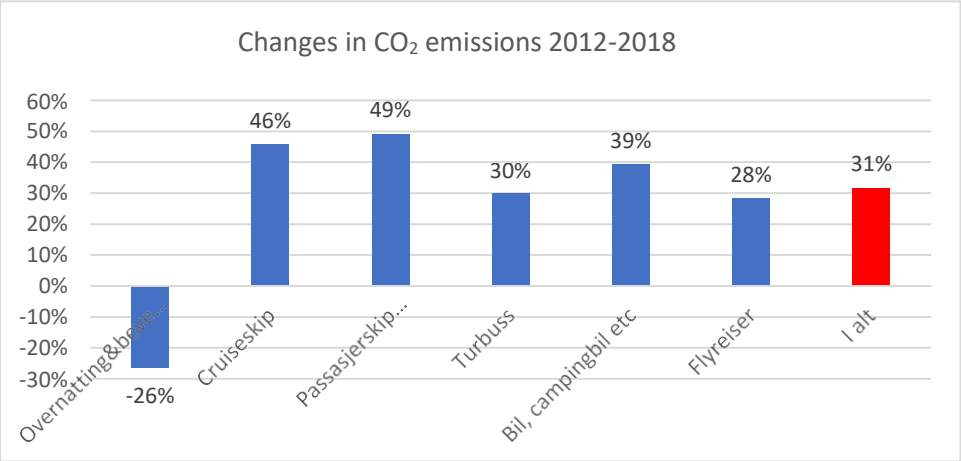


Figure 4. The growth in CO_2 emissions from transport linked to holidays and leisure trips has been rapid. It has increased by a total of 31 per cent between 2012 and 2018. Growth has been highest in the marine sector, for both cruise ships and passenger transport. The figures for flights show a growth in leisure trips.

[3] From January 2020, Switzerland will also be part of the EU Emissions Trading System.

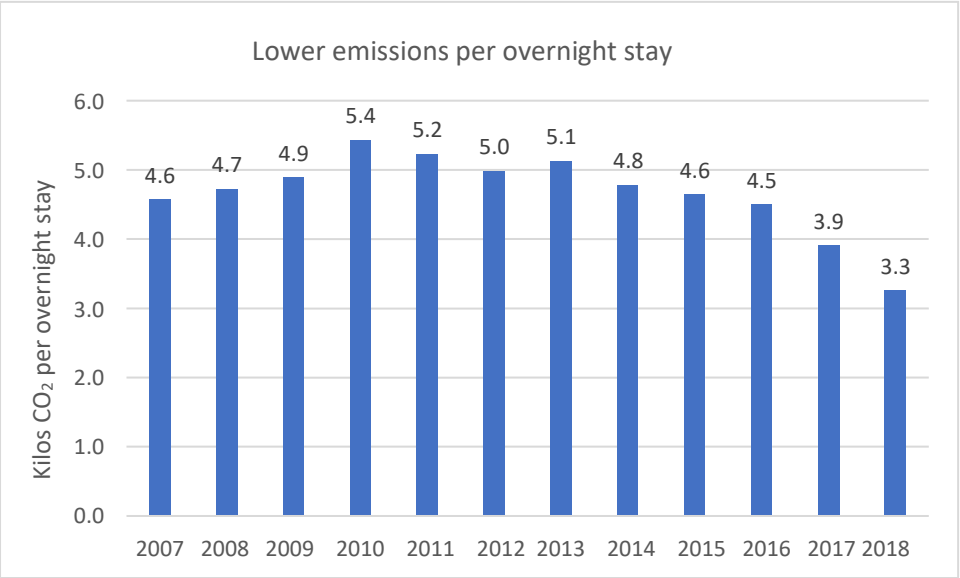


Figure 5. The emissions per night from overnight stays from the accommodation and hospitality industry are falling rapidly, and were down to 3.3 kilos of CO2 per night, and will continue to fall over the next two years. Source: Statistics Norway

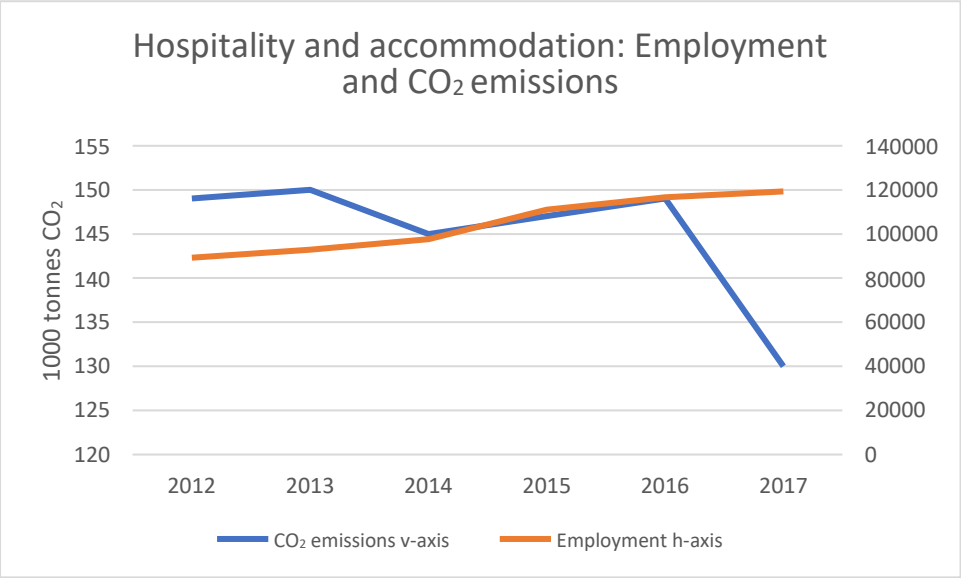


Figure 6. Since 2012, employment in the hospitality and accommodation industry has increased by 33 per cent, while CO_2 emissions have fallen by 13 per cent. Source: Statistics Norway

Norwegian climate targets

In June 2017, the Act relating to Norway's climate targets (the Climate Change Act) came into effect. It states that:

'The target is for greenhouse gas emissions to be reduced by at least **40** per cent by **2030** compared with the reference year 1990'.

'The target is to achieve reductions of greenhouse gas emissions of the order of **80-95** per cent by **2050** from the level in the reference year 1990. The effect of Norway's participation in the EU Emissions Trading System is to be taken into account in assessing progress towards this target'.

The government has also adopted a number of specific targets relating to various forms of

transport. The Act also states that a *report* on progress must be submitted every year.[4]

Norway is also bound by the EEA Agreement to reduce greenhouse gas emissions from sectors not included in the Emissions Trading System by 40 per cent from 2005 to 2030. Because the emissions from this sector in 2005 were higher than the emissions in 1990, this target is stricter than those in the Climate Change Act.

In addition, this also means that Norwegian businesses that are included in the Emissions Trading System must assist with reducing the emissions from this sector by 43 per cent between 2005 and 2030.

In other words, Norway has a mixture of national and EEA-adopted climate targets, which can be confusing in terms of objectives.

Aviation

Leisure trips involving flights

Aviation has grown significantly over the last 20 years, and holidays and leisure trips in particular have grown significantly over the last 10 years. Leisure trips made by Norwegians involving a flight were at around the same level in 2018 as in 2013. It is foreigners who represent the entire growth in the leisure market for flights.

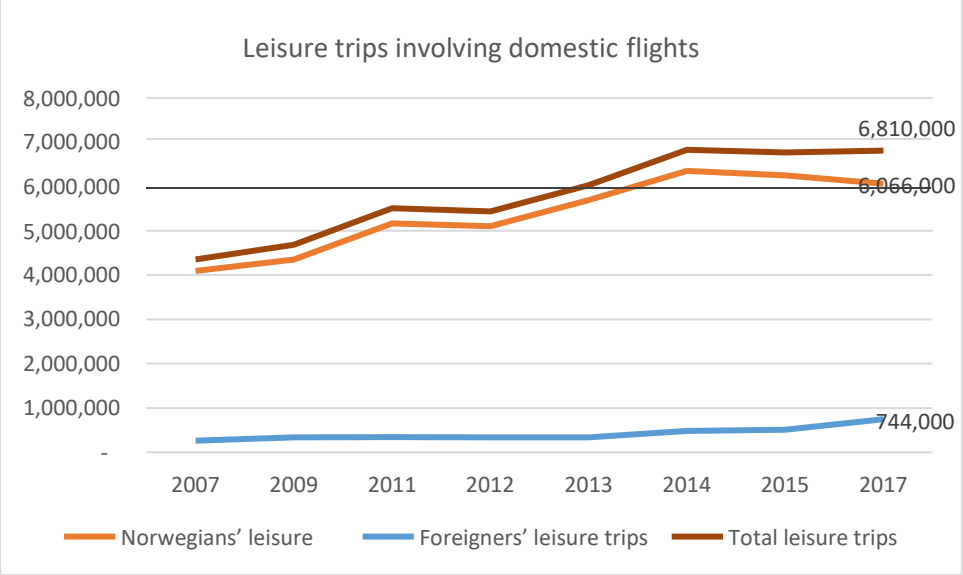


Figure 7. Norwegians' domestic leisure trips have stagnated, while foreigners are taking more domestic flights when they are on holiday in Norway. There were a total of 6.8 million leisure trips in Norway in 2018. Source: Avinor

[4] https://tema.miljodirektoratet.no/Global/dokumenter/tema/klima/klimatiltak/klimatiltak-klimalovrapportering2018.pdf

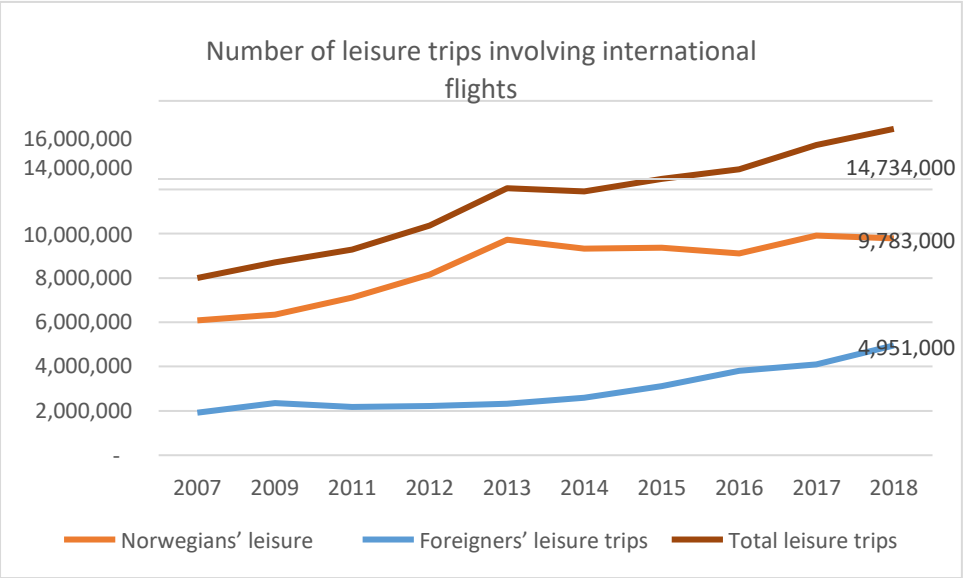


Figure 8. In practice, Norwegians' leisure trips abroad have remained at the 2013 level, while far more foreigners are coming to Norway by plane than in 2012. The overall result is that growth in international trips is continuing at about the same rate as before 2013. There were a total of 14.7 million leisure trips involving flights into and out of Norway in 2018. Transit flights have not been included. The figures do not include Rygge and Torp. Source: Avinor

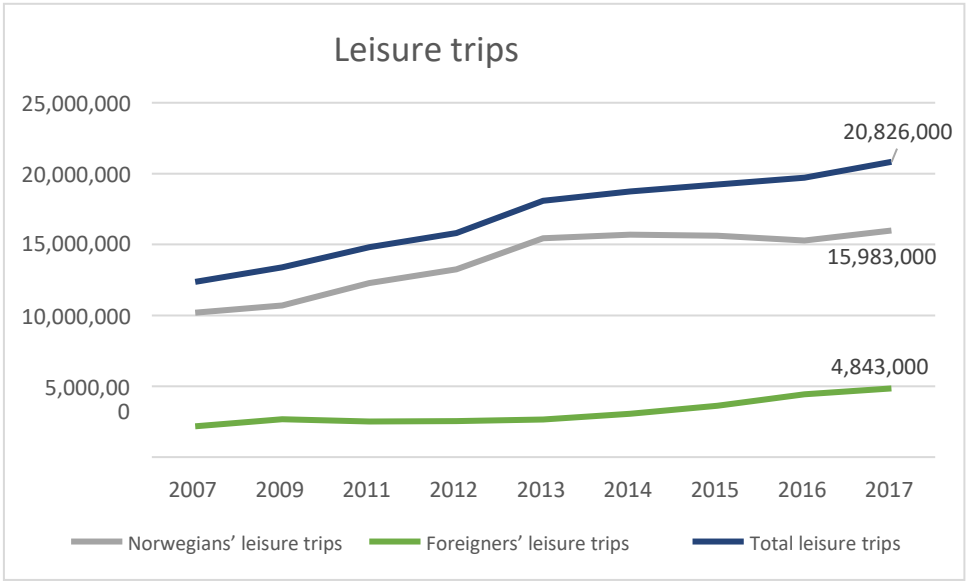


Figure 9. In practice, leisure trips by Norwegians involving flights have flattened out since 2013, although there was a slight increase in 2018. Foreigners' leisure trips to Norway is a different matter, with this sector having grown since 2012. Total growth in leisure trips involving a flight has thereby increased, albeit at a slower pace. There were 20.8 million leisure trips within, into and out of Norway in 2018. Source: Avinor

CO_2 emissions from flights

Statistics are available from Statistics Norway for domestic emissions of CO_2 equivalents (CO_2, methane and nitrous oxide) from aviation. Statistics Norway also sent the undersigned figures which exclude emissions from flights by the Norwegian Armed Forces, helicopter traffic (which is dominated by traffic to and from oil platforms in the North Sea)

and light aircraft. Combined with Avinor's differentiation of trips between leisure trips/business trips and Norwegians/foreigners, it is possible to present precise estimates of emissions from leisure trips in Norway.

In terms of trips abroad, Statistics Norway prepares emissions figures based on the amount of jet fuel taken on board at Norwegian airports before an international flight. This means that emissions for flights are calculated to the first destination abroad.

That is not sufficient for our objective, which is to chart emissions for trips all over the world. We have therefore calculated emissions from trips made by Norwegians to any country in the world, where this number exceeded 1,000 trips in 2018, including return trips. Correspondingly, we have included all trips made by foreigners to Norway from any country in the world, where this number exceeded 1,000 trips in 2018, including return trips. Avinor was the source of these passenger figures to and from the various countries.

We have used the CO_2 calculator on the UN's International Civil Aviation Organization's (ICAO) website[5] to work out emissions per passenger per trip. We have used the fastest possible flight to and from Oslo as our basis. We have taken into account transit stops where necessary. The ICAO has corrected for air cargo that is not part of passengers' baggage,[6] which is ideal for this report. According to CICERO,[7] emissions from international flights carrying cargo amounted to 0.5 million tonnes of CO_2 in 2017. This includes dedicated cargo planes and cargo carried by passenger planes. For domestic cargo, that figure was only 47 thousand tonnes of CO_2.

We are basing our figures on the passenger survey performed by Avinor at its airports. Torp Airport is not included. Torp had a market share of 3.8 per cent in 2018, measured by passenger numbers, and is particularly strong on international trips, where it had a market share of 10 per cent. Flights go from Torp to destinations in Europe and Norway. If we add 10 per cent to one-way leisure trips within Europe, both for Norwegians and foreigners, that results in approximately 90 thousand tonnes of additional emissions for leisure trips in 2018. This means that our figures, based on Avinor's statistics, underestimate the emissions by around 5 per cent in 2018.

We do not have information for international transit passengers, i.e. foreigners flying into Norway and then on to another destination abroad. This means that travellers without an association with Norway are eliminated.

We only have figures for trips between countries, not between airports. That makes the figures less precise.

We have assumed that everyone is travelling in economy class. In practice, some people fly business class (or premium class, as it is called in the ICAO's calculator). This means that our calculations are systematically slightly too low. On a Norwegian flight to Bangkok, 13 per cent of the seats are premium class, and on the ICAO's calculator, these would generate double the carbon footprint. If this is typical, we will be underestimating emissions on long-haul international trips by 6.5 per cent. On shorter trips, in practice, the difference between economy and premium seats is only in terms of refreshments, and the vast majority of Norwegians' international trips are within a radius of 2.5 hours, where there is little

[5] https://www.icao.int/environmental-protection/CarbonOffset/Pages/default.aspx
[6] https://www.icao.int/environmental-
[7] Report for Air Cargo Forum 2018

difference in space between economy and premium seats. The total underestimation is therefore small.

The ICAO has also used the average emissions figures per kilometre of the types of planes that fly the various routes.

A detailed review of the assumptions can be found in the ICAO's methodology document; see footnote 7.

We have only included one way, and not the return trip, when we have calculated CO_2 emissions from international trips. For domestic flights, we have included both ways. This is common practice when countries report greenhouse gas emissions to the UN. If every country reports both ways, that would result in an overreporting of emissions. It is also a question of responsibility: Should we put the responsibility for emissions from all flights to and from Norway on the Norwegian government or on representatives of the Norwegian tourist industry, or should other countries also take their share of the responsibility for international flights?

We use the UN's practice and split international trips into two.

For a family wondering whether they should travel to Bangkok, or for a company considering organising a company trip to Nice, the situation is different. They must take responsibility for the complete round-trip.

Figure 7 shows how CO_2 emissions linked to leisure trips have risen from 1,148 thousand tonnes in 2007 to 1,895 thousand tonnes in 2018, an increase of 65 per cent. In 2018, CO_2 emissions from business trips amounted to 791 thousand tonnes, a reduction of 7 per cent. Total emissions of CO_2 from aviation linked to passenger traffic have risen to 2.7 million tonnes of CO_2 in 2018, an increase of 34 per cent since 2007. Total CO_2 emissions have risen by 4.6 per cent since 2013 and are due to the increase in foreigners travelling to Norway, as shown in Figure 8.

Figure 9 shows the distribution between foreigners and Norwegians in terms of emissions from leisure trips. Norwegians' total emissions from leisure trips amounted to 1.4 million tonnes in 2018, having grown by 48 per cent since 2007. Foreigners' leisure trips to and within Norway generated 466 thousand tonnes in 2018, a growth of 152 per cent since 2007.

Figure 10 shows how much of this can be attributed to international trips. Foreigners still travel very little by plane in Norway, but their flights to Norway have increased a great deal. CO_2 emissions from foreigners' flights to Norway in 2018 amounted to 407 thousand tonnes. Norwegians' share of CO_2 emissions on leisure trips abroad in 2018 amounted to 956 thousand tonnes of CO_2, the same as in 2013.

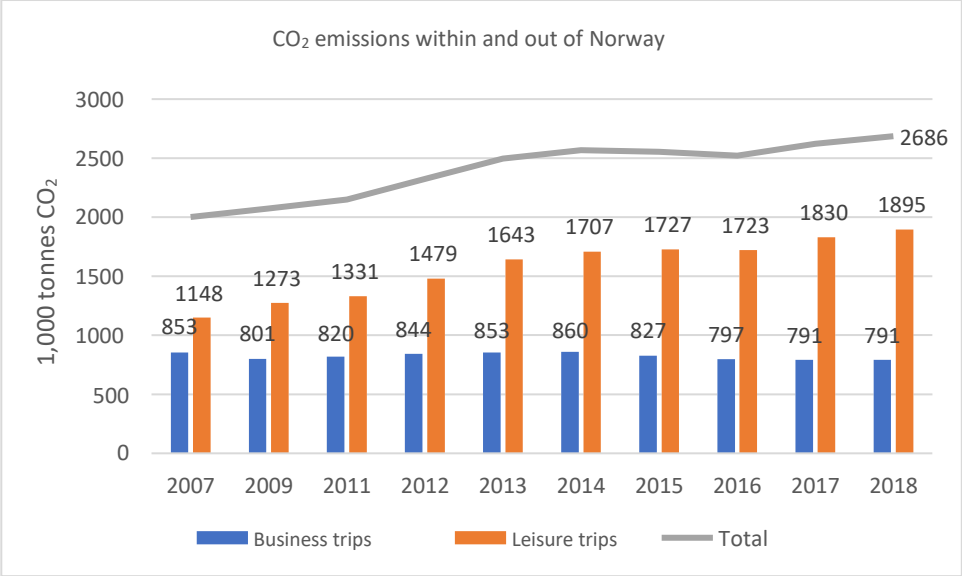


Figure 10. CO_2 emissions from all flights within Norway and out of Norway amounted to 2.7 tonnes of CO_2 in 2018. Emissions from business trips were 800 thousand tonnes and emissions from leisure trips were 1.9 million tonnes of CO_2. On top of that, there are emissions from international air cargo, which in 2017 came to 0.5 million tonnes.

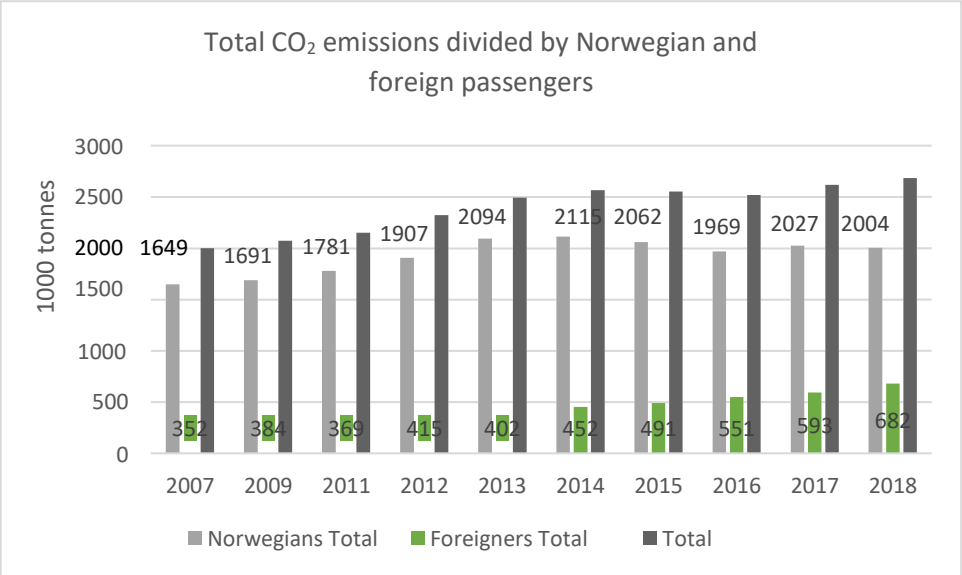


Figure 11. The moderate increase in CO_2 emissions since 2013 from passenger traffic within and out of Norway is due to the increase in foreign passengers. Emissions from Norwegian passengers have gone down slightly since 2013. The figures include business trips, but not cargo.

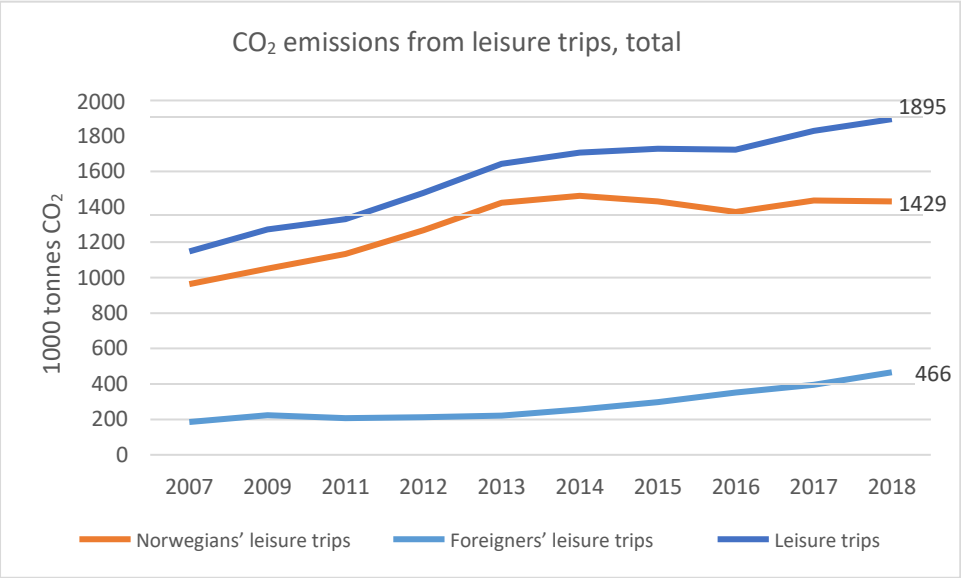


Figure 12. CO_2 emissions from Norwegians' international trips have not changed since 2013, while there has been a large increase in foreigners' leisure trips since 2013. Total CO_2 emissions from leisure trips have been rising almost continuously since 2007, and in 2018 amounted to 1,895 thousand tonnes of CO_2.

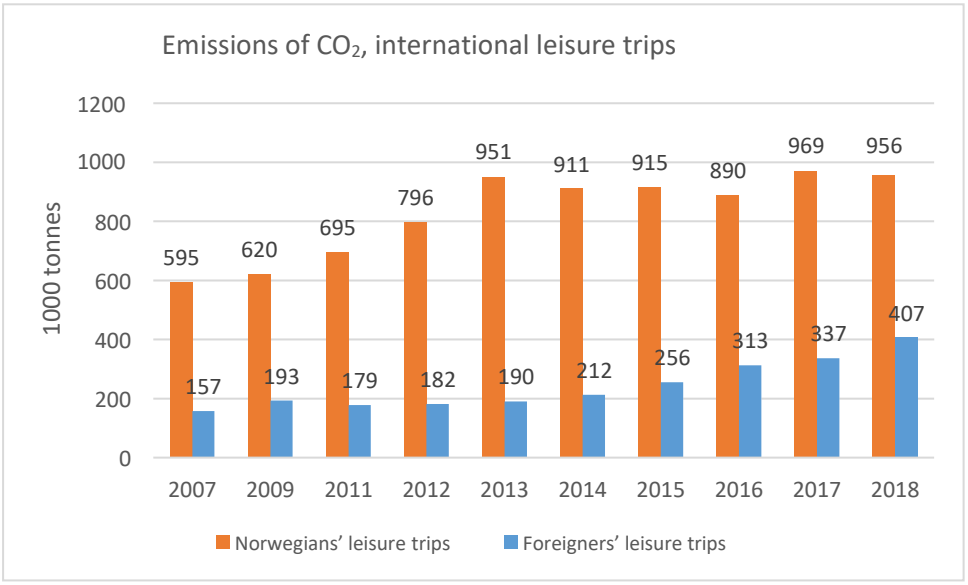


Figure 13. CO_2 emissions from international trips have increased, because of the travel habits of both foreigners and Norwegians. Foreigners' flights into Norway resulted in emissions of 407 thousand tonnes of CO_2, while Norwegians' flights out of Norway resulted in emissions of 956 thousand tonnes of CO_2.

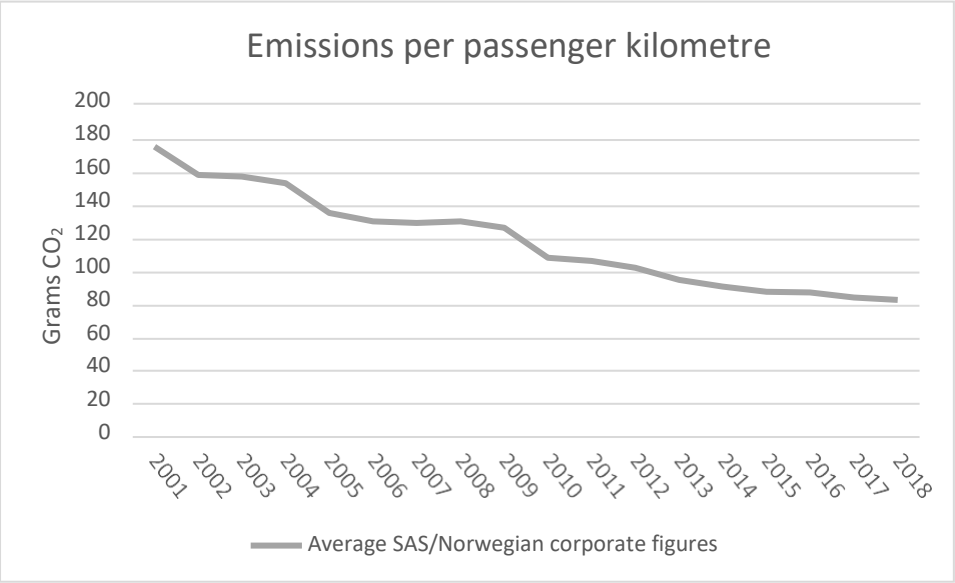


Figure 14. Emissions per passenger kilometre with Norwegian and SAS have fallen by more than 50 per cent since 2001, and in 2018 were 83.5 grams of CO_2 per passenger kilometre. The graph shows the average of the two companies. More modern planes, smarter traffic management, more energy-efficient flying styles and longer average journeys are contributing to the decrease. Source: companies' annual reports

Effects of emissions at higher altitudes

Calculating the climate effects of emissions from a plane is more complex than calculating emissions occurring at ground level. There are factors associated with the emissions which have a cooling effect and factors which have a warming effect. Most calculations indicate that the warming effect is higher than the cooling effect. The length of a flight also plays a role, because the warming effect occurs when the plane is cruising at altitudes higher than nine kilometres.

Most of the effects are warming:

- Emissions of greenhouse gases (CO_2 and steam)
- Changes in ozone and methane from emissions of NOx
- Formation of condensation trails and the development of these into cirrus clouds
- Emissions of soot particles

But there are also cooling effects:

- Emissions of precursors to sulphate and nitrate particles

It is also agreed that the formation of cirrus clouds (tiny ice particles) has a large indirect effect, but we do not know whether the effect is positive or negative, or how great it is.

On a domestic flight in Norway, the length of time the plane is above 9,000 metres will be very short in relation to the duration of the flight, while the opposite applies to longer journeys. It is common to multiply the CO_2 emissions by a factor in order to illustrate the additional effect. The German Institut für Energi und Umweltsforschung research institute recommends an index of between 1.23 and 2.5, depending on the length of the flight.[8]

Climate researchers at CICERO were commissioned by Avinor to write a memo on this. In the last memo, written in 2016, it states the following: 'There is no definitive answer to how this kind of

[8] http://ecopassenger.hafas.de/hafas-res/download/Ecopassenger_Methodology_Data.pdf

multiplier should be calculated. Researchers currently use multipliers mainly to illustrate the size of effects other than CO_2 and how these depend on the various assumptions in the calculations'.[9]

CICERO has reviewed calculations performed by a number of researchers and has summarised the findings in a table incorporating parameters based on two different methods. The most common is Global Warming Potential (GWP), but Global Temperature Potential (GTP) is also used, particularly when the aim is to achieve a temperature target like that of the Paris Agreement within a given time. The additional effects also have a much shorter lifespan than CO_2, which among other things means that the effects accumulate to a much lesser degree than those of CO_2 emissions. The discussion about the choice of a relevant time horizon is therefore also important.

The table below shows that we can choose between parameters that have a cooling effect (parameters between 0 and 1) or a warming effect (parameters greater than 1) and still say that something has been scientifically demonstrated.

		Beregnet med GWP		Beregnet med GTP		
	Tidshorisont	**20**	**100**	**20**	**50**	**100**
	Modellgjennomsnitt	4.2	1.8	1.5	1	1.1
Strålingspådriv	Nedre estimat	0.6	0.8	0.4	0.9	1
	Øvre estimat	6.6	2.5	2.3	1.2	1.2

Tabell 1. Multiplikatorer for klimapåvirkningen fra luftfart for ulike valg av utslippsvektfaktor (GWP eller GTP) og tidshorisonter mellom 20 og 100 år. Tabellen viser beregninger gjort med øvre og nedre estimat av strålingspådrivet i Brasseur m.fl. (2015), samt modellgjennomsnittet (indirekte effekter av partikler er ikke inkludert). Beregningene er gjort for denne rapporten.

Table 1. This table was taken from CICERO Report 2016:05 Aviation and climate - An updated summary of the status of research of climate effects from emissions from planes. It shows that there is a major difference of opinion as to which factor researchers have arrived at. CICERO concludes that there is no best estimate, just different and mean values of these.

In this report, we have estimated the effect of emissions at higher altitudes by using the factor of 1.3 on domestic flights and 1.8 on international flights. 1.8 is the model average in CICERO's table.

Table 1 shows that the total greenhouse gas emissions from passenger traffic from aviation are 4.3 million tonnes of CO_2 equivalents calculated in this way, compared with 2.7 million tonnes of CO_2 without the estimated additional effects. That is an increase of 1.6 million tonnes or around 60 per cent, so we have used an average factor of 1.6.

The greenhouse gas emissions from holiday and leisure trips then become 3.1 million tonnes of CO_2 equivalents, and 1.2 million tonnes of CO_2 equivalents from business trips.

[9] CICERO Report 2016:05 Aviation and climate - An updated summary of the status of research of climate effects from emissions from planes.

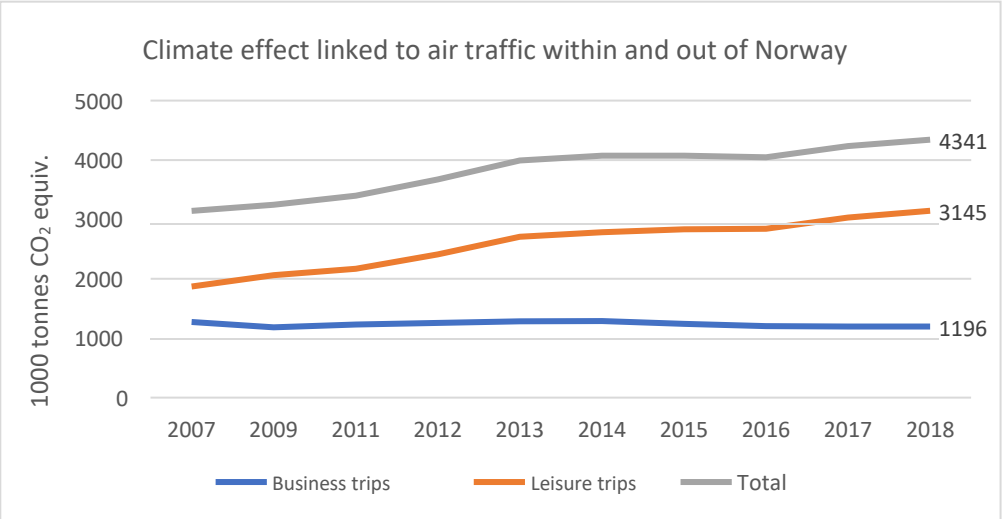


Figure 15. The graphs show figures including the estimated effects of emissions at higher altitudes. A factor of 1.3 has been used on domestic flights and 1.8 on international flights, because they are longer.

EU Emissions Trading System

Norway is part of the EU Emissions Trading System, which includes the processing industry (companies like Elkem, Hydro, Norske Skog), the oil and gas industry, energy producers (gas power stations, thermal power stations) and aviation. Aviation is the only sector of the transport industry that is part of the EU Emissions Trading System, and it has been participating since 2012. Norwegian, SAS and Widerøe are all covered by the scheme. The two biggest helicopter companies, Bristow and CHC are also covered. This means that 77 per cent of all CO_2 emissions from Norwegian aviation are regulated in this way, and that these emissions do not result in any extra greenhouse gas emissions globally.

Participants in the EU Emissions Trading System are allocated emission allowances on the basis of background and historic emissions. The airlines in the EEA area were allocated allowances on the basis of their average CO_2 emissions for the three years 2004, 2005 and 2006. 1 allowance = the right to emit 1 tonne of CO_2.

All the growth in air traffic and extra CO_2 emissions this has entailed have been bought by the airlines from other participants in the EU Emissions Trading System. This means that the actual emissions from aviation are the same as they were in the 2004-2006 period.

The EU Emissions Trading System functions irrespective of the price of an allowance. The allocation of CO_2 allowances sets a legal cap on the total emissions that can be emitted by the companies. The price of the allocations affects which climate measures are financially worth implementing. The principle is to encourage climate measures to be implemented where the costs are lowest. These measures can be extremely varied, ranging from closing or modernising a coal power station in Poland to investing in new and more modern planes. The cost increases resulting from the allowance price may also encourage people to fly less or buy fewer products which are affected by the allowance price.

Between 2005 and 2020, CO_2 emissions in the EEA area from the entire sector included in the Emissions Trading System will fall by 21 per cent. Between 2005 and 2030, emissions will fall by 43 per cent. The sector included in the Emissions Trading System covers 45 per cent of all CO_2 emissions in the EEA. The EU's target is for all CO_2 emissions to be reduced by 40 per cent between 2005 and 2030, and by 90 per cent by 2050.

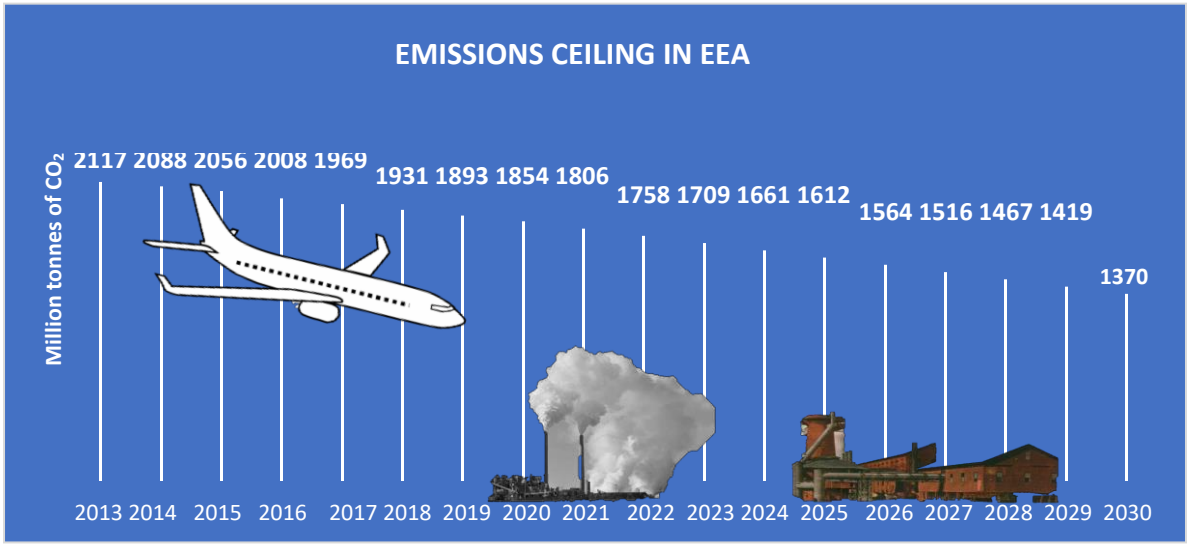


Figure 16. The figure shows how the overall, total emissions from the companies participating in the EU Emissions Trading System will fall by 2030. The figures after 2020 are not completely accurate. Source: European Commission

In Europe, the only countries not participating in the Emissions Trading System and to which we fly frequently are Turkey, Switzerland and Russian EU countries. Switzerland has its own trading system, but has agreed to join the EU's system from January 2020. The main reason is because emissions trading is far more expensive and less effective in small economic areas.

In practice, the trading system means that one extra flight in Norway or another EEA country will not result in extra CO_2 emissions, because the total permitted emissions from aviation and the rest of the sector included in the Emissions Trading System have already been set for the period between now and 2030. Extra emissions from a flight will result in lower emissions from a different party within the trading system, such as a smelting plant in Norway, a coal power station in Poland or fewer flights with another airline.

In terms of effect on the climate therefore, it is important whether a flight takes place within or outside the EEA area.

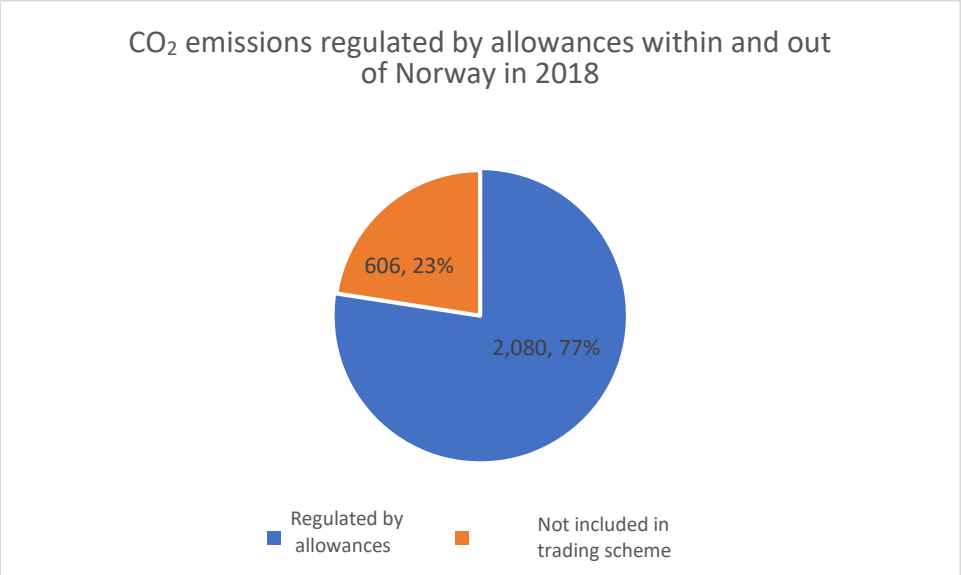


Figure 17. The figure shows how much of the proportion of the total emissions from passenger traffic taking place within the EEA area is included in the EU Emissions Trading System. Source: own calculations.

CORSIA

From 2021, there will be an emissions trading system operated by the UN that will cover all aviation. The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), will freeze net emissions from aviation globally to their 2020 level. This is the first step on the road to reducing global emissions from aviation.

The EU is the driver behind this work, which is also funded by Norway. The plan was that from the beginning, the EU Emissions Trading System would also cover all flights into and out of the EEA area. Unfortunately, that was stopped by the USA and China.

Cruises

There are two official sources for the emissions from cruise ships; one is the Norwegian Environment Agency's municipal database, and the other is the Norwegian Coastal Administration. Both base their calculations on an electronic system for monitoring all vessels in Norwegian waters (AIS), which combined with data about the vessels' size etc., makes it possible to calculate CO_2 emissions and other environmental emissions.

The figure below shows emissions within 12 and 200 nautical miles (Exclusive Economic Zone). The municipal database uses 12 nautical miles, the Norwegian Coastal Administration 200. In summarising emissions from cruises, in this report we have chosen to use 200 nautical miles, because we find it likely that the vast majority of traffic within 200 nautical miles can be attributed to visits to Norway or Svalbard.

The emissions have increased significantly since 2015; see Figure 15, which is also reflected in the number of visits by cruise ships to Norwegian ports. In 2018, emissions of CO_2 within 200 nautical miles was estimated to be 558 thousand tonnes of CO_2. That is an increase of 175 thousand tonnes of CO_2, or 46 per cent since 2012. CO_2 emissions from cruise ships are significantly higher than emissions from foreigners' leisure trips by plane to and within Norway, which amounted to 407 thousand tonnes of CO_2 in 2018.

Around 3.9 million cruise ship passengers are expected in Norwegian ports in 2019, according to

Cruise Norway. That is a formidable rise since 2015, when 2.6 million people visited by cruise ship. It is a growth of exactly 50 per cent in four years. The number of vessel calls has increased from 1,703 in 2015 to 2,365 in 2019, an increase of 39 per cent.

If the forecasts from Cruise Norway are accurate, emissions of CO_2 from cruise ships will exceed 600 thousand tonnes in 2019.

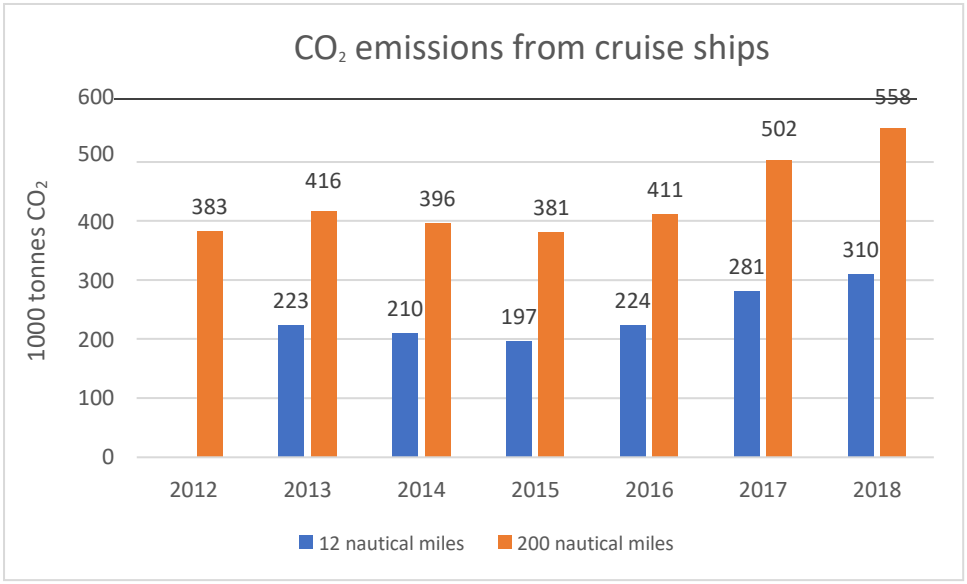


Figure 18. The growth in emissions from cruises is enormous, whether we are measuring emissions within 12 or 200 nautical miles. Source: Norwegian Coastal Administration (200 nautical miles) and Norwegian Environment Agency (12 nautical miles).

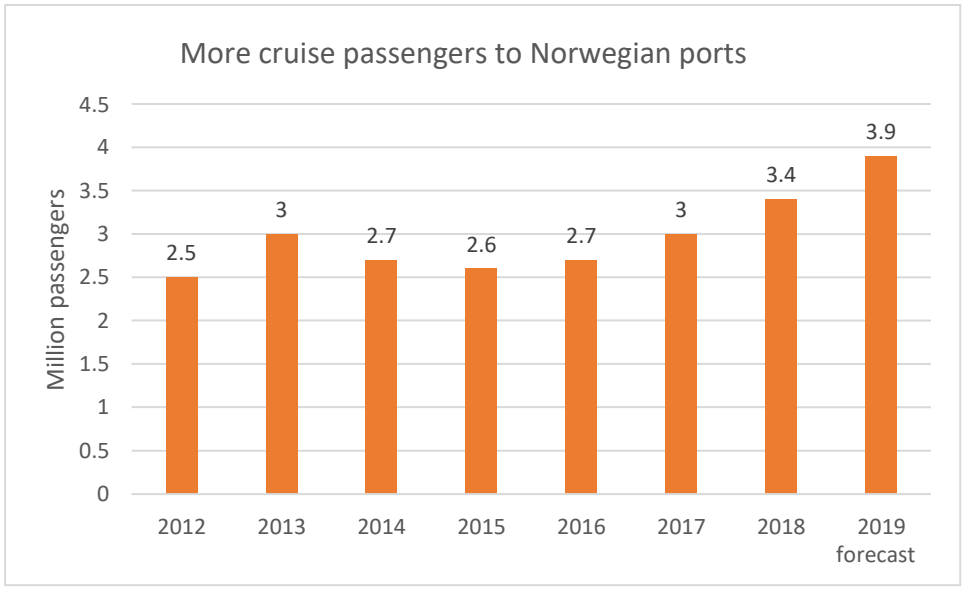


Figure 19. The cruise industry experienced two years of decline in 2014 and 2015, but has seen growth ever since. Cruise Norway's forecast for 2019 shows new record figures. Source: Cruise Norway

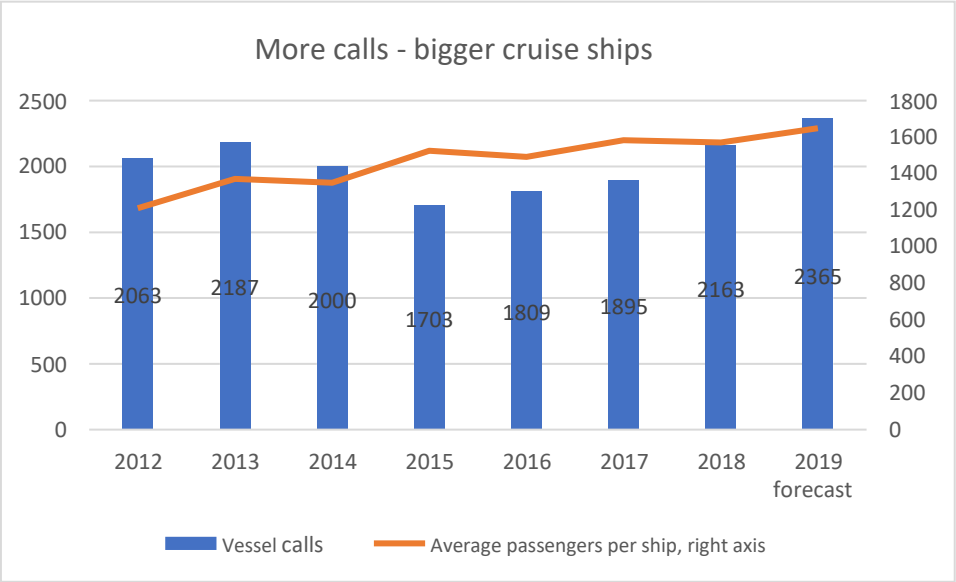


Figure 20. Cruise ships have been getting bigger and more numerous. The trend of bigger ships has been with us for some time. Source: Cruise Norway

Passenger ships

Emissions from passenger ships are an important source of emissions. In practice, we are talking here about a combination of passengers and vehicle and cargo ships. When Color Line transports passengers between Kiel and Oslo, the cargo hold is full of HGV trailers. It is not easy to determine how to distribute CO_2 emissions between passengers and cargo. We could do this on the basis of factors such as weight or trade figures. We have chosen here to simplify this by allocating half to passengers and half to cargo transport.

There is also the question of which ships we should include. A large percentage of the passenger traffic travels on ferries linking county roads and national roads. The passengers on these ferries are not really relevant for us, since most of these belong to general traffic rather than holiday and leisure traffic. In an attempt to remove the ferries linking county roads and national roads from the statistics, we have restricted ourselves to ships larger than 5,000 tonnes.

The figures are based on statistics from the Norwegian Coastal Administration and extend to 200 nautical miles, or to the territorial boundaries between Norway and other countries. This is particularly relevant with regard to traffic to Denmark and Germany.

Total emissions from passenger ships larger than 5,000 tonnes amounted to 965 tonnes of CO_2 in 2018, with the volume due to passenger traffic thus working out at 482.5 tonnes. All of this can be attributed to holiday and leisure trips, although some companies doubtless use ferries to transport employees to seminars etc. in Germany and Denmark.

Emissions from passenger ships with a weight of less than 5,000 tonnes amounted to just over 0.5 million tonnes of CO_2 in 2018.

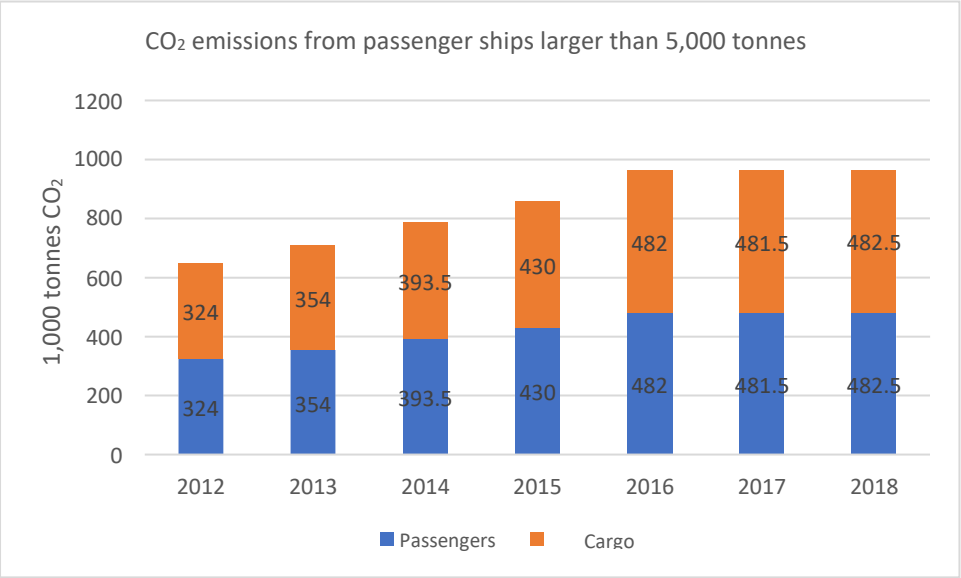


Figure 21. We have chosen here to divide CO_2 emissions from passenger ships equally between cargo traffic and passenger traffic. The total emissions from passenger ships larger than 5,000 tonnes amounted to almost 1 million tonnes in 2018. That is an increase of 49 per cent since 2012, but emissions have been stable in the 2016-2018 period. Source: Norwegian Coastal Administration

Emissions from cars, camper vans etc.

Calculating which emissions from cars, camper vans and motorbikes are linked to holiday and leisure trips is complicated. For this purpose, we have based our figures on Statistics Norway's quarterly survey, in which Norwegians are asked about how often they have been on trips and what means of transport they used. We then estimated that foreigners' holiday and leisure trips in Norway are 10 per cent that of Norwegians. We must bear in mind that most Norwegians' trips are to cabins, in both summer and winter.

Based on this total number of trips, we have assumed that an average holiday and leisure journey is 500 kilometres (return), and that an average of two people are in each car. We also assume that each car's fuel consumption is 0.5 litres per 100 kilometres, and that the CO_2 factor is 2.7 multiplied by the number of litres of fuel. We have also corrected for the admixture of biofuels and the increasing number of electric cars.

There are a number of factors here that could prove to be incorrect, and the estimates must therefore be regarded as uncertain.

The statistics for trips show a jump in the number of trips (particularly long trips) in 2018, which pushes up the estimate for emissions from the sector compared with the previous years. This shows that Norway has also become a popular holiday destination for Norwegians. The CO_2 emissions from cars, camper vans etc. are estimated to be 439 thousand tonnes of CO_2, i.e. slightly less than from passenger traffic.

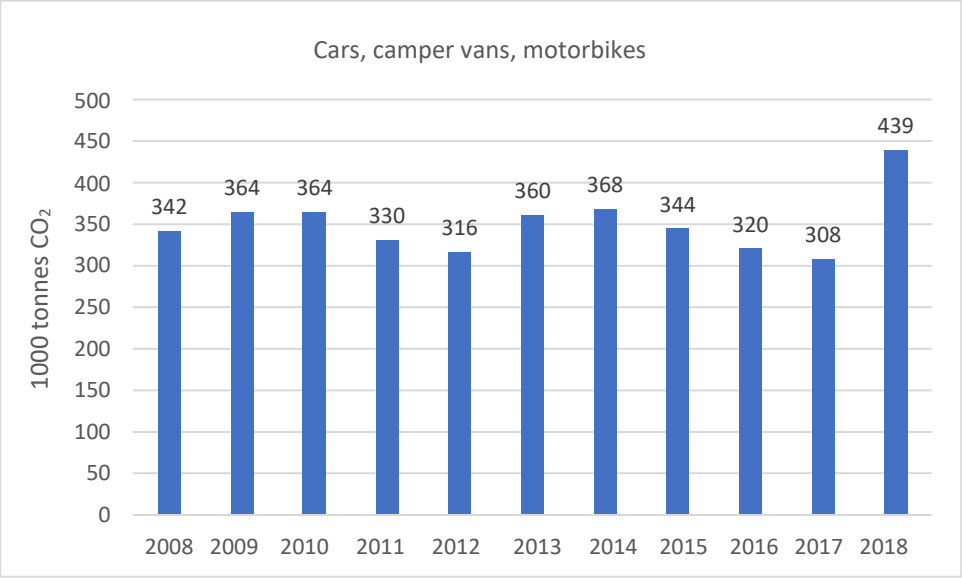


Figure 22. Emissions from cars and camper vans showed a falling trend until 2018, when the number of trips increased dramatically. The admixture of biofuels and increase in the number of electric cars have been taken into consideration. The estimates are based on a number of assumptions and must be regarded as uncertain. Source: Statistics Norway and own calculations.

Emissions from coaches

The coach industry is an important part of the Norwegian tourist industry, which has experienced strong growth in the influx of foreign tourists since 2013; cf. figures for cruises and aviation. This has led to a strong growth in the number of bookings to transport tourists on longer tours and on shorter sightseeing excursions. There has also been an increase in NSB's need for rail replacement bus services. This growth in demand for coach services has been met by foreign buses, which have taken over parts of the market.

The coach industry can be divided into four segments:

Business services: These are charters for businesses, schools, sports teams etc., either single charters or regular charters.
Coach holidays: Round trips by coach or travel by coach to and from a set holiday destination.
Incoming market: This segment is made up of visitors coming to Norway by plane, train, ferry or cruise ship, who need coach transport for tours around all or parts of Norway, transportation to hotels or other accommodation, or who need transport for local sightseeing of a shorter duration.
Replacement bus services: Rail replacement buses. Either due to planned maintenance or unplanned line closures.

Figures collected from Norwegian coach operators for 2019 estimated that the CO_2 emissions from Norwegian companies, including trips abroad and rail-replacement services for NSB, amounted to 52 thousand tonnes of CO_2.[10] This means that the coach industry represents around 10 per cent of the emissions from all buses in Norway.

The survey of the coach market incorporated a survey of foreign coaches. Based on these figures, there is reason to believe that the total emissions from foreign coaches amount to around the same figure as those from Norwegian coaches. They include trips to and from Norway and

[10] Coach market. Stakeholder, January 2019.

cabotage services in Norway during the summer season.

Using Statistics Norway's turnover figures for the coach industry, we have calculated figures for the entire 2007-2018 period. These estimates must be regarded as fairly uncertain, and are likely to underestimate emissions at the start of the period, because modern coaches use less diesel per kilometre.

Coaches are undoubtedly the most emissions-friendly form of transport of all those discussed in this memo. A modern coach uses around 3.5 litres of diesel per 100 kilometres. With 52 passengers on board, that results in emissions of 18 grams of CO_2 per passenger kilometre. A coach also takes up much less space on the roads than the equivalent number of cars. If the coaches use some biodiesel, in practice they are emissions-free with current engine technology.

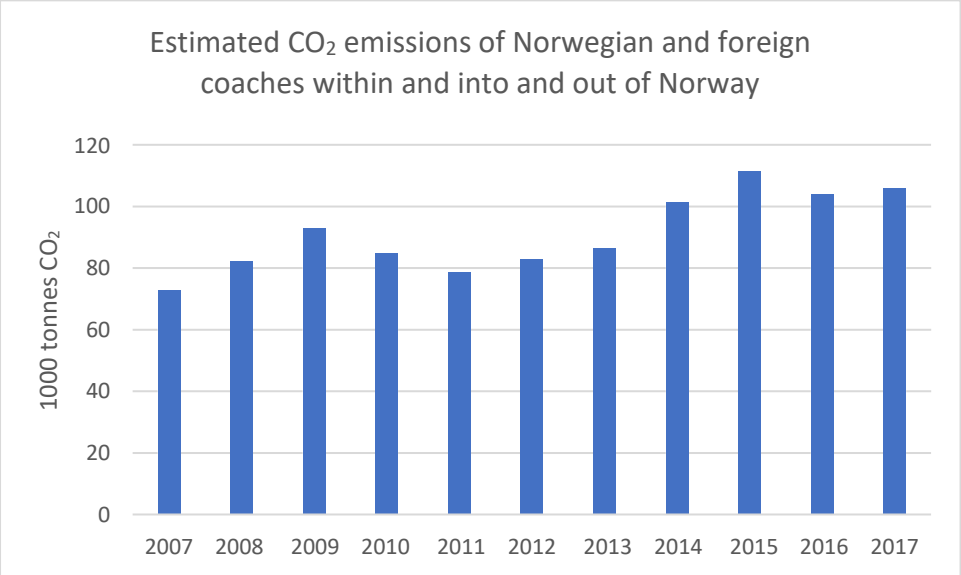


Figure 23. Emissions from the coach industry have been calculated on the basis of a survey of Norwegian coach operators in 2018 and an overview of the number of foreign coaches in Norway in the 2018 summer season. Source: Stakeholder

Emissions from the accommodation and hospitality industry

Statistics Norway has separate figures for the CO_2 emissions from the accommodation and hospitality industry from as far back as 1990 until 2017. We have prepared an estimate for 2018.

The emissions showed a rising trend until 2010, when emissions were at 155 thousand tonnes. Since then, they have fallen gradually and are now expected to fall significantly as all the operators replace oil-fired heating systems with emissions-free heating systems. We have assumed that the trend from 2016 to 2017 will continue, and estimated the 2018 emissions at 110 thousand tonnes of CO_2.

Emissions from the accommodation and hospitality industry are low and moving towards zero as early as 2020:

- All lighting and technical equipment is powered by electricity, which does not generate direct CO_2 emissions.
- Heating commercial buildings using mineral oils is prohibited from 2020 onward.

Figure 24. CO_2 emissions from accommodation and hospitality businesses rose until 2010, and are now heading rapidly downward in tandem with the process of replacing oil-fired equipment. Source: Statistics Norway

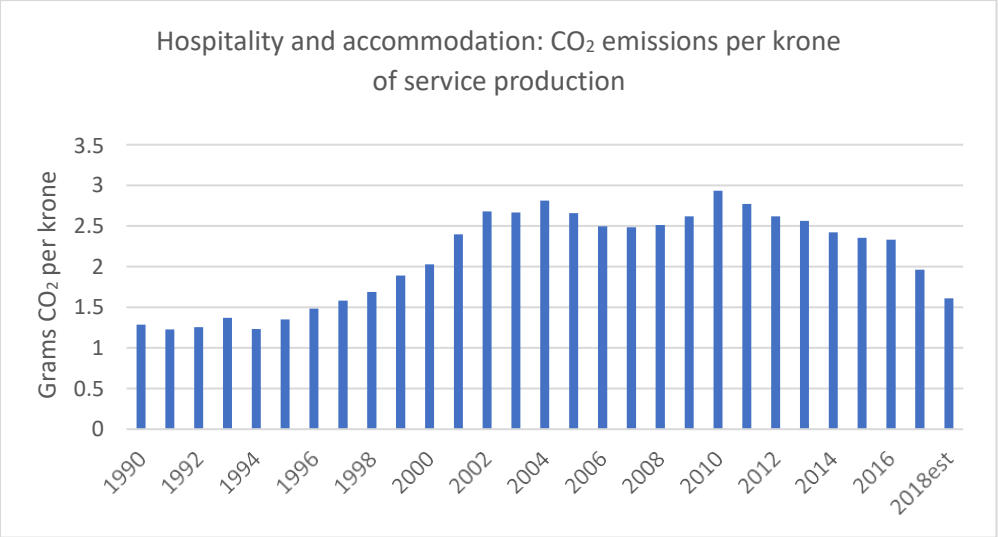


Figure 25. CO_2 emissions per produced krone have followed the trend for the total emissions, and in 2018 are estimated at 1.6 grams per krone, or 1.6 tonnes per million krone of turnover. Source: Statistics Norway

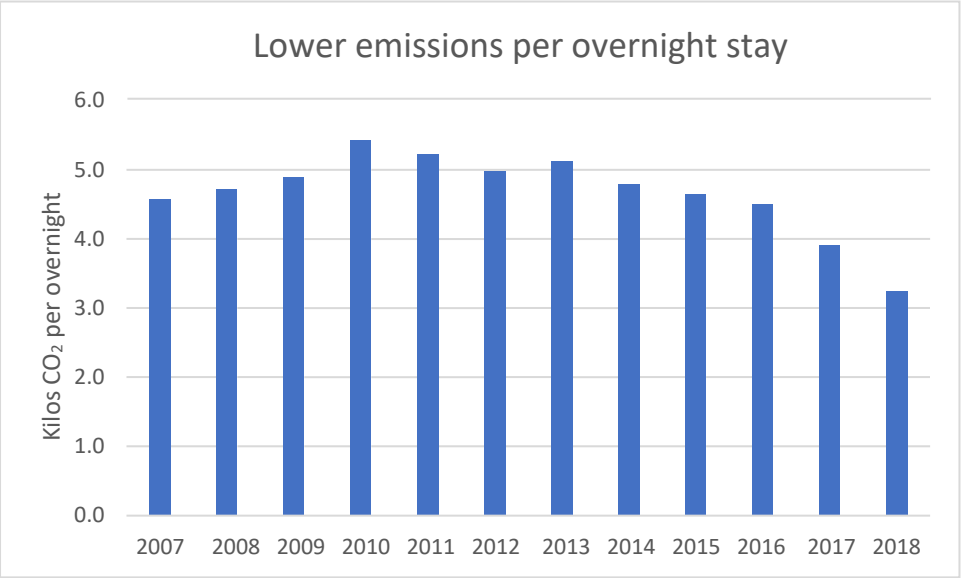


Figure 26. Also when measured in kilos of CO_2 emissions per overnight stay, the emissions intensity is falling in the accommodation and hospitality industry.

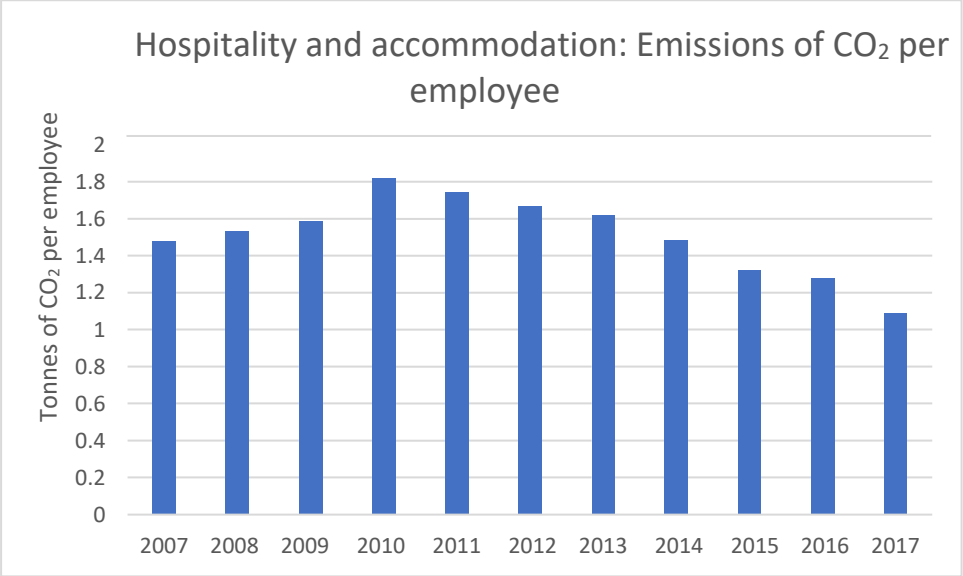


Figure 27. CO_2 emissions per employee have also fallen, and in 2017 were around 1 tonne per employee.

Emissions linked to means of transport chosen

The climate footprint we leave depends on where we decide to travel to and how we choose to get there. We have created a table below showing examples of how we impact the climate with our choices.

The further we travel and the more comfortably we travel, the bigger the footprint. A trip in premium class to Sydney in Australia for a family of four would emit 11,884 kilos of CO_2. The CO_2 emissions from a car driving 15,000 kilometres in a year amount to around 2,000 kilos of CO_2. A trip to Sydney therefore generates the same as four years of car use for a family of four.

A weekend in Berlin with the wife generates emissions of 367 kilos. That is just a fifth of one annual car budget.

If you live in Oslo and want to visit your mother in Bergen for a weekend, it is better to fly than to drive your car, if you are travelling alone. If there will be two or more of you in the car, the car is more climate-friendly. If you find an express bus to take you to Bergen, your emissions will only be 17 kilos, compared with 138 by car or 102 by plane. All trips are return trips.

The express bus to Bergen takes 9 hours and 25 minutes and you have to change once. The plane takes one hour. If the bus was a direct service, it would take seven hours.

A trip to Berlin is definitely most climate-friendly if it is made by bus, but the trip would take 12-13 hours of effective driving time. Its emissions would amount to 37 kilos of CO_2 for a return trip, compared to 183.5 kilos of CO_2 by plane.

Examples of journeys					
		Kilos CO_2		Kilos CO_2 per person	
Return trip	Passengers	Economy	Premium	Economy	Premium
Oslo-Bergen	1	102	102	102	102
Oslo-Berlin	2	367	367	183.5	183.5
Oslo-New York	2	1,196	2,393	598	1,196.5
Oslo-Bangkok	4	2,933	5,867	733	1,466
Oslo-Sydney	4	6,345	11,884	1,586	2,971
		Distance in km		kilos CO_2 per person	
Car Oslo-Bergen	2	928		62	
Car Oslo-Berlin	2	2,050		138	
Bus Oslo-Bergen	52	928		17	
Bus Oslo-Berlin	52	2,050		37	

Assumptions: Fuel consumption per kilometre by car is 0.05 and by bus is 0.35.

Summary and assessment of future developments

The growth in emissions from the accommodation and hospitality industry in Norway is moving towards zero. For a hotel with a restaurant, the direct CO_2 emissions in 2020 will be almost zero, because by then, heating using fossil fuel (oil) will be prohibited. We will then be in a favourable position to market this part of the industry as climate-neutral. To enable every business to do this, and to use it in their marketing, they must document that the electricity they use is clean. For this, EU regulations require them to buy guarantees of origin for the amount they consume.[11] Vehicles used by the business must also be zero-emissions vehicles (biofuel or electricity/hydrogen).

For the rest of the tourism industry, it is a very different scenario. If we include all journeys to holiday and leisure destinations as part of tourism, CO_2 emissions rise dramatically, in 2018 reaching 3.6 million tonnes. Quite simply, trade in the tourist industry will generate a corresponding increase in greenhouse gas emissions from the transport chain, unless the transport industry implements climate measures, or if the trade moves towards fewer travellers and longer stays. The effects of the climate measures in the transport sector have been achieved relatively quickly, particularly in the marine sector.

[11] https://www.nve.no/energiforsyning/varedeklarasjon/nasjonal-varedeklarasjon-2018/

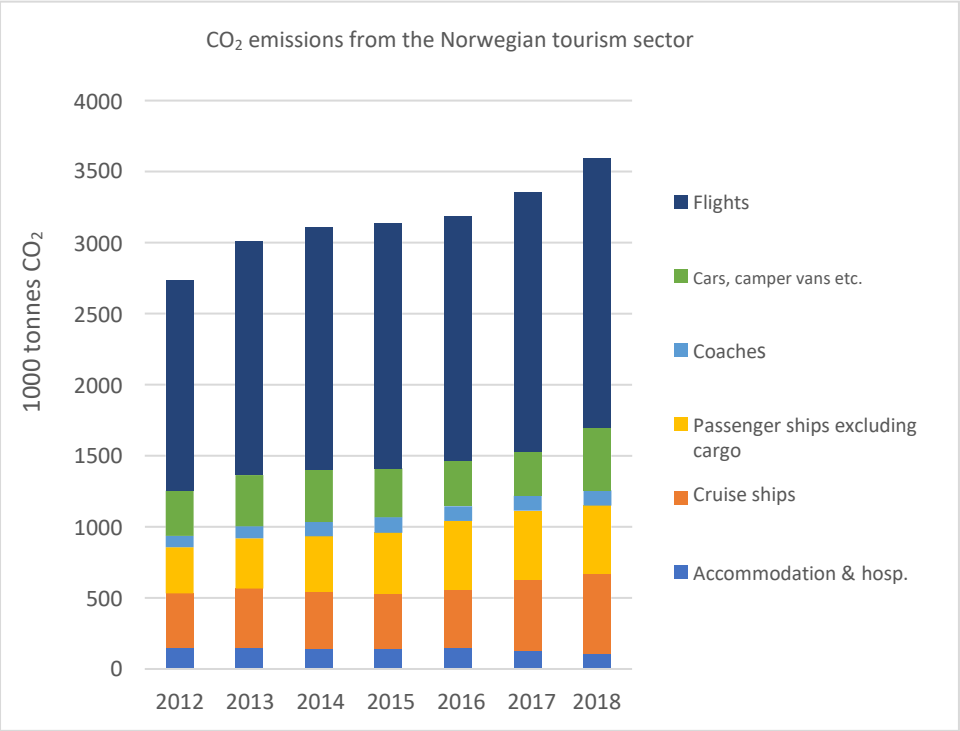


Figure 28. Total emissions from Norwegian tourism, including the transport chain, have grown to 3.6 million tonnes in 2018. That is an increase of 31 per cent since 2012. Various sources and own calculations

Status of various sources:

Accommodation and hospitality industry: 110 thousand tonnes of CO_2 in 2018. We could be green by the end of 2020 because the use of fossil oil will be prohibited.

Coach industry: 104 thousand tonnes of CO_2 in 2018. Coaches are by far the most energy- and climate-friendly form of transport. There is a major potential here to become completely green.

Use of own car, camper van etc. 439 thousand tonnes of CO_2 emissions in 2018. This figure is uncertain. The increase in holidays in one's own country means that this figure is rising, but the increasing admixture of biofuels and more electric vehicles means that this could become an almost green form of transport from 2030.

Passenger ships larger than 5,000 tonnes: 483 thousand tonnes of CO_2 in 2018, excluding the cargo traffic element. LNG and an increasing use of biofuel could start to have an effect as modern ships are phased in.[12] Smarter design and energy management systems are being phased in.

Cruise ships: 558 thousand tonnes of CO_2 emissions in 2018. Growth is high here, and in 2019, emissions will exceed 600 thousand tonnes of CO_2 if the growth forecasts from the industry prove correct. The proposal to demand a ban on ships entering world heritage fjords could have

[12] Modern LNG solutions could reduce greenhouse gas emissions by 25-30 per cent on the assumption that we can avoid emitting methane (natural gas).

an effect if it brings less total cruise traffic into the Norwegian Exclusive Economic Zone. The use of LNG on new ships could gradually reduce greenhouse gas emissions.

Aviation: 1,895 thousand tonnes of CO_2 emissions in 2018. Growth in emissions from Norwegians' flights has almost stopped since 2013, but the increase in tourists from abroad means that growth in emissions has continued. Emissions per passenger kilometre have halved in 15 years, and because aviation is part of the EU Emissions Trading System, the net effect of growth is limited to flights outside of the EEA.

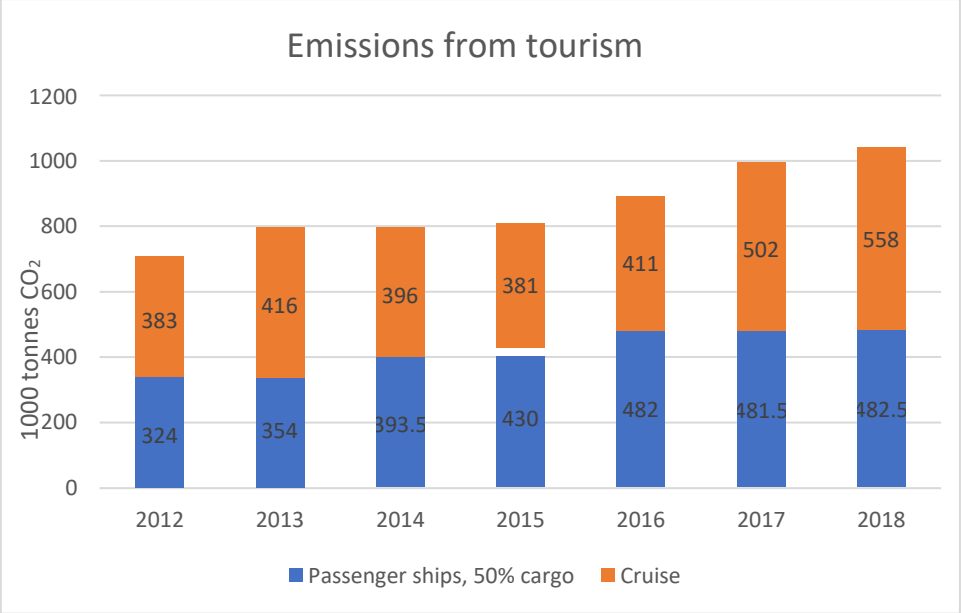


Figure 29. In 2018, tourism associated with shipping emitted 1,041 thousand tonnes of CO_2, and is currently the biggest actual source of CO_2 emissions in tourism, because unlike aviation, it is not part of an emissions trading scheme. Source: Norwegian Coastal Administration

Measures

The biggest CO_2 emissions within tourism are associated with aviation, at 1.9 million tonnes, but because Norway is part of the EU Emissions Trading System, most of the CO_2 emissions from aviation are effectively regulated. From 2021, Norway will be part of the UN's new emissions trading system (CORSIA) which covers the entire world. However, while the CO_2 emissions under the EU Emissions Trading System will fall by 43 per cent by 2030, CORSIA's objective is to stabilise CO_2 emissions. The Storting has also voted for the admixture of 30 per cent bio-jet fuel by 2030, starting with an admixture of 0.5 per cent in 2020.

The other major source is shipping. No measures have been taken which we can be certain will reduce CO_2 emissions in the future, but the Storting has asked the government to ensure that there are zero emissions in the 'world heritage fjords'. Total emissions from passenger ships (larger than 5,000 tonnes) and cruise ships amounted to 1 million tonnes in 2018, and they are growing rapidly. Particularly within the cruise sector, the need for reasonable measures is a major and difficult issue to address. Any development will rely on shipping companies taking the initiative to accelerate the transition to biofuels (gas/liquid), or on binding international resolutions being made. Hybrid systems and electrification while in port are moves in the right direction, but these have the greatest effect on local emissions.

In 2018, the IMO adopted an Initial Strategy whose objective was to reduce CO_2 emissions by 50 per

cent by 2050. The strategy has no deadlines for start-up or implementation in stages. [13]

For a review of status, we recommend reading the government's action plan for green shipping, which was submitted in June 2019.[14]

Road traffic is moving towards becoming climate neutral, thanks to an increased admixture of biofuels and increasing numbers of electric vehicles. Since the authorities cannot assume that foreigners coming to Norway in the next 10-20 years will be driving electric vehicles, it means that biofuel at the pumps is essential, if holiday traffic is to become climate-neutral.

Greenhouse gas emissions linked to tourism can be reduced in three ways:

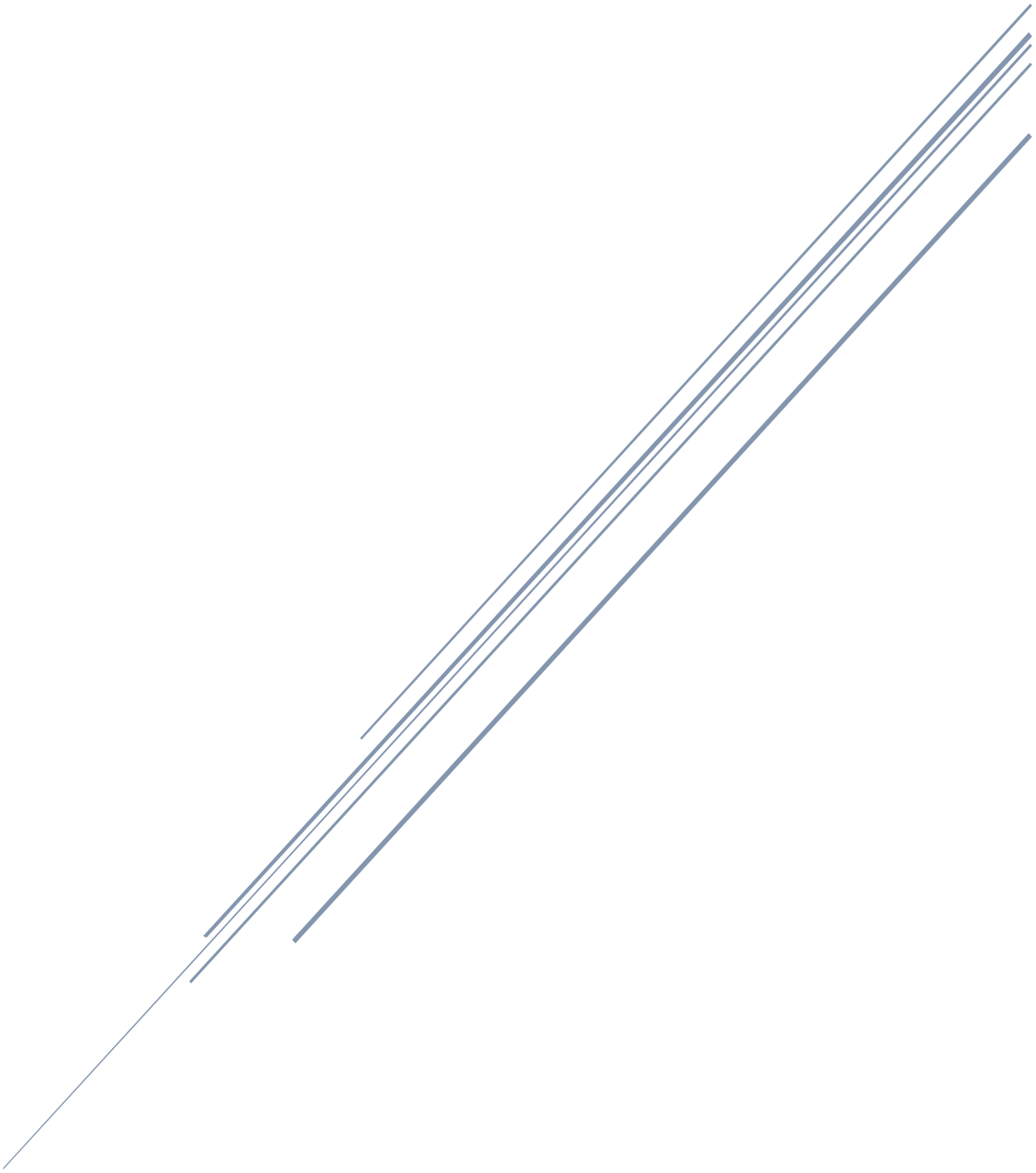
- Reduce trade in the tourism industry
- Make transport more climate-friendly
- Make the tourism industry less transport-intensive.

The latter can be done either by ensuring that tourists travel shorter distances, or by ensuring that the tourists who come here stay longer, which will then ensure growth in the number of overnight stays and food consumed.

[13] https://maritime-executive.com/article/imo-agrees-to-co2-emissions-target

[14] https://www.regjeringen.no/contentassets/00f527e95d0c4dfd88db637f96ffe8b8/handlingsplan-for-gronn-skipsfart.pdf

CO_2 EMISSIONS IN TERMS OF TOURISTS' SPENDING IN NORWAY



Svein Thompson
Stakeholder AS, September 2019

Tourists' CO_2 emissions in terms of spending in Norway

Summary

Swedish tourists are the tourists who emit the least CO_2 during their holidays in Norway. At the other end we find cruise tourists, who emit the most. It is Swiss tourists who spend the most during their stay in Norway, partly because they are here so long and partly because they have a high daily spend.

The Swiss are 'dream tourists' measured in grams of CO_2 emissions per krone spent during their stay, together with the other German-speaking holidaymakers in Norway.

Cruise tourists spend the least money ashore and emit the most CO_2, thereby emerging as the least beneficial tourist group, if we consider climate impact in relation to value creation in Norway.

Emissions from cruise tourists who come from other continents are particularly high: Americans, Canadians and Australians on cruises in Norway represented a total of 142,000 passengers out of 852,000 cruise passengers in 2018.

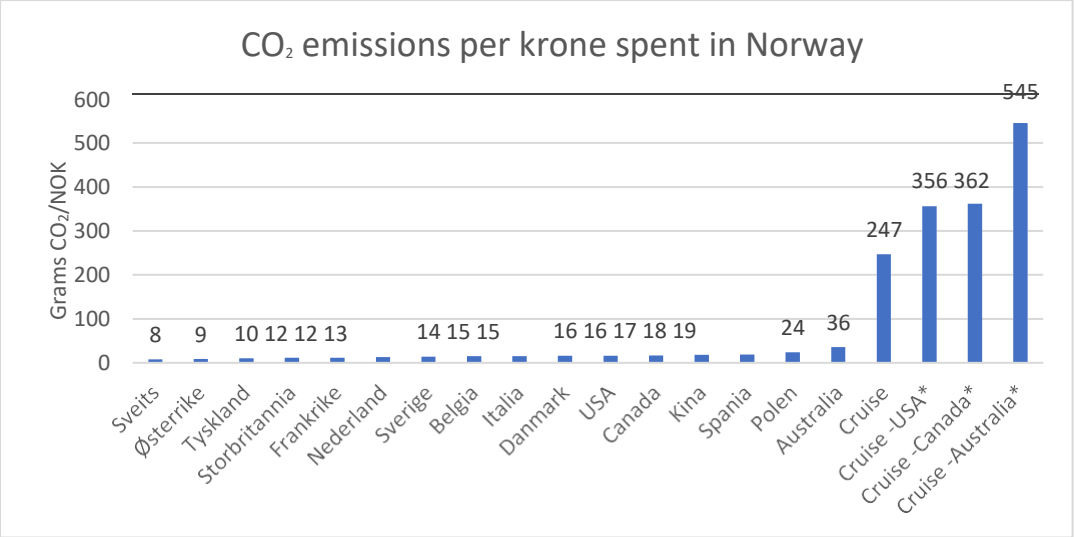


Figure 1. The CO_2 footprint of a Swiss tourist is 8 grams per krone spent in Norway. At the other end we find cruise tourists from Australia, who generate emissions per krone of more than 0.5 kilos per krone spent onshore. Cruise tourists are those who spend the least and emit the most CO_2.

About the report

This report was commissioned by the Norwegian Hospitality Association. It is largely based on the same methodology as the August 2019 report about the total greenhouse gas emissions linked to Norwegian tourism.[1] In this report, the objective is not to apportion CO_2 emissions across the various groups, but to identify CO_2 emissions linked to the various foreign tourist groups, and compare these with the spending generated in Norway.

The spending figures were taken from Innovation Norway's 2018 tourist survey. The various groups' preferred methods of travel to Norway were also taken from this survey. The number of cruise tourists in 2018 was taken from Innovation Norway's Key Figures for 2018.

We have calculated most of the emissions figures ourselves.

Oslo, 5 August, Svein Thompson

[1] Greenhouse gas emissions linked to Norwegian tourism, Stakeholder, August 2019

CO_2 emissions from various tourist groups

In deciding which tourist groups to use to work out the climate footprint, the choice was simple: We have used the 15 countries for which Innovation Norway has spending figures in its annual tourist surveys, and we have also used cruises.

Emissions from cruises are based on the total CO_2 emissions in 2018 of 558 thousand tonnes divided by 852 thousand passengers. We have based this on passenger figures from Innovation Norway. The emissions figures were taken from the Norwegian Coastal Administration's Emissions Database, and include all emissions from cruises within 200 nautical miles (Norwegian Exclusive Economic Zone). For cruise passengers, we also included a small amount of emissions linked to coaches used for local sightseeing.

The biggest contribution to emissions from tourists travelling to Norway is their journey to Norway. We have calculated these journeys from the country's capital city to Oslo. For the tourists' choice of means of transport, we have used the annual survey by Innovation Norway. The vast majority arrive either by plane or car (and camper van). A few come by bus, boat, train or motorbike. For the sake of simplicity, we have calculated the climate footprint as if everyone arrives by plane or car. Obviously, the further away the tourists' start point is, the higher the flight portion.

For cars, we have assumed that tourists do not go on driving holidays alone, but that there are 2.5 people in each car. We have assumed a fuel consumption of 0.06 litres per kilometre, in order to take into consideration the somewhat higher consumption of camper vans.

For the percentage who fly, we have used the ICAO's emissions calculator[2] and used capital cities as the point of departure. We have only calculated the emissions for one way of a trip by car or plane, in line with international practice. We have only looked at CO_2 emissions, not any other potential effects of emissions at high altitudes.[3]

Foreign tourists also take domestic flights in Norway. The CO_2 emissions from these are split across all the groups excluding cruises with 11.8 kilos CO_2, based on the number of tourists arriving by air. The total emissions from foreigners' leisure trips within Norway in 2018 were calculated to generate 59 thousand tonnes, based on Avinor's measurements and calculations of foreigners' leisure trips which were performed in the previous climate report[4] for the Norwegian Hospitality Association.

We have also calculated CO_2 emissions relating to accommodation and hospitality, and here have used Statistics Norway's figures for emissions from this sector. The emissions for each group are the same per night, but total emissions of each group will increase with the length of stay.

We have also considered motoring in Norway during a holiday. It is assumed that tourists drive an average of 100 kilometres per day. The CO_2 emissions from motoring by group vary according to the length of stay and percentage who drive their own car into Norway.

Swedish and Danish tourists have the lowest climate footprint. After that come the other countries in Europe, generating between 177 kilos CO_2 and 267 kilos CO_2 per day. There are now direct flights between Beijing and Oslo, which reduces the CO_2 footprint considerably, resulting in a footprint of 345 kilos CO_2 per stay for the average tourist from China. In other words, there is not a discouragingly large 'climate difference' between a Chinese and a Spanish tourist (267 kilos CO_2).

[2] https://www.icao.int/environmental-protection/CarbonOffset/Pages/default.aspx
[3] Read more in the Climate Report from August; see footnote 1
[4] See footnote 1

When we look at cruises, the picture is very different. Emissions here are an average of 659 kilos per passenger, and if the passenger comes from a different continent, the footprint increases due to the flight to Europe. We have based our figures on an assumption that everyone flies in to London and starts their cruise in Southampton after a train journey there. Another start point could be Hamburg, with approximately the same footprint. We have not included the CO_2 emissions generated by the cruise ship from its journey from Southampton until its entry into the Norwegian Exclusive Economic Zone.

For a cruise tourist from Australia, the footprint is 1,452 kilos per passenger. A large share of cruise tourists arrive by plane. Among the 10 biggest groups in 2018, we find tourists from the USA, Canada and Australia, totalling 142 thousand cruise passengers in Norway, with total emissions of 145 thousand tonnes of CO_2. That is more than the CO_2 emissions from all Norwegian tourist businesses (hotels and hospitality) combined.

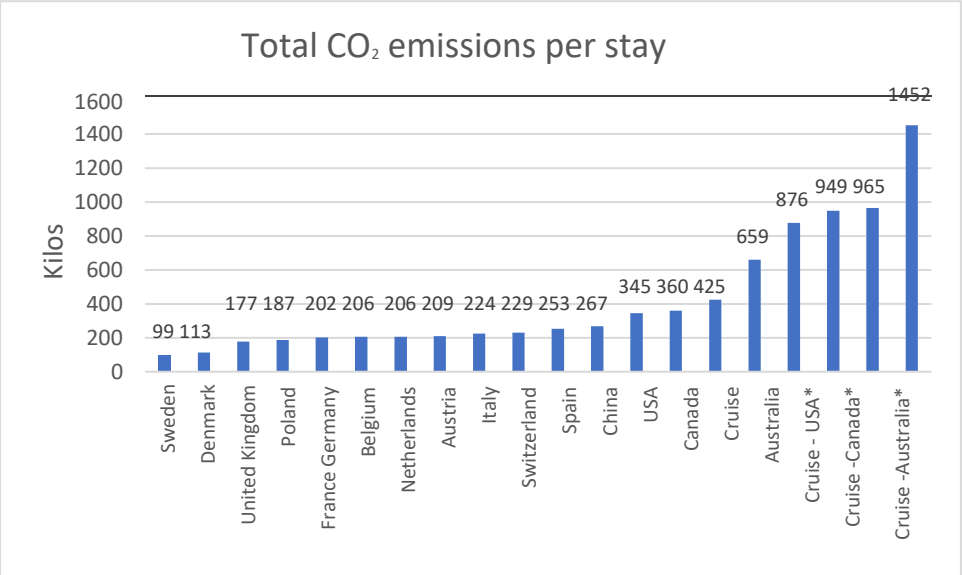


Figure 2. Total greenhouse gas emissions per holiday in Norway have been calculated in order to analyse the climate footprint of the various market groups. Since it is the transport into Norway which generates the greatest emissions, tourists from the nearest countries will emerge as the best. For cruise tourists, separate figures have been calculated for overseas tourists who arrive by plane to Europe (using London as a basis).

Table 1. The table shows the various elements in the calculations for some of the countries included. CO_2 emissions linked to travel to Norway vary according to distance, but also according to how many people fly rather than drive a car or camper van. Whether tourists drive their own vehicle or not also affects their choice of how many kilometres they drive in Norway during their stay. We have distributed emissions from domestic flights in Norway equally across all markets (excluding cruise tourists). Emissions will also increase according to length of stay, in terms of most factors.

Emissions per traveller kg CO_2	**Sweden**	**Denmark**	**Germany**	**Netherlands**	**Belgium**	**Austria**	**Switzerland**	**China**
Inbound journey	43	53	77	91	107	137	131	300
Emissions accommodation and hospitality per stay	20	23	52	45	41	42	56	24
Emissions from motoring during the stay	23	22	60	57	41	25	46	2
Emissions from coaches during the stay	2.2	3.3	5.6	4.1	5.3	8.1	8.6	6.3
Emissions from domestic flights per stay	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
Total CO_2 emissions per stay in Norway	**99**	**113**	**206**	**209**	**206**	**224**	**253**	**345**

EU Emissions Trading System

Aviation is included in the EU Emissions Trading System for CO_2 emissions. In practice, the trading system means that one extra flight in Norway or another EEA country will not result in extra CO_2 emissions, because the total permitted emissions from aviation and the rest of the sector included in the Emissions Trading System have already been set for the period between now and 2030. Extra emissions from a flight will result in lower emissions from a different party within the trading system, such as a smelting plant in Norway, a coal power station in Poland or fewer flights with another airline.

In terms of effect on the climate therefore, it is important whether a flight takes place within or outside the EEA area.

From 2021, there will be an emissions trading system operated by the UN which will cover all aviation. The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), will freeze net emissions from aviation globally to their 2020 level. This is the first step on the road to reducing global emissions from aviation.

Total spending per traveller

Spending per traveller depends on two factors: daily amount spent and number of days in Norway. As mentioned above, this has been calculated by Innovation Norway through a survey. It included 11,744 people, and should provide a representative picture of average amount spent and length of stay for the various groups.

It is a little more difficult for cruise passengers. Here we have used the Institute of Transport Economics/Dybedal as our basis, which assumes that each ship calls at an average of 4.1 ports per cruise in Norway. We have also assumed that all the passengers actually go ashore. How much they spend onshore is uncertain. The Institute of Transport Economics/Dybedal have reviewed a range of surveys and their conclusion is that the correct figure for average amount spent in Norwegian ports is between NOK 600 and NOK 700.[5] We have therefore used NOK 650 per day as a basis per cruise passenger.

The group that spends the most money per stay is Switzerland, with its tourists spending NOK 1,810 per day, staying an average of 16.8 days, i.e. a total of NOK 30,463. In second and third place come Canada and Austria. Cruise passengers come in last place, with an average spend in Norway of NOK 2,665 per cruise passenger.

[5] Cruise tourists' spending in Norway - a comparison of results and methods from 10 surveys. Institute of Transport Economics/Dybedal 2019

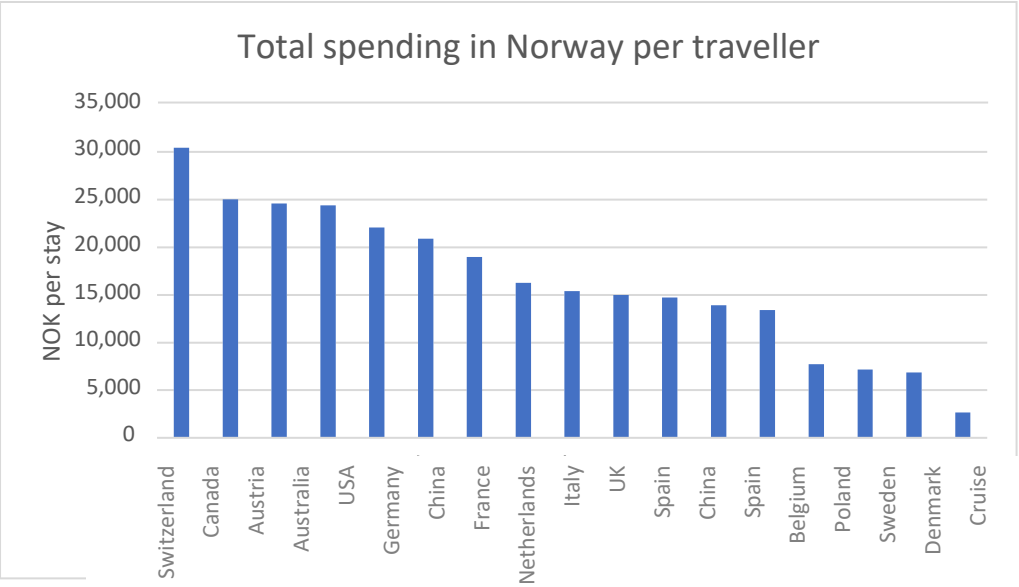


Figure 3 The Swiss have the biggest spending in Norway per person. They stay for a long time and spend a lot of money per day. It is the opposite for cruise tourists: Few days ashore and little spending per disembarkation. Source: Innovation Norway and Institute of Transport Economics

Revenues in relation to greenhouse gas emissions

A negative side of tourism is the emission of greenhouse gases. Tourism is an emissions-intensive industry, because it depends on transport services which emit a lot of CO_2.[6]

However, tourism is an important contributor to economic value creation and to cultural understanding between people from different parts of the world. The tourist industry also provides services and experiences that are highly sought after.

It is therefore interesting to look at how CO_2 emissions relate to value creation, represented here in terms of spending per tourist group in Norway.

The Swiss top the list in the comparison of spending in relation to emissions of CO_2, with NOK 120 per kilo of CO_2 emissions. Following them are Austria, Germany, United Kingdom and France. It is the three German-speaking countries (although Switzerland also has French and Italian-speaking populations) who have the highest scores in spending versus CO_2 emissions. This is primarily due to the fact that once they are here, they stay for a long time. The average stay for those nationalities is 15.1 days, which is unbeaten by any other group. We do not know what it is that makes German speakers stay for 50 per cent longer than English speakers, but from a climate viewpoint, it would be very beneficial if all tourists chose longer stays and fewer trips.

Swedes and Danes emerge relatively poorly, because their average stays are short. Tourists from neighbouring countries presumably come on frequent and short visits, compared with Chinese and Americans. That pushes up emissions per krone spent by our neighbours.

[6] See more about this in the report on greenhouse gas emissions linked to Norwegian tourism, note 1

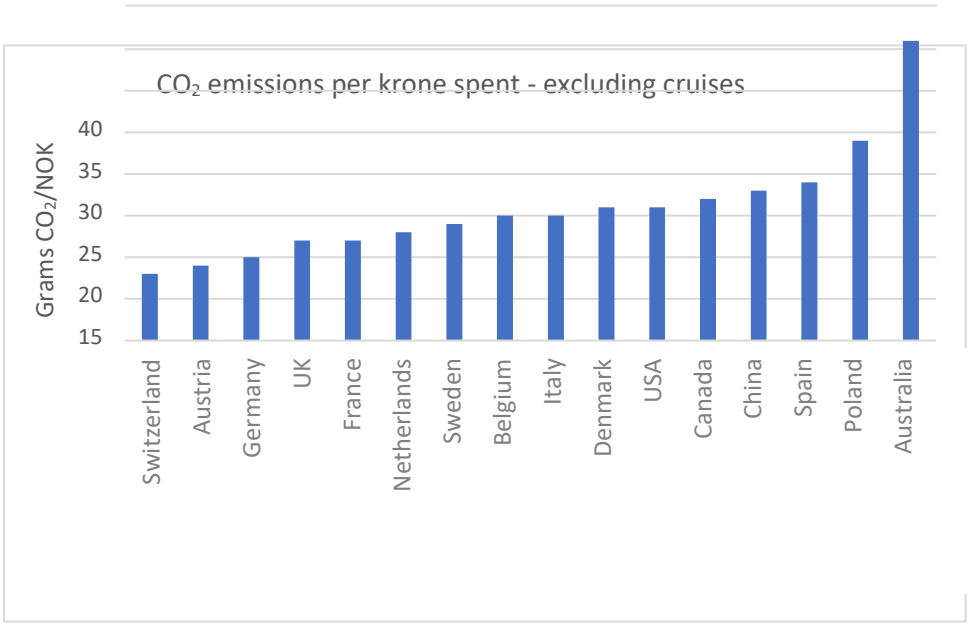


Figure 4. The CO_2 emissions per krone spent by most tourist groups lie between 10 and 20 grams of CO_2 per krone which they spend in Norway during their stay. The difference between a Danish and a Chinese or American tourist is minimal when we have corrected for the length of stay.

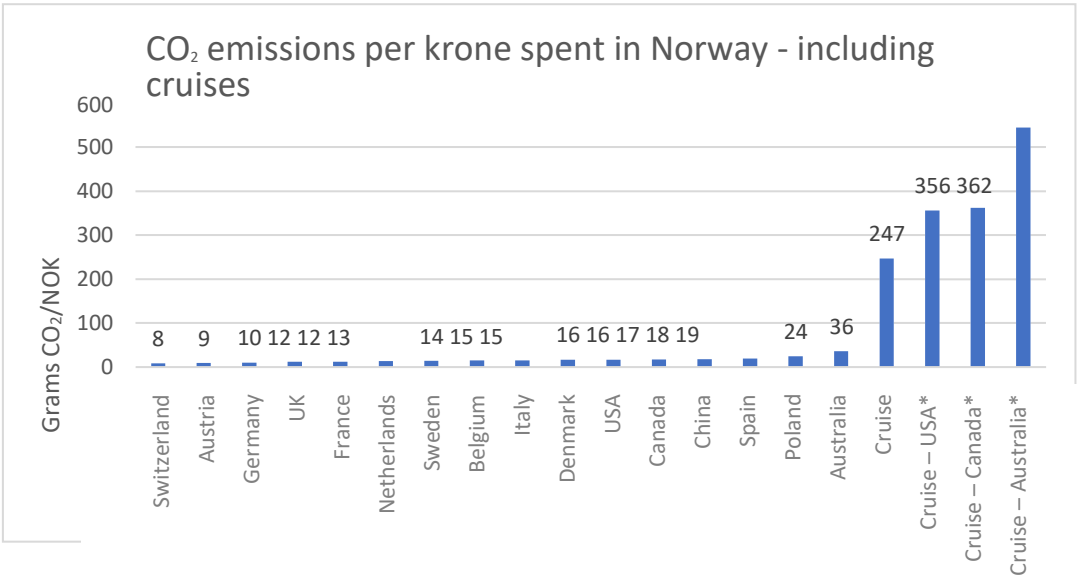


Figure 5. The graph shows how much higher the CO_2 emissions are per krone spent by cruise tourists than for all other tourists. The emissions per krone for an average Australian tourist are high compared with those of a Swiss tourist, but when the Australian chooses to see Norway from a cruise ship, those emissions per krone increase fifteenfold. That is primarily because his spending in Norway plummets.

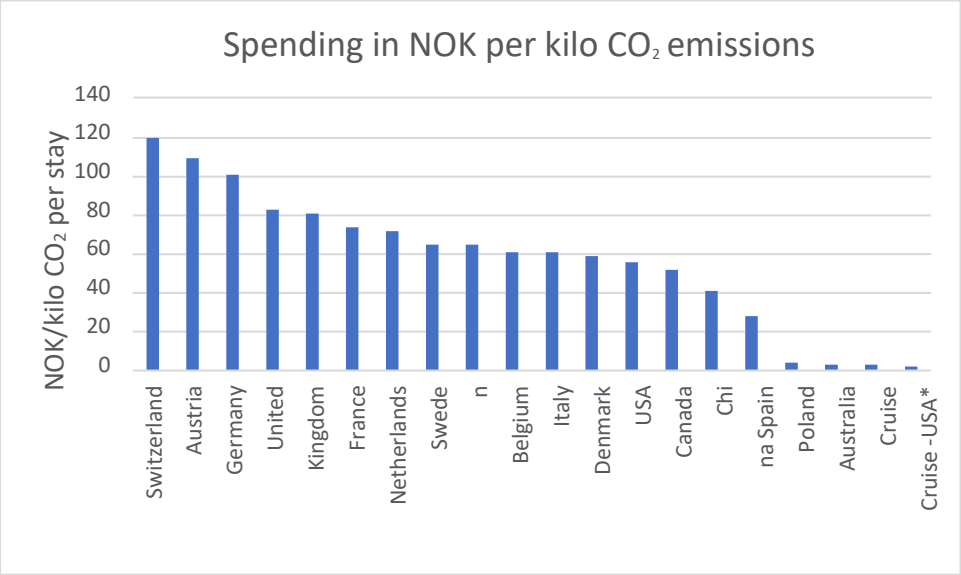


Figure 6. The Swiss are the ideal tourists. Compared with the other German-speaking tourists, they spend most money per kilo of CO_2 emissions overall during their stay. At the other end of the scale, we find cruise tourists, particularly those who have also flown in to Europe in order to go on a cruise in Norway.

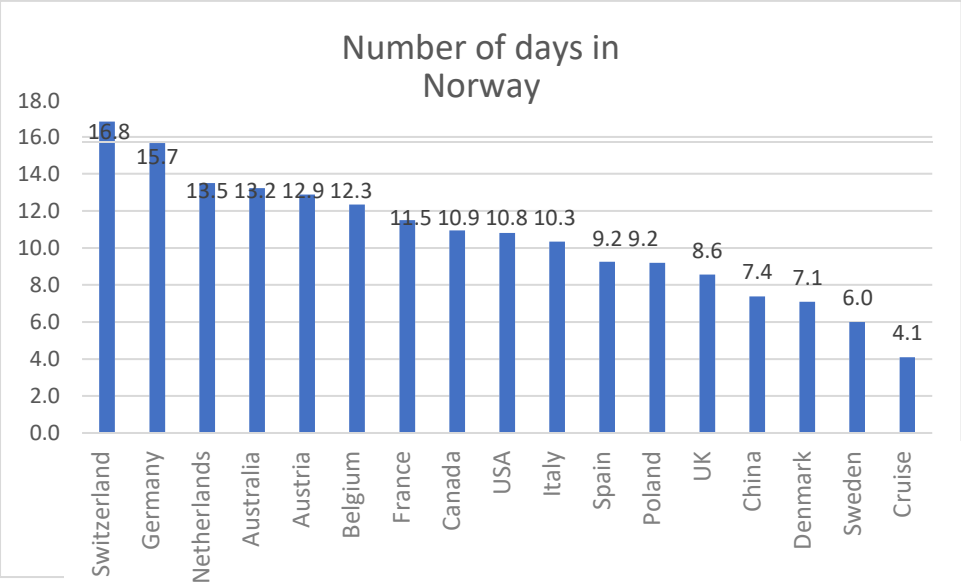


Figure 7. The more days a tourist spends in Norway, the lower his average climate footprint per day, because it is the journey to Norway which has the greatest effect on greenhouse gas emissions. Source: Innovation Norway