

The Global Warming Reduction Potential of Night Trains

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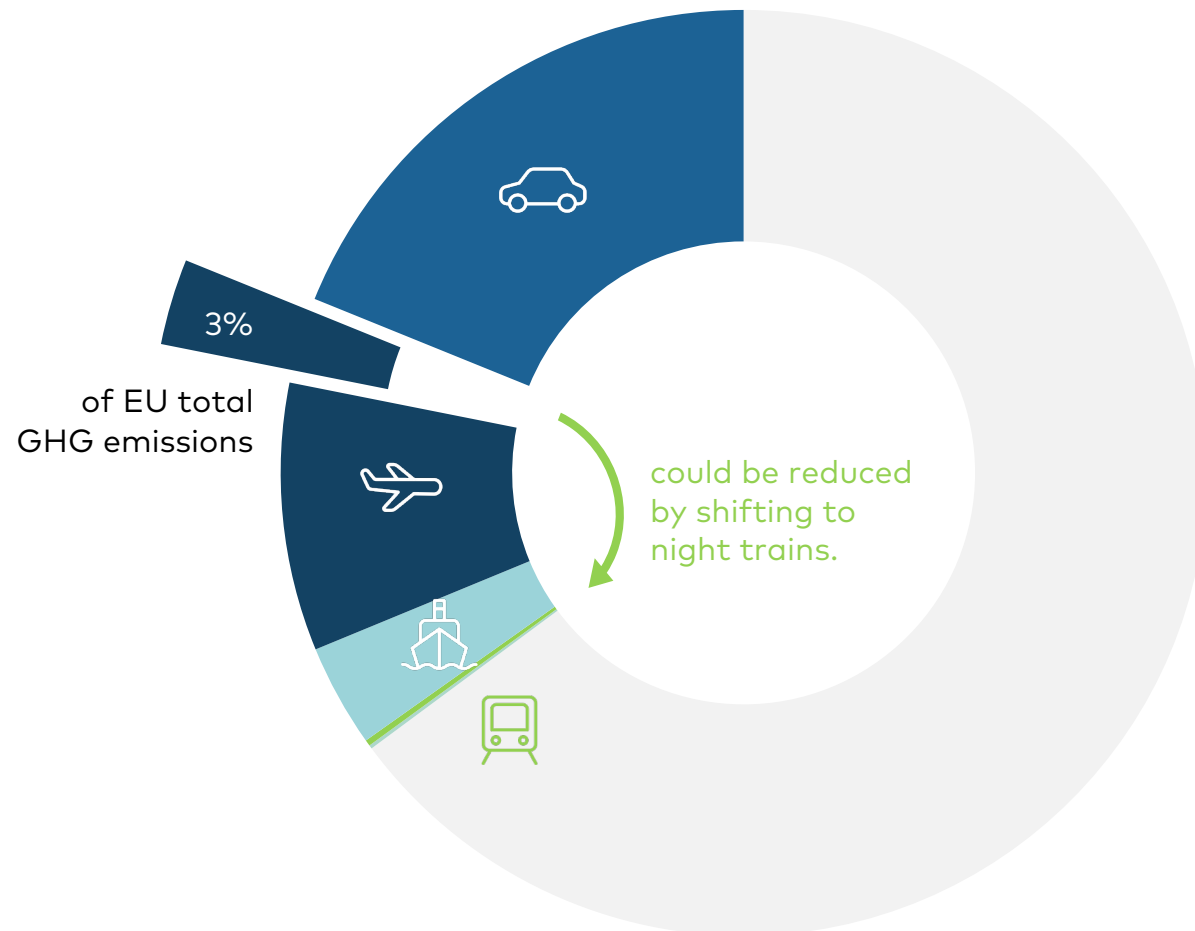
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Back-on-Track.eu

European network to promote
cross-border night trains

Abstract



Night trains have the potential to reduce EU greenhouse gas emissions by 3%.

According to opinion polls, 7 out of 10 Europeans would be willing to take the night train instead of the plane if the offer seemed reasonable to them. Back-on-Track, a European network of night train initiatives, has used this as a basis to examine air passenger numbers in the EU in 2019 to see which air connections could be replaced by night train connections. Distances up to 1500 km as well as distances up to 3000 km were considered with different scenarios. Overall, up to 32 % of passengers could switch to night trains if there were an attractive offer. This would reduce emissions from air traffic by 26 %. In order to create such an offer, up to 2500 more night trains would be required, as well as a considerable improvement in the framework conditions, in particular a reduction in track access charges.



Why this paper?

The potential of night trains has been recently examined in a couple of studies, but

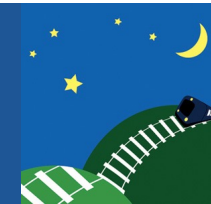
- the studies either examined a predefined target network
- the potential passenger numbers were examined based on given constraints
- if climate effects were calculated, non-CO₂ effects have been ignored

This paper is a follow-up to our 2021 study* on EU air passenger volumes that could be shifted to night trains and examines **possible climate effects in a scenario assuming optimal conditions.**

We assumed

- a capable rail infrastructure on TEN-T routes prepared for 160 km/h max. speed
- modern rolling stock with substantial improvements of privacy, security and comfort
- an average occupancy rate of 80% like for other means of transport that require booking
- a level playing field that allows for reasonable ticket prices

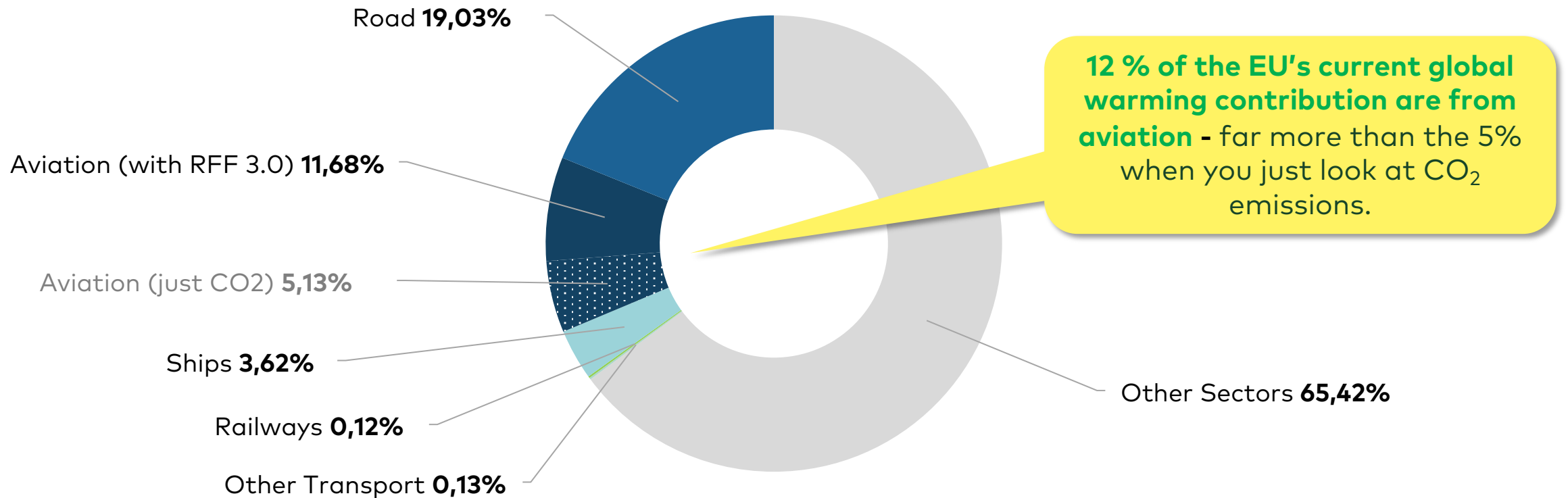
*[Oui au train de nuit \(2021\): Half of the air passengers will benefit from night trains, if Europe invests](#)



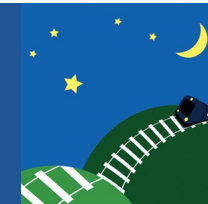
The current global warming potential of aviation

EU greenhouse gas (GHG) emissions 2019

CO₂e incl. radiative forcing (RF) of non-CO₂ emissions (factor 3.0 using GWP* method)

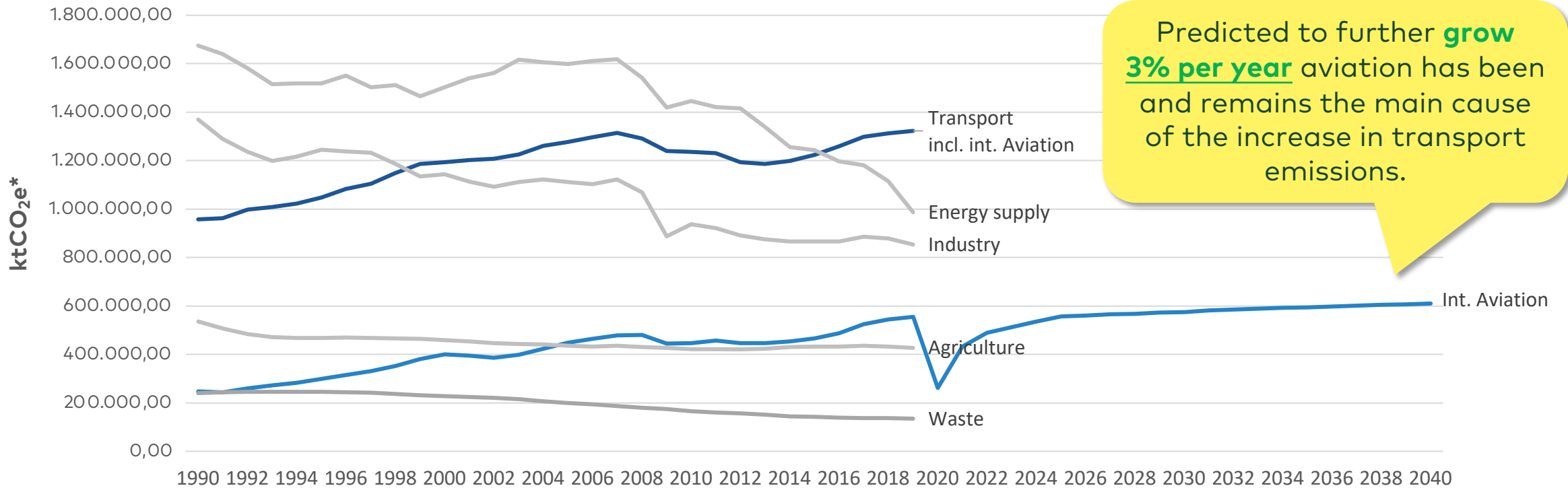


Source: [EEA](#) | EU-28 data

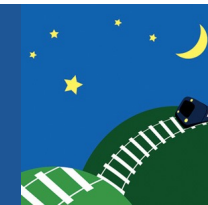


Only aviation emissions continue to grow

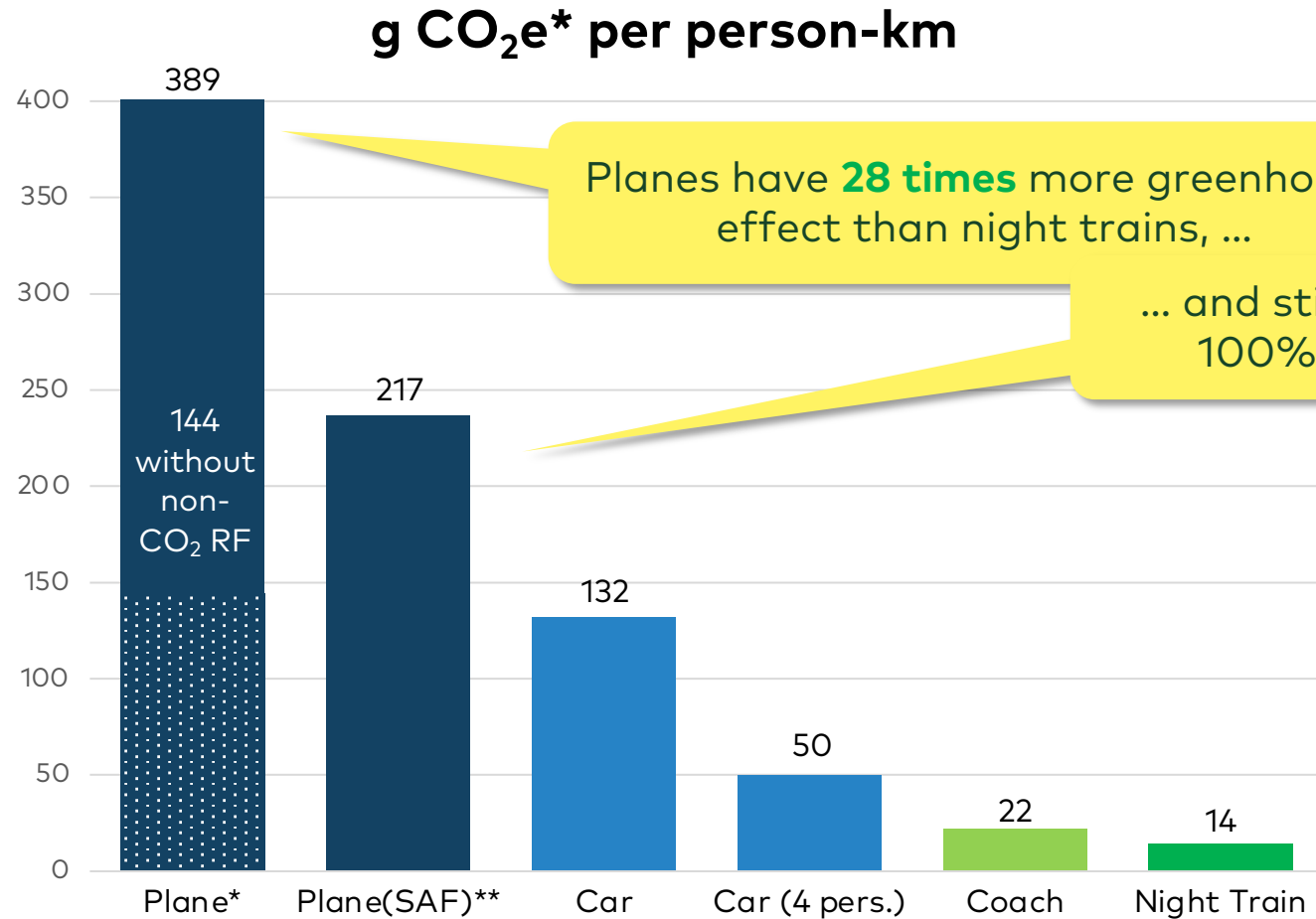
Development of EU GHG emissions 1990-2019
incl. projection for aviation (with all existing measures)



Source: EEA, [Data 90-19](#), [Forecast 20-40](#) | EU-28 data | *incl current RF (GWP*) of non-CO₂ emissions of aviation



GHG emissions by means of transport



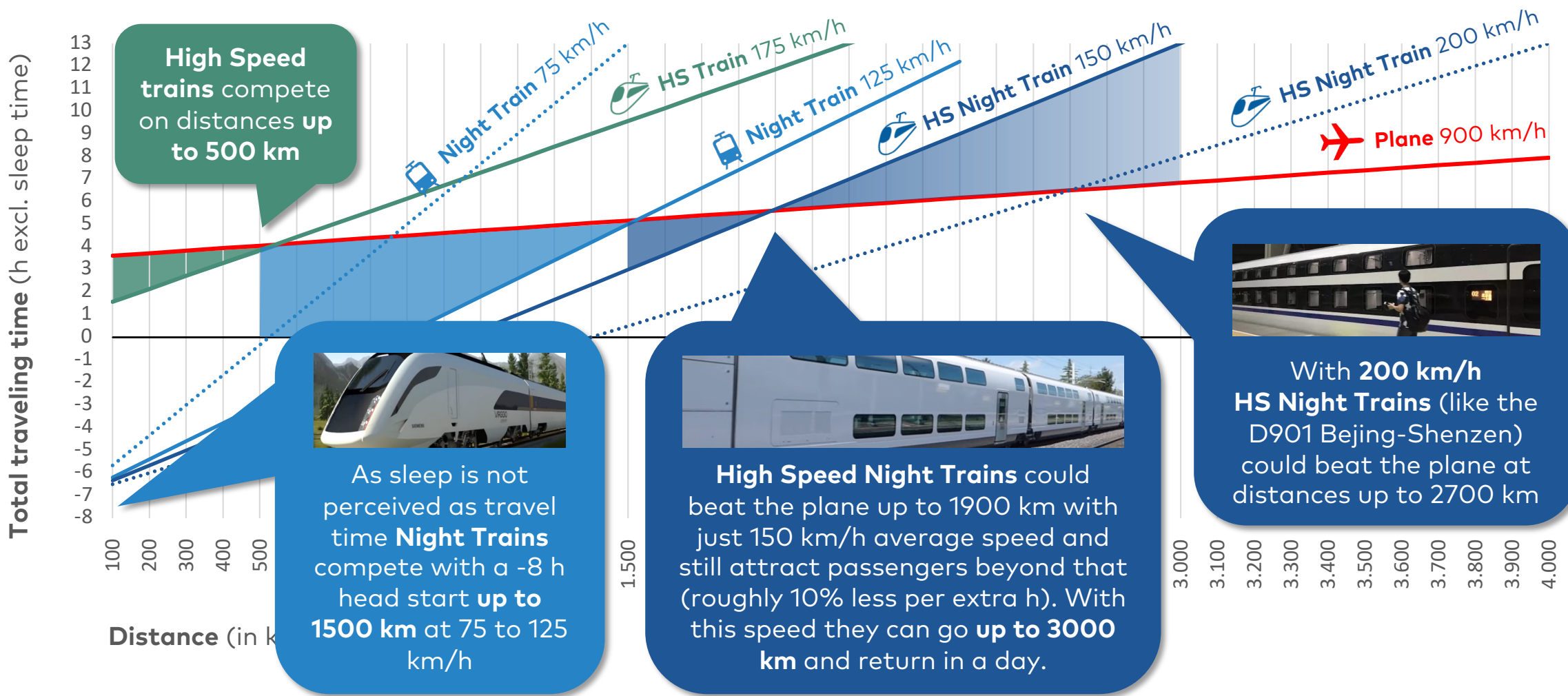
Planes have **28 times** more greenhouse effect than night trains, ...

... and still **16 times more** with 100% sustainable fuels.

Base Source: [IEA](#) | *incl current RF (GWP*) of non-CO₂ emissions of aviation | **remaining well-to-tank emissions and RF when using Sustainable Aviation Fuel (SAF), source: [Sausen](#)

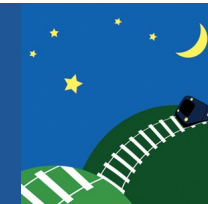


Night trains go further

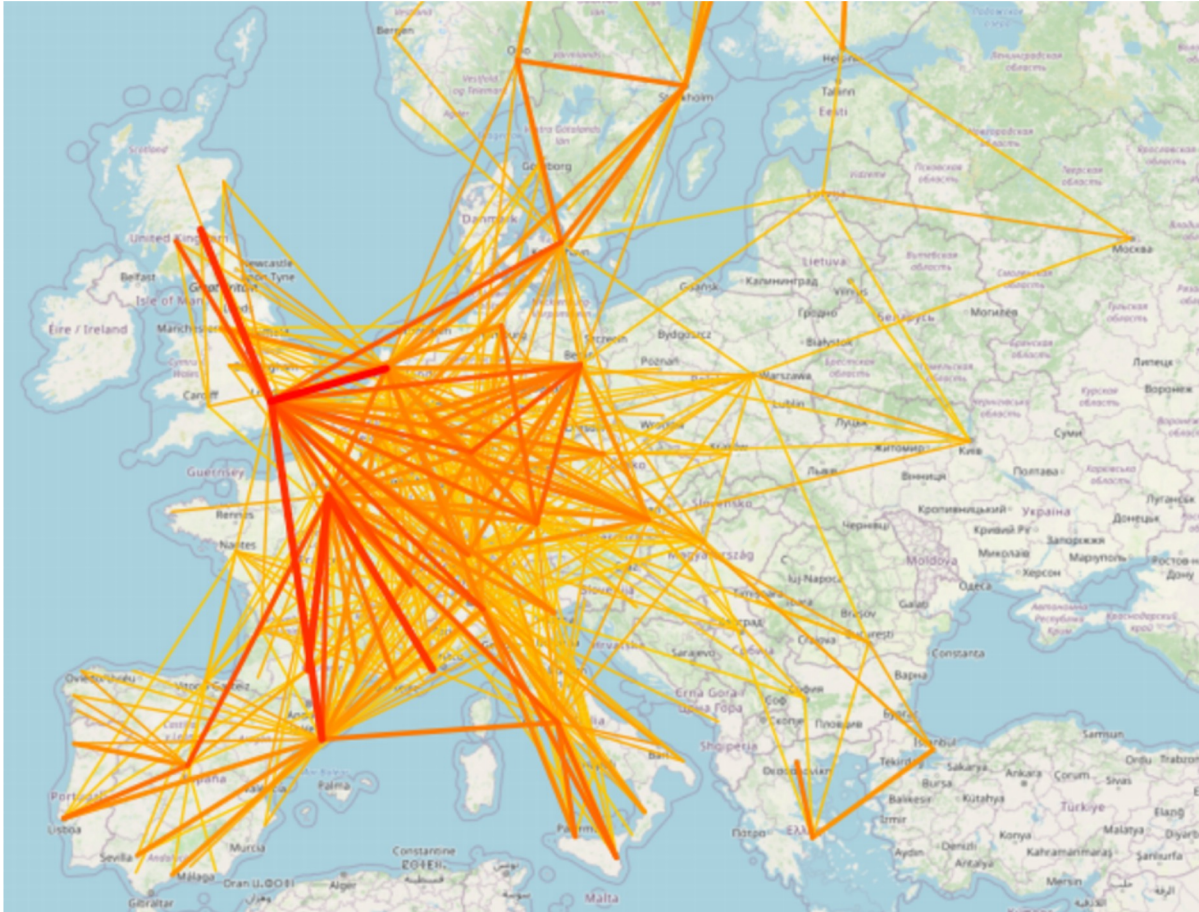


Which flights can be replaced?

- We analysed Eurocontrol data for flights from EU-28 Airports*.
- We excluded
 - connections to islands and places not connected by rail
 - connections separated by more than 3000 km road distance
 - connections which are served by day trains in less than 4 hours and
 - connections to other continents
 - connections with less than 100.000 passengers per year (as 140 passengers per day and direction might be insufficient to fill a feeder train)
- The reported passenger numbers per connection differ from the total number of passengers in the EU-28 due to under-reporting. Therefore, the total numbers per connection were extrapolated to the total passenger numbers.



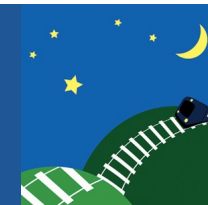
Replaceable connections 500-1500 km:



According to our 2021 estimate, out of yearly 1.1 B EU aviation passengers in 2019

- **362 M** passengers travel on replaceable routes from 501 to 1500km distance.

Source: [Oui au train de nuit, 2021](#)



Replaceable connections 500-3000 km:

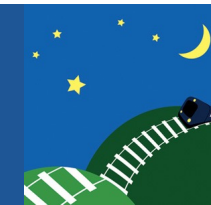


According to our 2021 estimate, out of yearly 1.1 B EU aviation passengers in 2019

- Another **213 M** passengers travel on replaceable routes from 1500 to 3000km distance.

For **50% of 1.1 B EU aviation passengers** night trains could provide an alternative.

Source: [Oui au train de nuit, 2021](#)



How many would use the alternative?

69%

of Europeans are **very or fairly** willing to use night trains.

So, if night trains were offered to 38% of all EU aviation and we can assume **69% would use them** (as long as prices are reasonable and travel times competitive as **in the 500-1500 km segment**) ...

25%

of Europeans are **very** willing to use night trains.

... and if some would use night trains even if travel times (excl. sleep) exceed those of a plane trip so we may assume 11,4% less potential per 1 extra hour (at 150 km/h avg. speed) so we may still assume **53% average preference in the 1500-3000 km segment** ...

... then **32%** of all EU aviation passengers would shift to night trains.

Source: [YouGov](#)

