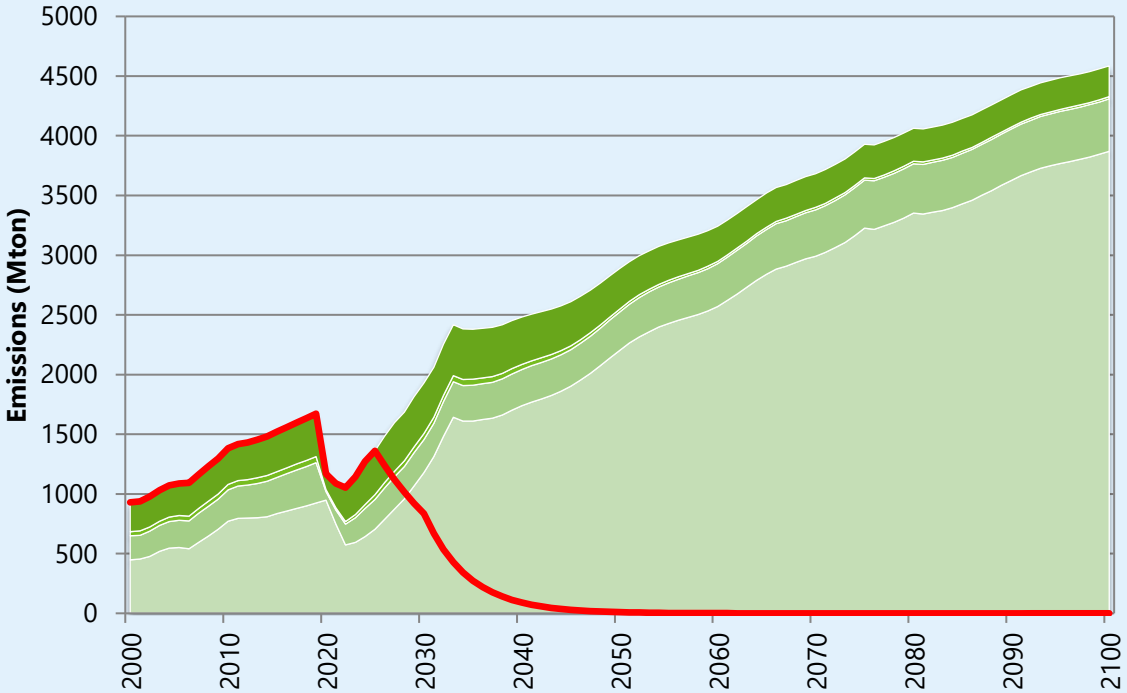
Does air ticket carbon information deliver emissions reductions?

Paul Peeters (Guest Scholar WUR, former BUAS, The Netherlands), 24-10-’24

The problem of aviation's footprint

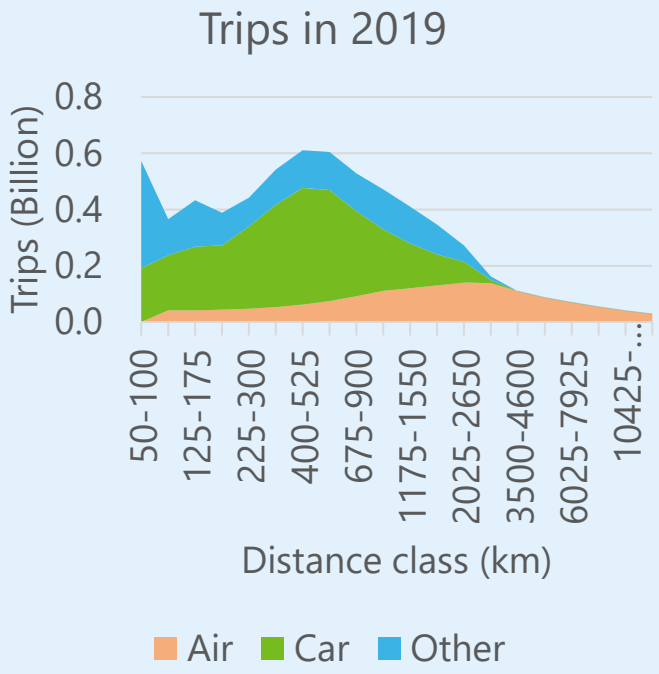


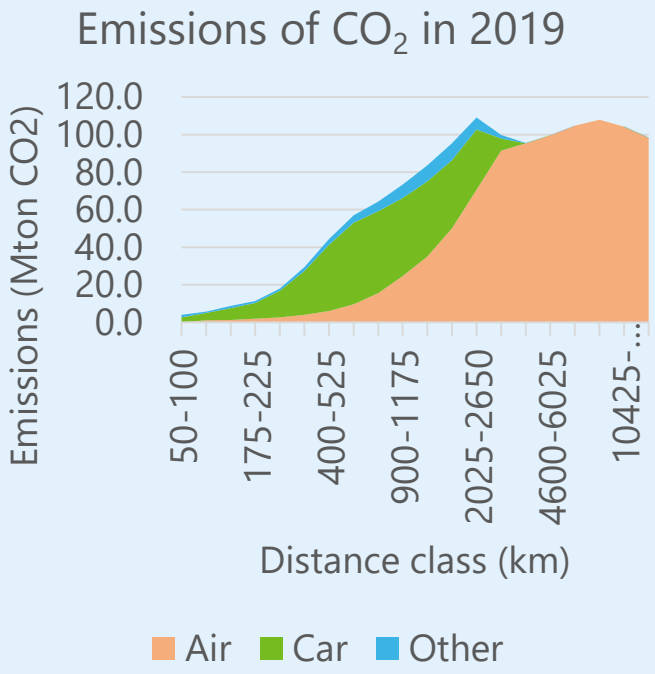
Tourism would consume 25-45% of the remaining 1.5° C carbon budget.

- Accommodation
- Other transport
- Car transport
- Air transport
- Emissions goal

Glasgow Declaration
Climate Action in Tourism

Distance is the main cause for the CF!



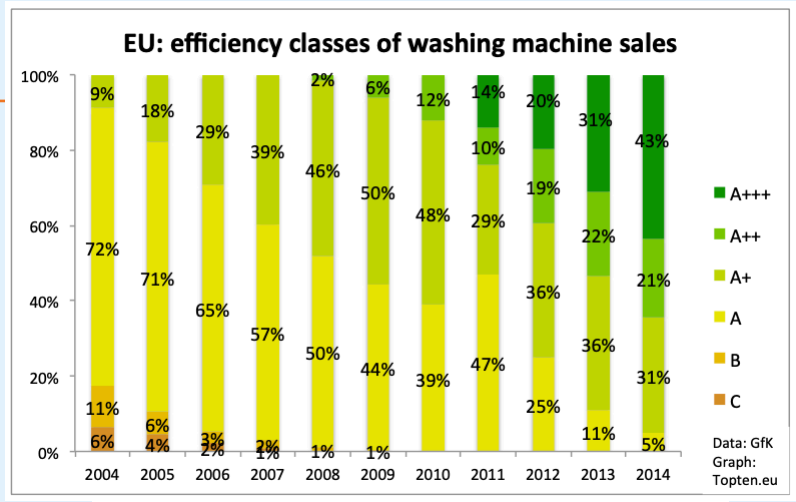


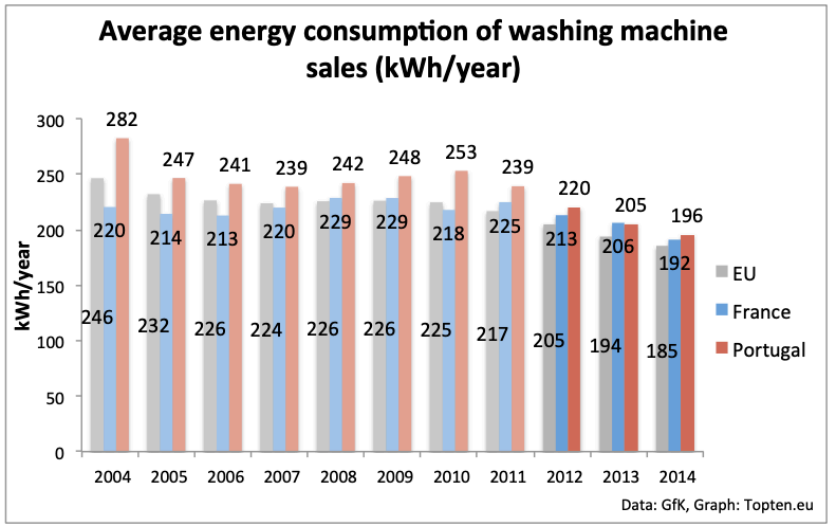
Theory of change of ecolabels

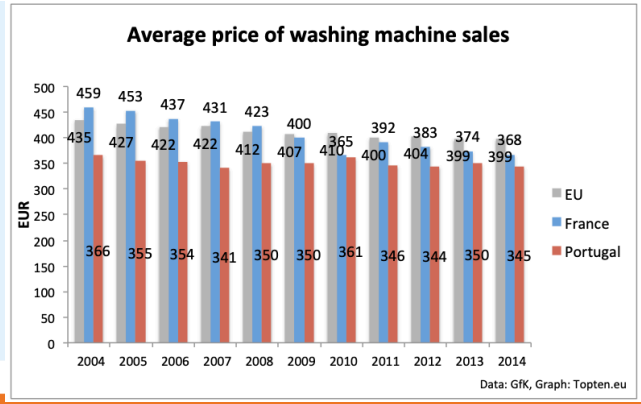
- Ecolabel informs consumers:
  - → Green consumers (x%) purchase green labelled products
  - → suppliers feel pressure to quickly produce more green products
  - → also non-green consumers get access to greener products.
- Example washing-machines.. .

Example EU washing-machines energy label

- After introduction in 2004, the share of green labelled purchases rapidly increased.







Source: Michel, A., Josephy, B., Bush, E., & Attali, S. (2015). *Monitoring the washing machines market in Europe* EEDAL 2015: 8th International Conference on Energy Efficiency in Domestic Appliances and Lighting, Lucerne.

Why were energy labels for washing machines, White Goods & cars effective?

- To achieve behavioural success: Ecolabels must be understandable, significant and reliable and consumers must perceive a clear behavioural change (Gössling, & Buckley, (2016).

- Furthermore, these energy labels were successful because:
  - One-dimensional: everyone understands it
  - Based on legislation and standardized and therefore reliable
  - Energy = cost: buying green saves money (both cheaper acquisition and energy savings)
  - Still, the green-labelled fridge delivers the same cooling as the non-labelled one.

Gössling, S., & Buckley, R. (2016). Carbon labels in tourism: Persuasive communication? *Journal of Cleaner Production, 111*, 358–369. https://doi.org/http://dx.doi.org/10.1016/j.jclepro.2014.08.067

“So, we want a carbon label for tourism!”

- Holiday Fair, Utrecht (NL), January 2012: Green Day keynote (Stefan Gössling)
- This triggered ANVR tour operators branch organization to aske the Center of Sustainable Transport and Tourism (CSTT), BUAS to develop a carbon calculator and carbon management system: Carmacal was born!

The “Carmacal” calculator

- Goal: provide detailed CF (carbon footprint) for tour operating products.
- Detail:
  - 25 high-carbon tourist activities
  - >1 million estimated accommodation footprints
  - 25 different transport modes
    - ***Aviation detail up to each specific flight in the world***

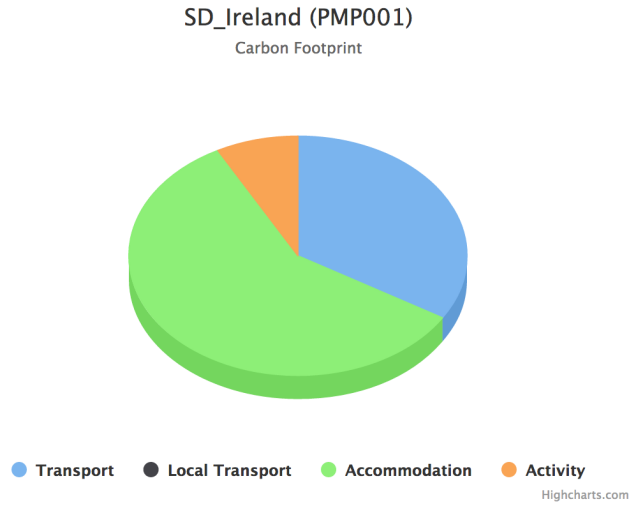
- This detail enabled tour operators to apply carbon management and develop their portfolio towards low emissions:
  - Avoid heavy CF tourism activities
  - Select specific accommodations (or 25 types)
  - Select many transport modes
  - Select the best airline

Screenshot (1)

CARMACAL Calculator

Totals | Per day | Label

Category	Total CF	Avg. CF / Day
Transport	163	7
Local Transport	0	0
Accommodation	283	11
Activity	38	2
Total	**483**	**19**



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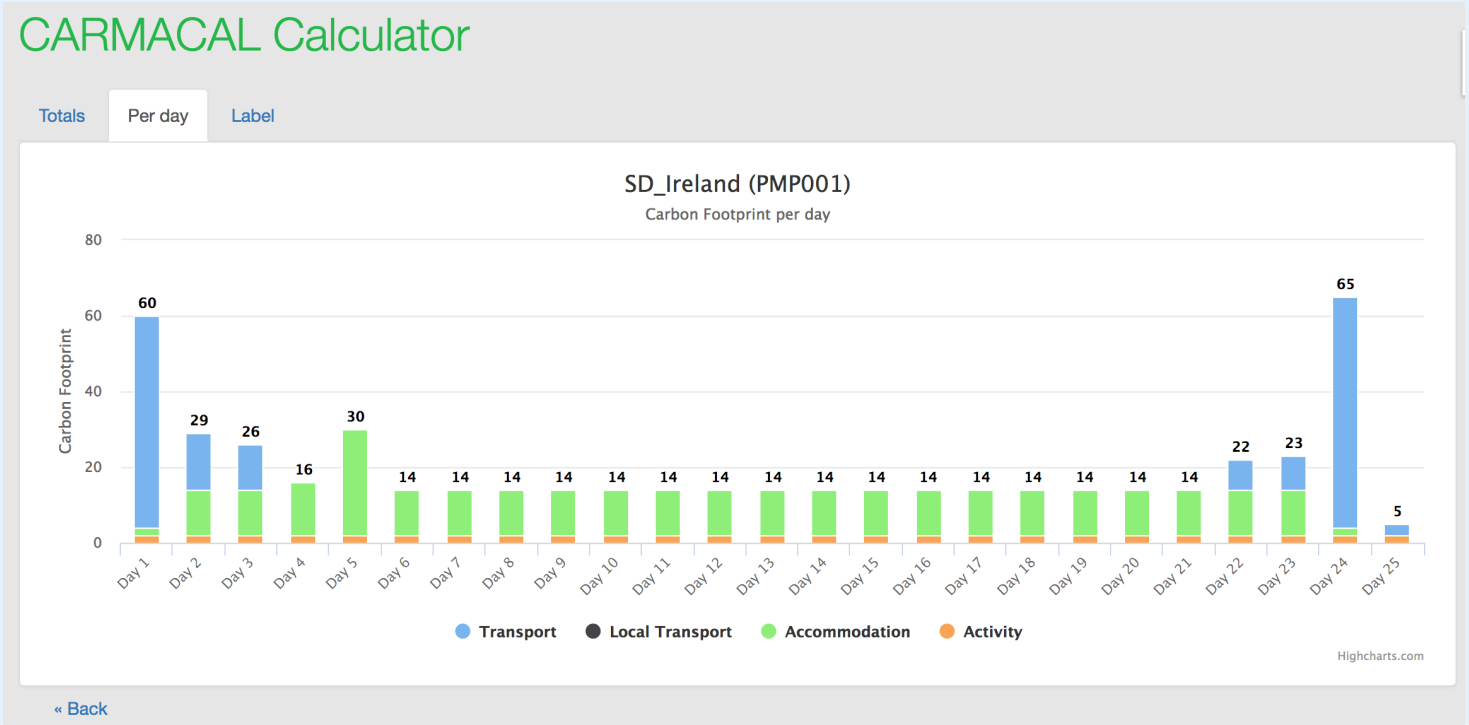
Screenshot (2)



An idea for a full carbon label

- A suggestion for a label looked like… .
- Gössling et al., (2016), tested it with consumers: it was well-received.
- But the Dutch tour operators failed to implement it.

SAWADEE puur reizen

China CHL 22 days

Carbon Footprint	**2.830**
A	
B	
C	C
D	
E	
F	
general	
kilometers:	4.359
percentage of CF taken up by flights:	68%
compensation amount:	€ 11,30
accommodation	
# nights:	29
# nights camping:	0
# hotels with eco-label:	1
flight	
airline:	KLM
kilometers:	15646
outward flight:	non stop
inward flight:	non stop
domestic flights:	3

Gössling, S., & Buckley, R. (2016). Carbon labels in tourism: Persuasive communication? *Journal of Cleaner Production, 111*, 358–369. https://doi.org/http://dx.doi.org/10.1016/j.jclepro.2014.08.067

What determines aviation's emissions per passenger-km?

- The emissions per passenger-km depend on:
  - Type of aircraft (e.g. Airbus A321NEO or B737-800 with winglets)
  - Share of freight on board
  - Cabin space per seat per class
  - Seat occupation rate
  - Distance flown

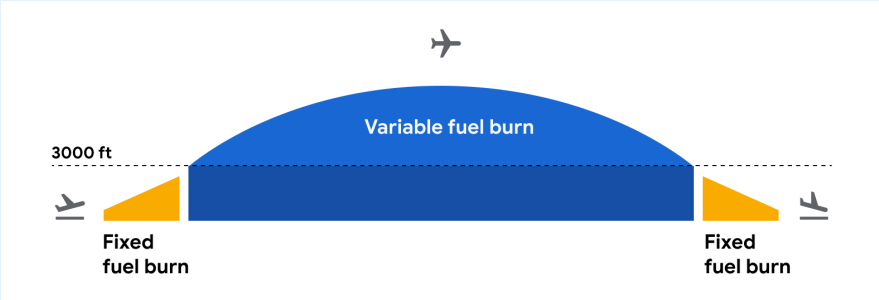
$$EF_{class_{pkm}} = \frac{C_{freight} * \left(\frac{Em_{flight} * \left(\frac{Area_{class}}{Area_{tot}} \right)}{Seats_{class}} \right)}{Seat.Occ_{Airline} * GCD}$$

- $EF_{class_{pkm}}$ = Emission factor per pax-km *(kg/pkm)*
- $C_{freight}$ = Correction factor for allocation of CF to freight
- Em_{flight} = Total CF of flight for that aircraft type *(kg)*
- $Area_{class}$ = Floor area of specific class *(m^2)*
- $Area_{tot}$ = Total floor area cabin *(m^2)*
- $Seats_{class}$ = number of seats for specific class
- $Seat.Occ_{Airline}$ = Seat occupation rate per seating class
- GCD = Great curcle distance *(km)*

Peeters, P., & Reinecke, T. (2021). *Berekening CO_2-emissiefactoren voor Nederlandse luchtvaartpassagiers.* Breda University of Applied Sciences.

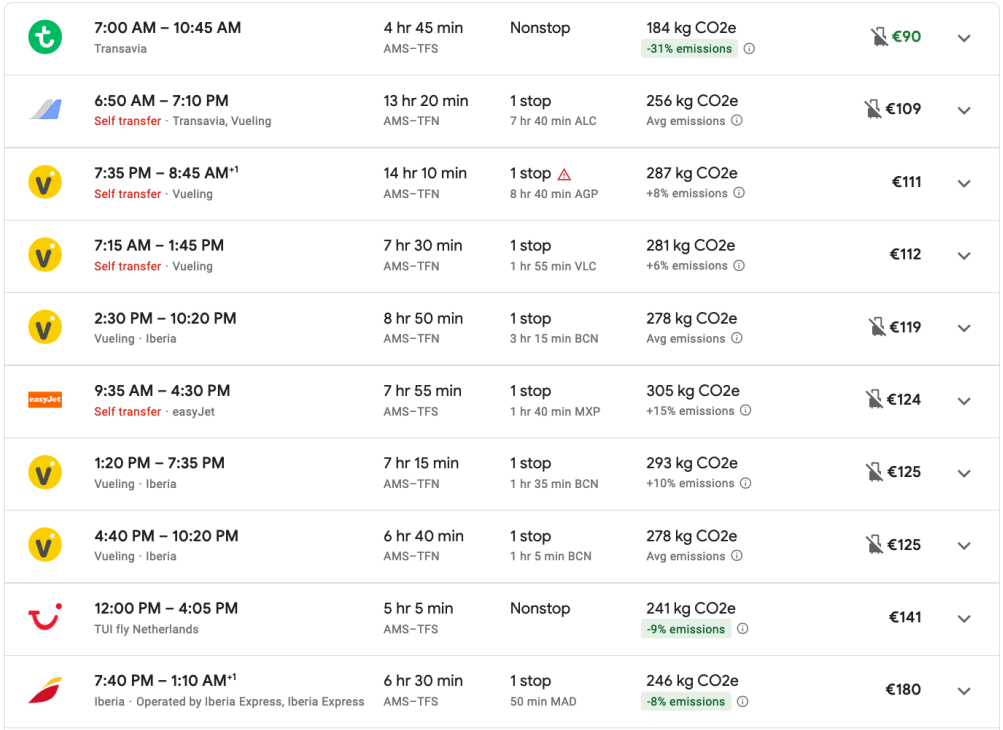
The Carmacal method has gone mainstream in the TIM

- Google has developed a CF calculator as partner of the Travalyst (London).
- This method basically does the same as the Carmacal calculator, but with better data access and now even more refined.
- Based on TIM (***Travel Impact Model 1.10.0***)



http://www.travelimpactmodel.org/
https://github.com/google/travel-impact-model?tab=readme-ov-file

Carbon info on air tickets

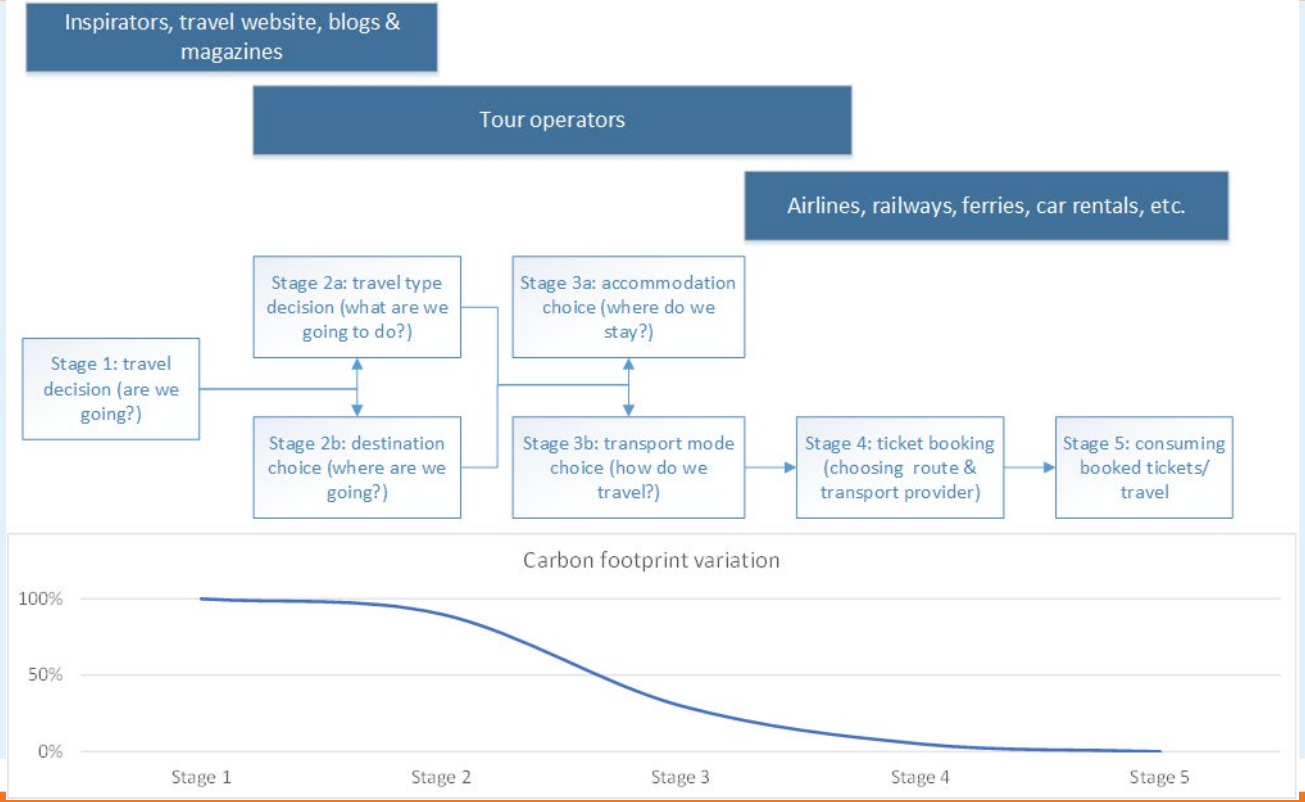


7:00 AM – 10:45 AM Transavia	4 hr 45 min AMS–TFS	Nonstop	184 kg CO2e -31% emissions	€90
6:50 AM – 7:10 PM Self transfer · Transavia, Vueling	13 hr 20 min AMS–TFN	1 stop 7 hr 40 min ALC	256 kg CO2e Avg emissions	€109
7:35 PM – 8:45 AM+1 Self transfer · Vueling	14 hr 10 min AMS–TFN	1 stop 8 hr 40 min AGP	287 kg CO2e +8% emissions	€111
7:15 AM – 1:45 PM Self transfer · Vueling	7 hr 30 min AMS–TFN	1 stop 1 hr 55 min VLC	281 kg CO2e +6% emissions	€112
2:30 PM – 10:20 PM Vueling · Iberia	8 hr 50 min AMS–TFN	1 stop 3 hr 15 min BCN	278 kg CO2e Avg emissions	€119
9:35 AM – 4:30 PM Self transfer · easyJet	7 hr 55 min AMS–TFS	1 stop 1 hr 40 min MXP	305 kg CO2e +15% emissions	€124
1:20 PM – 7:35 PM Vueling · Iberia	7 hr 15 min AMS–TFN	1 stop 1 hr 35 min BCN	293 kg CO2e +10% emissions	€125
4:40 PM – 10:20 PM Vueling · Iberia	6 hr 40 min AMS–TFN	1 stop 1 hr 5 min BCN	278 kg CO2e Avg emissions	€125
12:00 PM – 4:05 PM TUI fly Netherlands	5 hr 5 min AMS–TFS	Nonstop	241 kg CO2e -9% emissions	€141
7:40 PM – 1:10 AM+1 Iberia · Operated by Iberia Express, Iberia Express	6 hr 30 min AMS–TFS	1 stop 50 min MAD	246 kg CO2e -8% emissions	€180

- Someone buying ‘green’ flight saves 8-30% emissions (average is some 10-15%). Nice saving. But is it?
- Assume 100% of customers will choose the green flight:
  - Those green tickets will be sold out first; then the others buy grey flights → no kg of CO_2 will be saved as the fleet is not changed,
  - So, even massive the behavioural change does not reduce any emissions! (only the travellers redistribute differently over flights/airlines).
- In reality, only a small minority changes behaviour because of CF-information.

- The aviation system’s inertia (new types take decades to be developed!) causes the sector is unable to react by any reasonable time frame and thus won’t react.
- Airlines can only add more seats to reduce CF, but then also costs/prices reduce → almost 100% rebound, → further destruction of intrinsically low emission alternative modes.

The leisure/VFR travel decision process



So, is flight CF information important? YES, it is!!

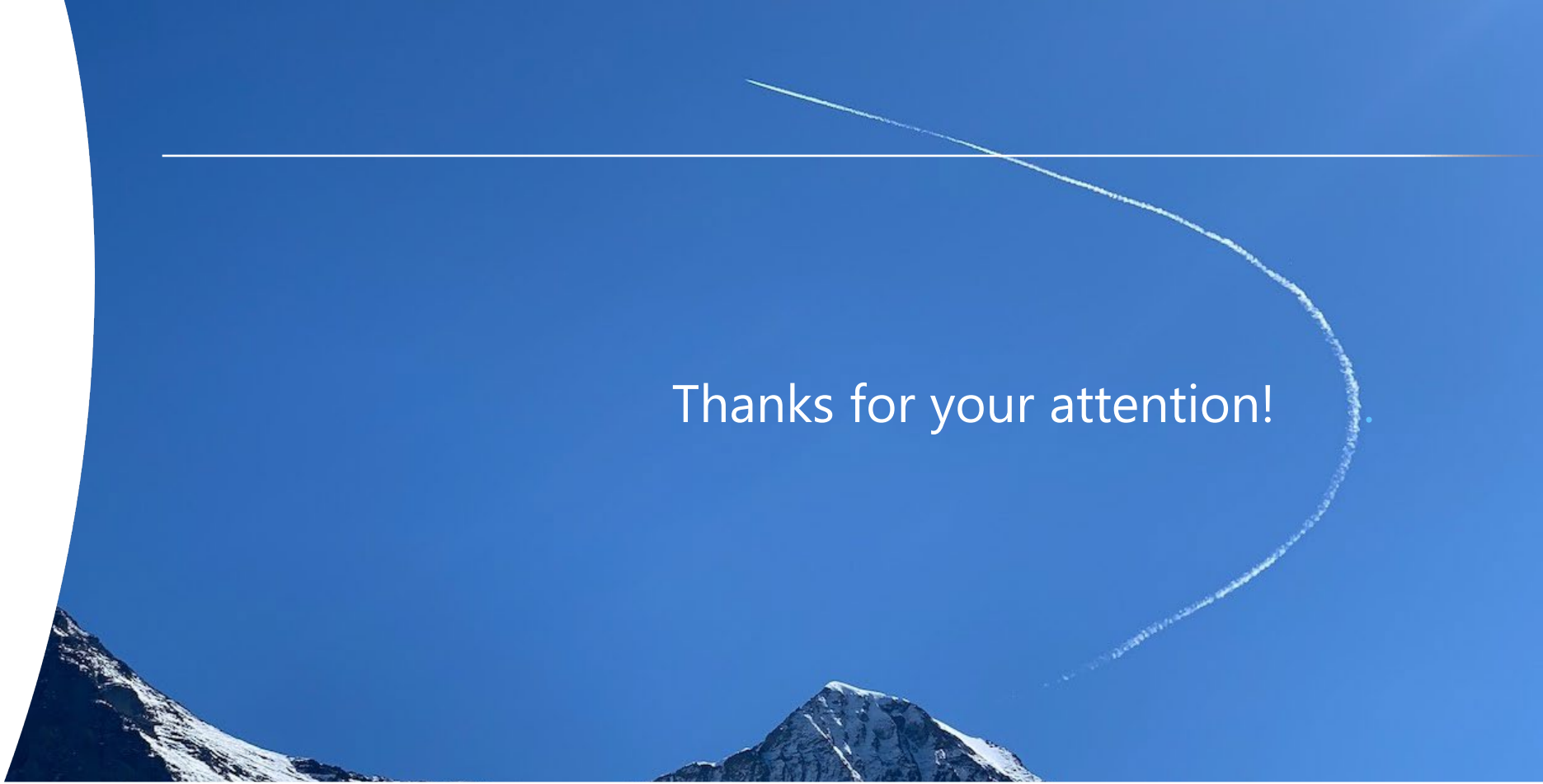
- For ***business travel*** (some 15% of all flights): businesses plan ahead and weigh necessity against number of flights and where to go
- This affects both number of flights and distances and that potentially does reduce emissions (aircraft are grounded, airlines grow less fast)

- For ***leisure/VFR travel***:
  - Tour operator label (thus full Carmacal label including all transport modes and accommodation)
  - Travel inspiration sites (example surfing in pacific)
  - For travel enterprises environmental goal-setting, carbon management and reporting.

Wrapping up

- The aviation system is too inert to be directly influenced by carbon label induced consumer behaviour
- But flight and transport carbon information is essential for:
  - Business travel, which can make a difference by avoiding (long) flights
  - Tour operators (destination choice, carbon management)
  - Travel inspiration enterprises (websites, travel magazines, blogs, etc.)
  - Governments: set clear standardised carbon labels

- And finally: keep it simple!
  - Adding life-cycle, well-to-wing and non-CO_2 (contrails/clouds) makes it very easy for the climate sceptical industry, policy-maker or individual to simply dismiss the whole thing.
  - Particularly up- and down-stream emissions should not be included in consumer information except CO_2 for production of kerosene. Also contrail and cloudiness CO_2-equivalents should not be added to pure CO_2 to avoid enormous confusion and violating proper scientific practices (because contrail-equivalents are not making sense!).


Thanks for your attention!