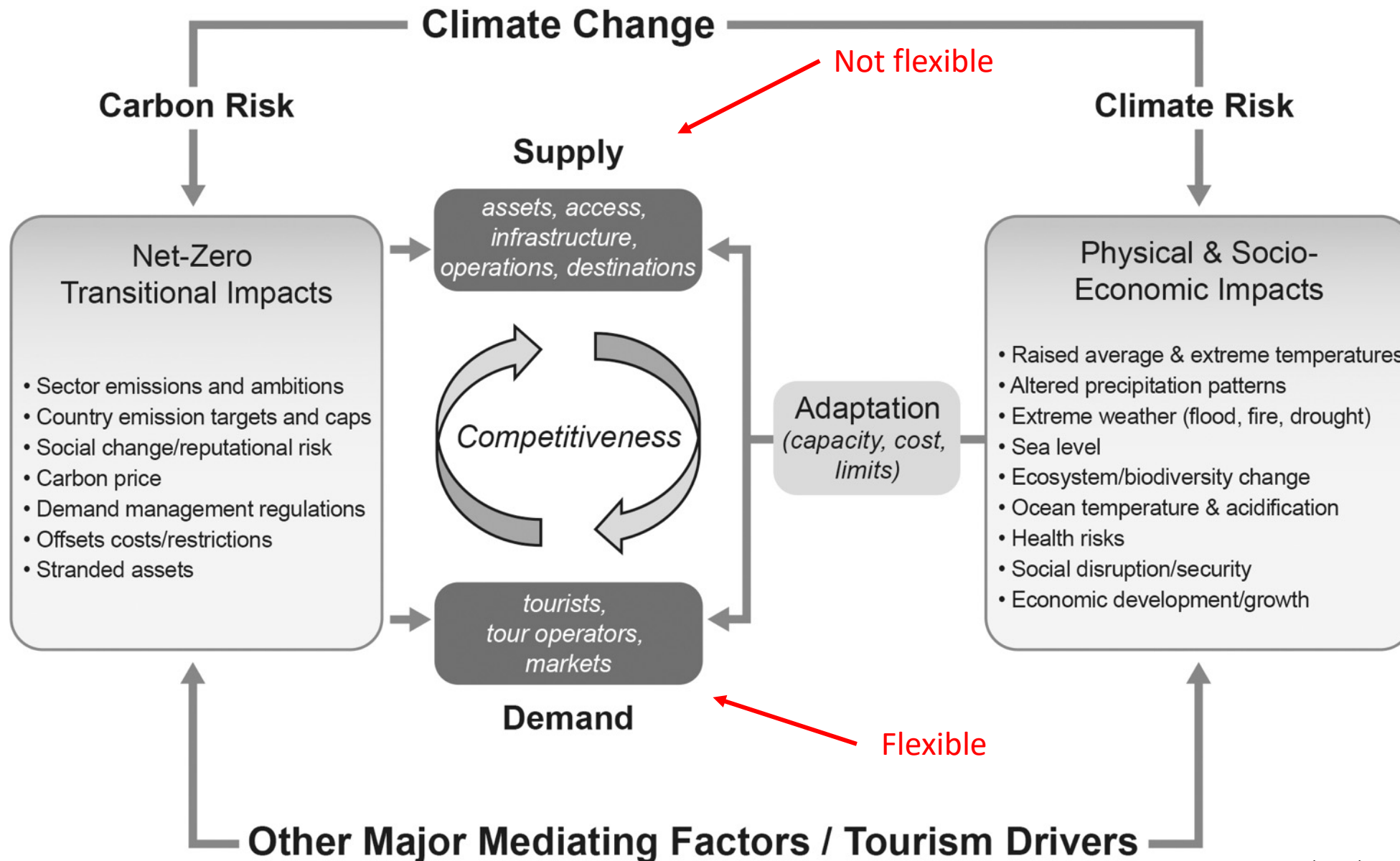
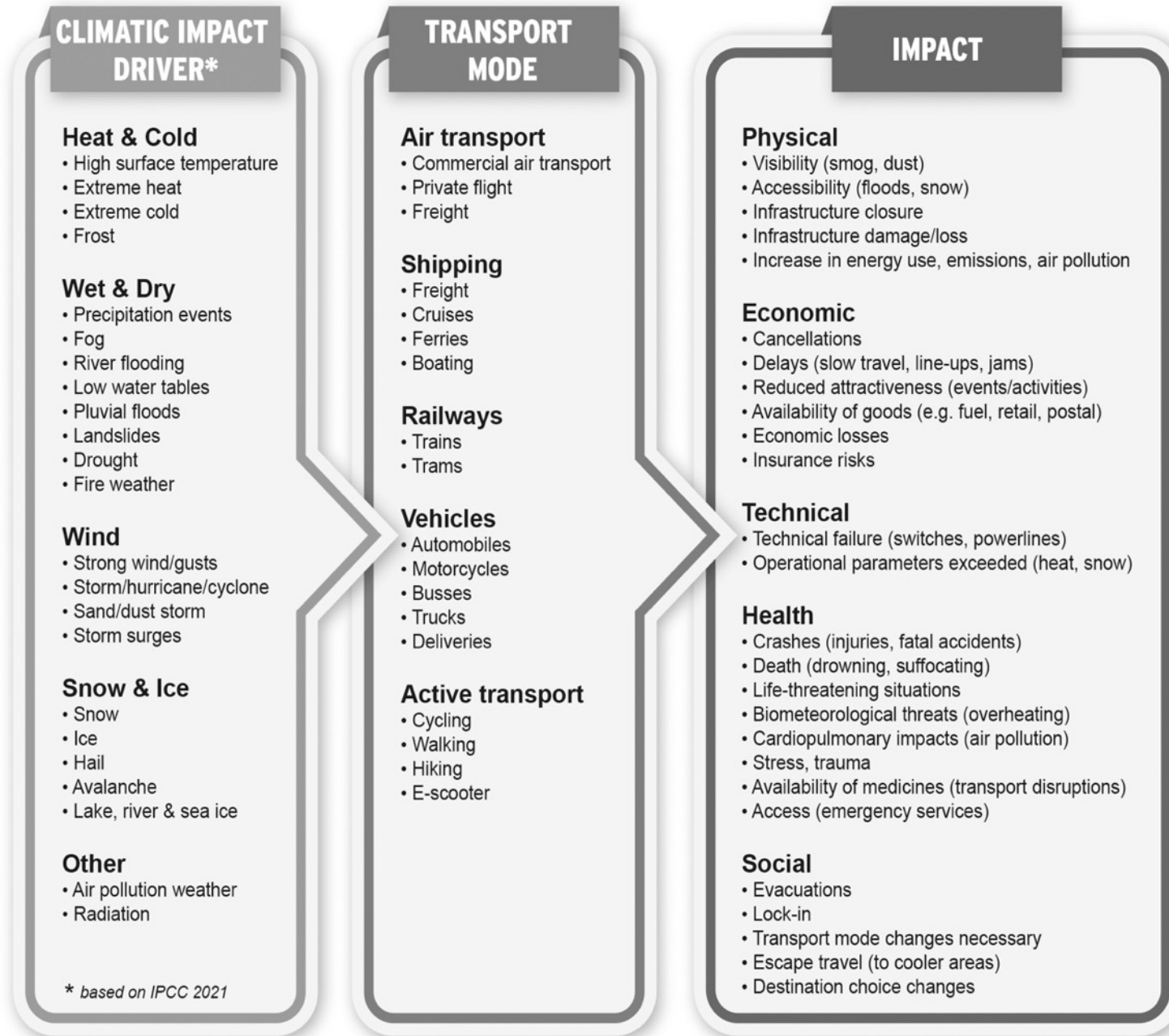


Ikke bare et varmere og våtere Norge,
men også en tøffere klimapolitikk.
Utfordringer for reiselivet

Stefan Gössling, 18 November 2022



Global impacts of climate change on transportation

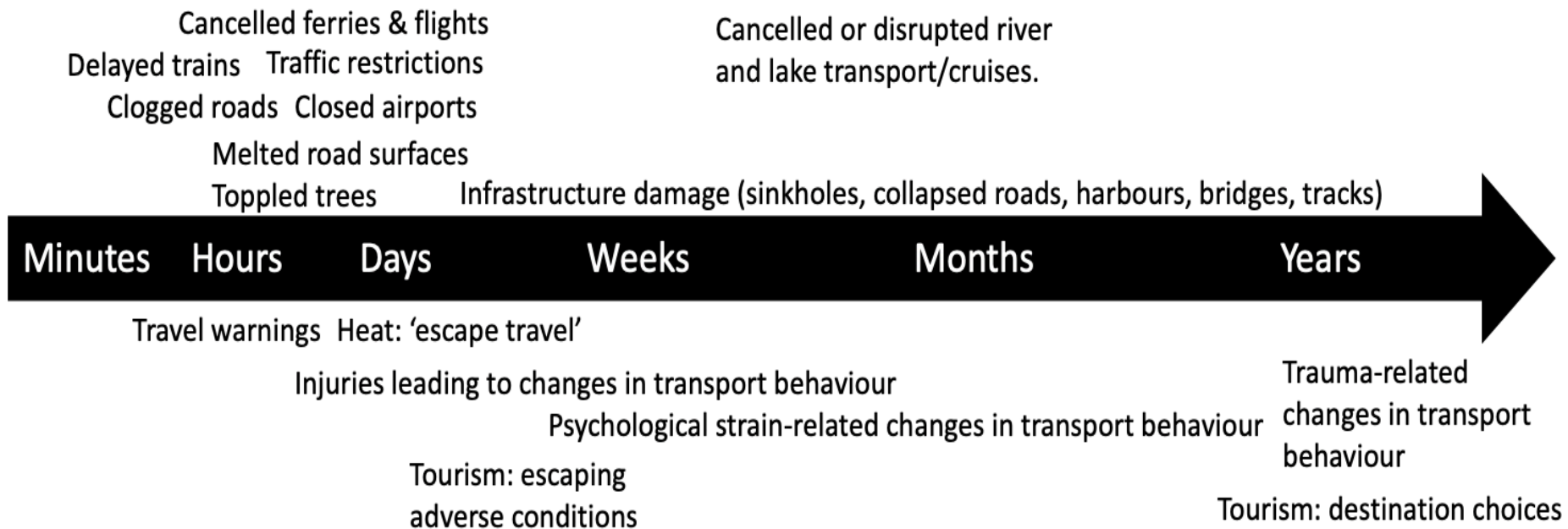


Gössling, S., Neger, C., Streicher, R. and Bell, R. 2022. Weather, climate change, and transport: A review. Natural Hazards, submitted.

Temporal perspective

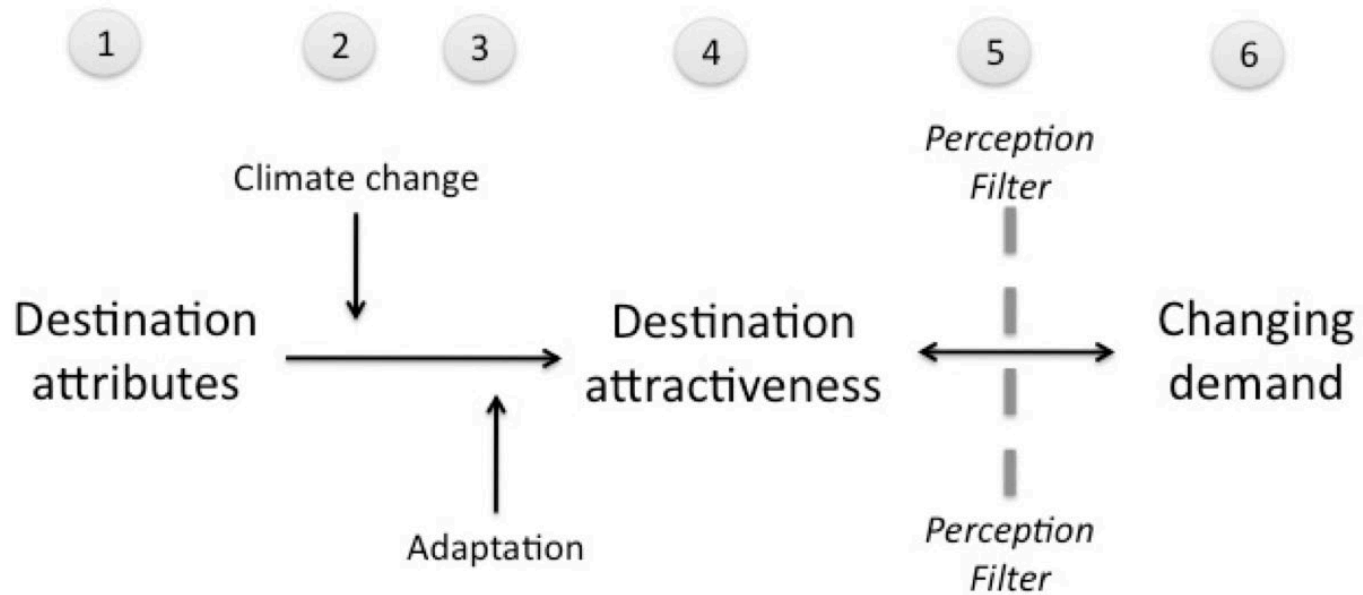
*Possibly the greatest risk for incoming tourism:
Delayed arrivals or no-shows*

Supply (Infrastructure)



Demand (Travel behaviour)

Unclear: Tourist demand responses



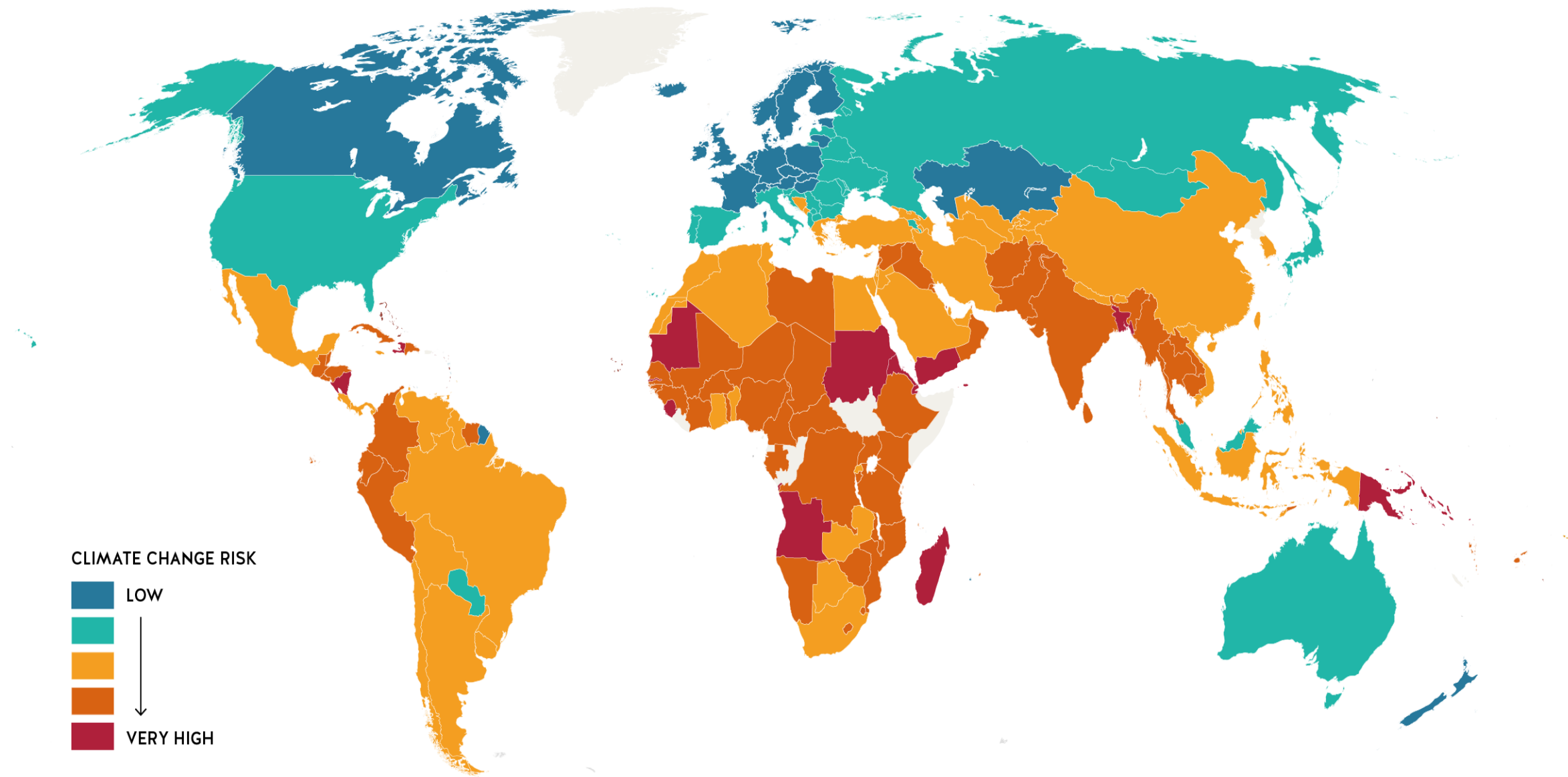
Norway Posts English > Trends

✓ Western Norway hit by torrential rain and 50-year flood: Voss sets up crisis staff

TRENDS Martha Trend 3 days ago 180



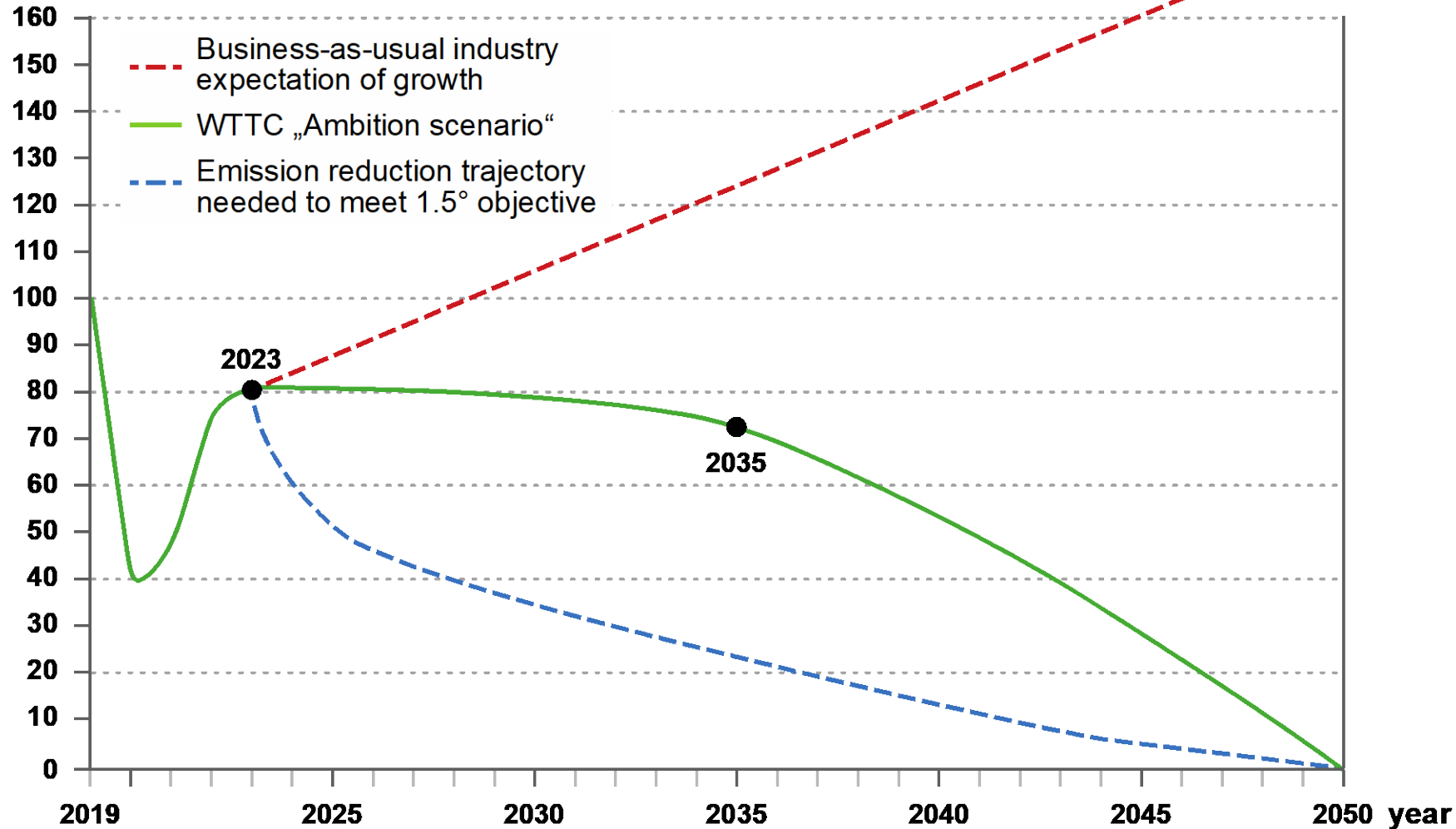
Gössling, S., et al. Consumer behaviour and demand response of tourists to climate change. *Annals of Tourism Research* (2011), doi:10.1016/j.annals.2011.11.002



Scott, D., Hall, C.M. and Gössling, S. 2019. Global tourism vulnerability to climate change. *Annals of Tourism Research*, 77: 49-61, <https://doi.org/10.1016/j.annals.2019.05.007>

From adaptation risks to carbon risks

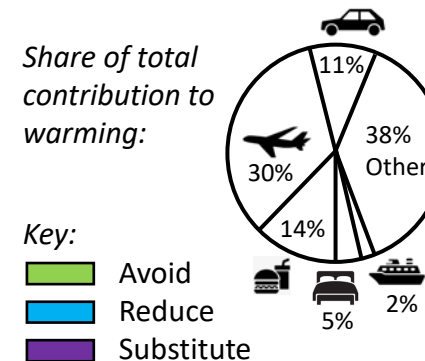
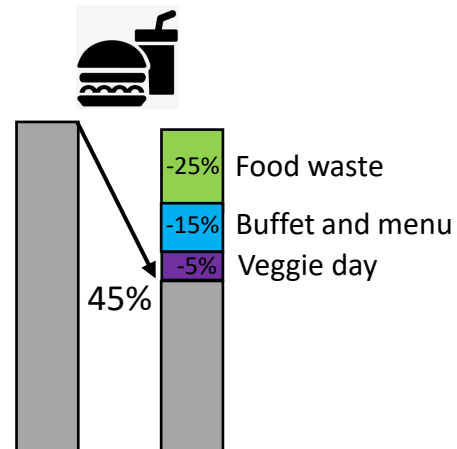
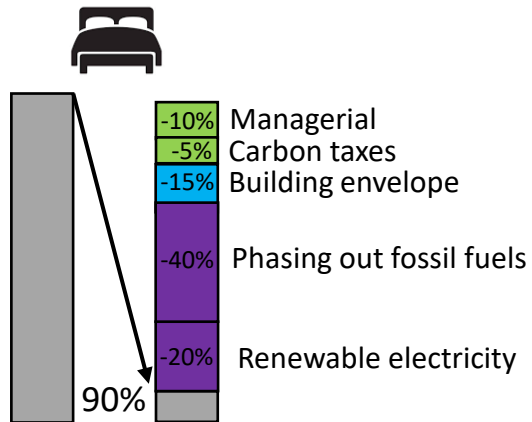
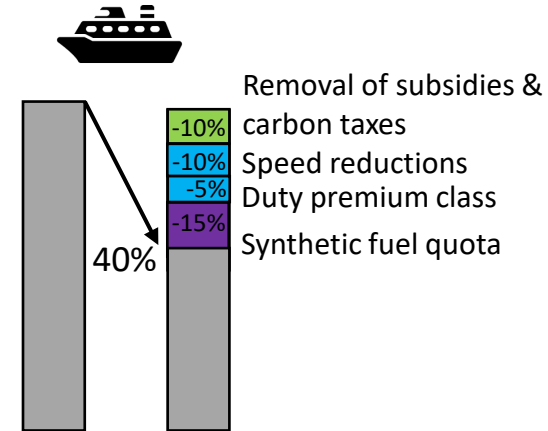
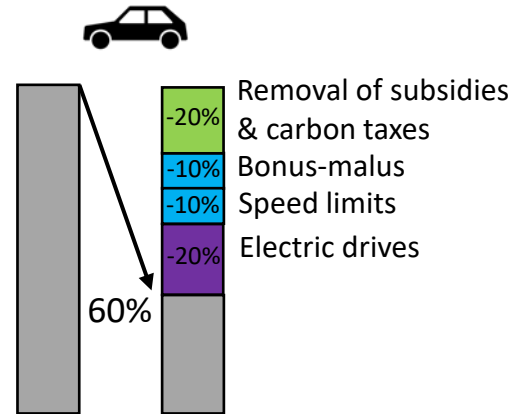
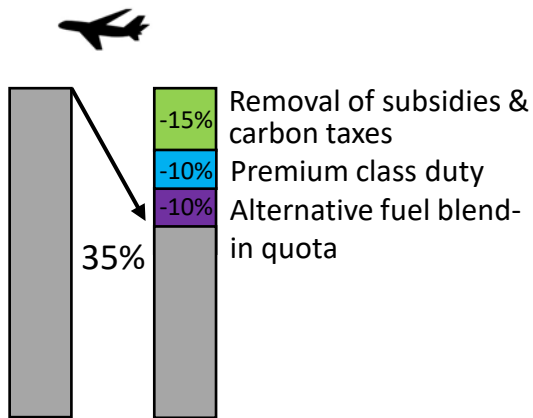
Absolute Emissions Index (2019 = 100)



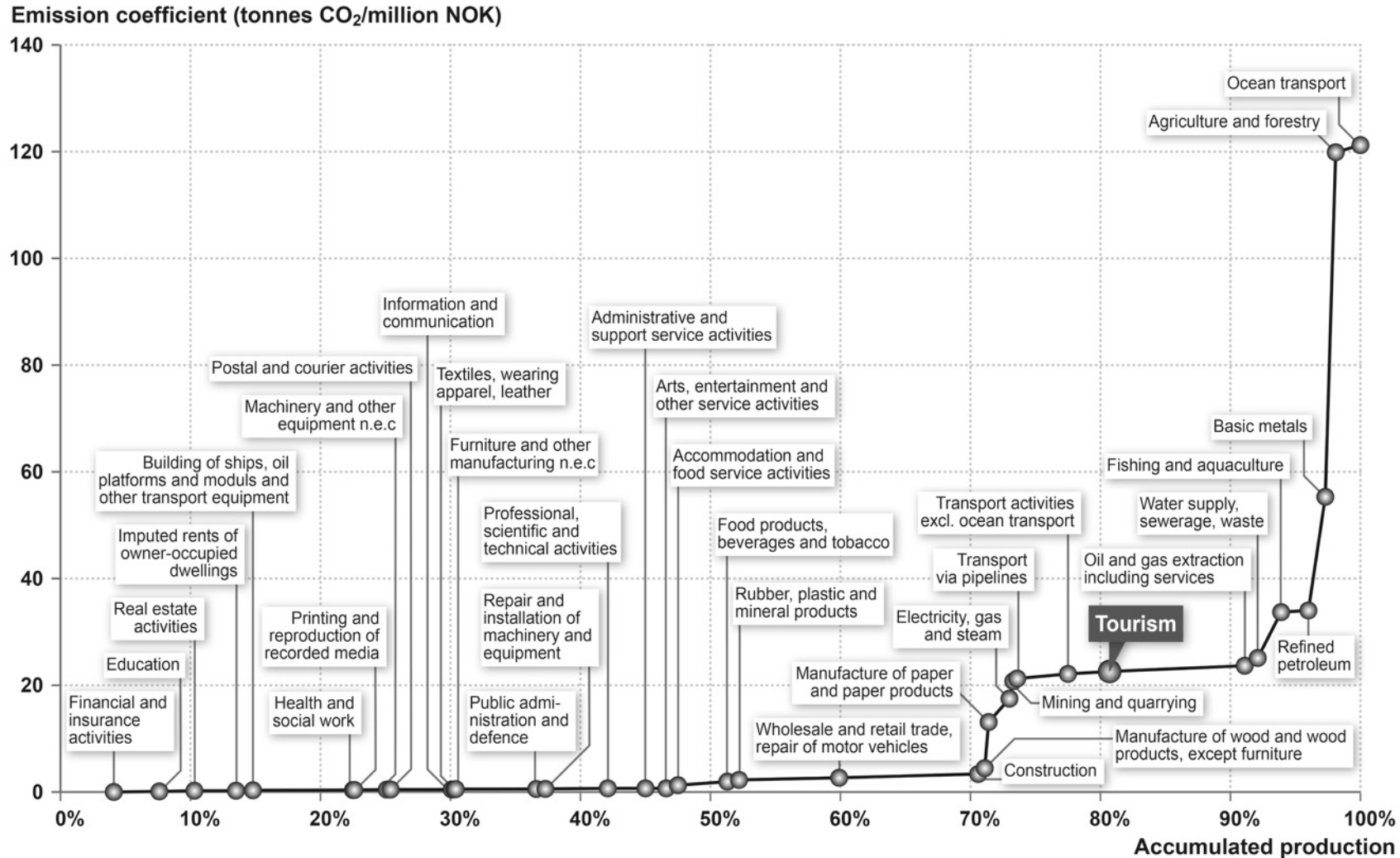
Gössling, S., Balas, M., Mayer, M. and Sun, Y.-Y. (2023). A review of tourism and climate change mitigation: The scales, scopes, stakeholders and strategies of carbon management. **Tourism Management** 95, <https://doi.org/10.1016/j.tourman.2022.104681>

Halving emissions to 2030?

Difficult even under no-growth scenarios



Climate policy. Will Norway lead the way?



Sun, Y.-Y., Gössling, S., et al. 2022. Can Norway become a net-zero economy under scenarios of tourism growth? Journal of Cleaner Production.

Case study Norway

The Norwegian tourism carbon emissions, 2019.

Spending and emissions	Inbound visitors	Domestic visitors (leisure)	Domestic visitors (business)	Total tourists	Percent of direct emissions	Percent of total emissions
Consumption expenditures (NOK million)	59,377	107,226	27,296	193,899		
Percentage	31%	55%	14%	100%		
Emissions (Mt)						
1. Total direct emissions (=1.1 + 1.2)	1.926	3.071	1.208	6.205		61%
1.1 Direct carbon emissions from sectors	1.076	2.094	1.208	4.379	100%	43%
Accommodation & food	0.024	0.021	0.014	0.059	1%	
Rail & road transport services	0.035	0.118	0.045	0.197	5%	
Water transport services	0.111	0.193	0.057	0.362	8%	
Air transport services	0.691	1.501	1.090	3.282	75%	
Transport equipment rental services	0.002	0.001	0.001	0.004	0%	
Travel agency operator services	0.000	0.012	0.001	0.014	0%	
Cultural services	0.001	0.001	0	0.002	0%	
Sports and recreational services	0.001	0.001	0	0.002	0%	
Tourism consumption of other products	0.211	0.246	0	0.457	10%	
1.2 Emissions from private motor vehicle	0.849	0.977	0	1.826		18%
2. Indirect emissions	0.561	1.157	0.031	1.927		19%
3. Embodied emissions	0.557	1.169	0.051	2.067		20%
4. Total emissions in Norway (=1 + 2)	2.487	4.229	1.239	8.132		80%
5. Total emissions in Norway and other countries (=1 + 2+3)	3.044	5.398	1.290	10.199		100%
Percent	30%	53%	17%	100%		
Direct emission/dollar ratio (t CO₂/million NOK)	18.1	19.5	44.3	22.6		

Benchmarks

Benchmarking tourism against the whole economy in Norway, 2019.

Economic and environmental performance	The tourism sector	Norway	Tourism share
GDP (NOK billion)	129.9	3568.5	3.6%
Employment (Full-time equivalents, 1000's)	171	2455	7.0%
Emissions(Mt)	6.205	70.883	8.8%
Emissions/revenue ratio ^a (t CO ₂ /million NOK)	22.58 ^a	10.76	

^a Private vehicle use does not generate revenue. To ensure consistency, we exclude emissions of private vehicle use.

Ranking by sector

Ranking of tourism, based on four indicators.

Revenue (billion NOK)		Employment (000's)		Total emissions (Mt)		Emission intensity (t CO ₂ /mill NOK)	
1. Construction	651	1. Health and social work	572	1. Oil and gas extraction	14.895	1. Ocean transport	121.2
2. Oil and gas extraction	630	2. Wholesale and retail trade	359	2. Ocean transport (non-tourism)	14.133	2. Agriculture and forestry	119.9
3. Wholesale and retail trade	465	3. Construction	247	3. Agriculture and forestry	5.988	3. Basic metals	55.3
4. Health and social work	464	4. Education	222	4. Land and air transport (non-tourism)	5.175	4. Refined petroleum and chemicals	34.0
5. Public administration	373	5. Public administration	221	5. Tourism	4.379	5. Fishing and aquaculture	33.7
Tourism (13th)	194	Tourism (6th)	171			Tourism (8th)	22.6
						National average	10.8

Needed decarbonization rates to net-zero

Table 5
Decarbonisation rates to net-zero under continued economic growth.

	Norway output (NOK billion)	Tourism output (NOK billion)	National CO ₂ (Mt)	Tourism CO ₂ (Mt)	Annual <u>national</u> decarbonisation rate on carbon intensity	Annual <u>tourism</u> decarbonisation rate on carbon intensity	Annual <u>national</u> decarbonisation rate on emissions	Annual <u>tourism</u> decarbonisation rate on emissions
2019	6,060	194	70.883	6.205				
Projected to 2050								
90% emission reduction	18,102	707	7.088	0.620	10.5%	11.3%	7.4%	7.4%
95% emission reduction	18,102	707	3.544	0.310	12.5%	13.3%	9.5%	9.5%
99% emission reduction	18,102	707	0.709	0.062	17.1%	17.9%	14.2%	14.2%

Norway: what did we learn from I/O?

- Tourism 3.6% of GDP, 8.8% of emissions (2019)
- National emissions declined by 0.2% per year, tourism emissions increased by 3.2% per year (2007-2019)
- Air transport responsible for 75% of direct tourism emissions
- Air transport responsible for 80% of emission growth (2007-2019)
- Assuming a continued growth in GDP, decarbonization efforts have to be scaled up by a factor 30 to achieve a decline in emissions by 90% by 2050

Technology

Over 25 years, the solution has been in the future*

Current ideas:

1. Battery-electric
2. Hydrogen(-electric)
3. Sustainable aviation fuels
4. Non-biogenic synthetic fuels

⇒ **In the absence of markets, how will any of these develop?**



*Peeters, P., Higham, J., Kutzner, D., Cohen, S., & Gössling, S. (2016). Are technology myths stalling aviation climate policy?. *Transportation Research Part D: Transport and Environment*, 44, 30-42.

EU Refuel

Table 1. Volume share of sustainable aviation fuels and synthetic aviation fuels in the European Commission ReFuelEU proposal, the European Parliament amendments, and the Council of the European Union amendments.

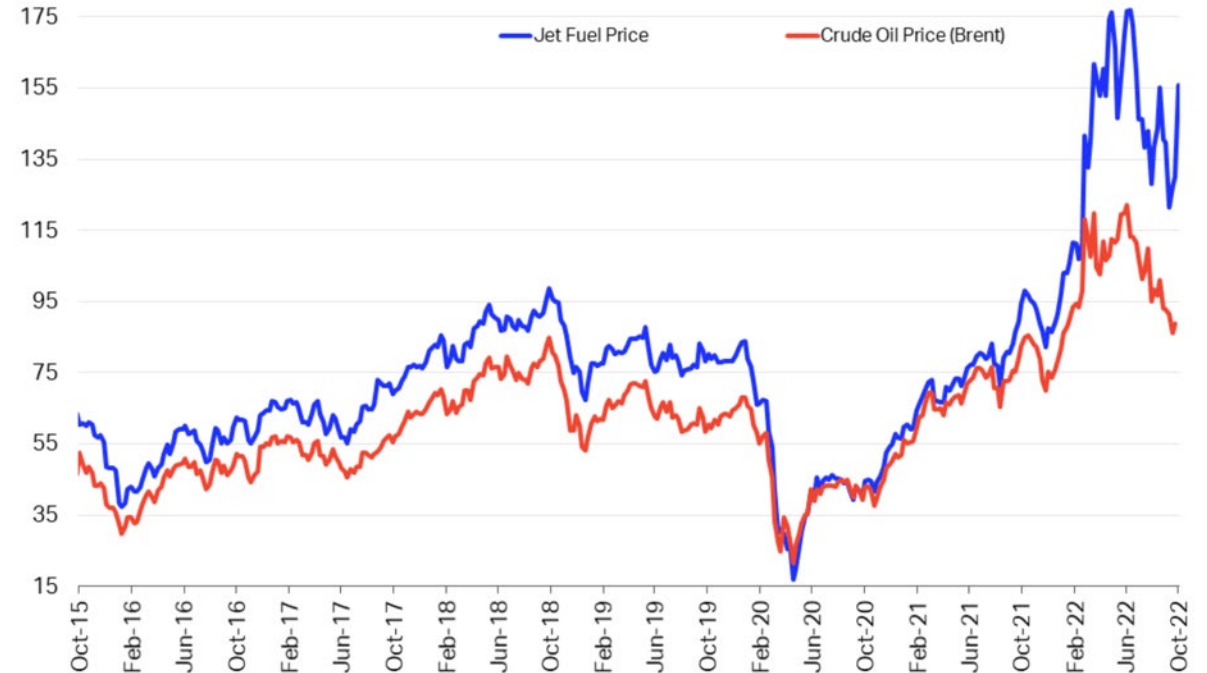
Year	Original European Commission proposal		European Parliament amendments		Council of the European Union amendments	
	Overall SAF target	Synthetic sub-target	Overall SAF target	Synthetic sub-target	Overall SAF target	Synthetic sub-target
2025	2%	-	2%	0.04%	2%	-
2030	5%	0.7%	6%	2%	6%	0.7%
2035	20%	5%	20%	5%	20%	5%
2040	32%	8%	37%	13%	32%	8%
2045	38%	11%	54%	27%	38%	11%
2050	63%	28%	85%	50%	63%	28%

Note: Shaded cells denote where the ambition in the Parliament or Council amendments is the same as the Commission proposal.

Scenario 2030

- 6% of fuel SAF, at most 5x as expensive as Jet A1
- 30% increase in fuel cost to 2030
- Fluctuation in jet fuel price Oct 2018- Feb 2022: about 85%

Jet Fuel & Crude Oil Price (\$/barrel)



Source: S&P Global, Refinitiv Eikon

<https://www.iata.org/en/publications/economics/fuel-monitor/>

=> We can/need to do more to create markets for SAF.

Ideal markets as previously defined for Norway

Table 3. Markets identified as suitable for the marketing of activities.

Segment for marketing	Price perception ^a	Net income (€) ^b	Length of stay ^c	Activities, # per day ^d	Spending per day (€) ^e	Activity intention ^f
AirBnB	8.77	49,183	8.60	0.62	126	5.32
Asia	8.49	104,687	8.07	0.53	192	4.61
USA	8.55	120,517	8.61	0.59	214	3.94
Italy	8.58	83,767	10.21	0.43	161	4.63
The Netherlands	8.78	40,974	15.20	0.28	154	2.94
<i>Survey average</i>	<i>8.73</i>	<i>58,942</i>	<i>11.00</i>	<i>0.44</i>	<i>139</i>	<i>3.95</i>

Note: a: measured on a scale 1–10, where 1 is very cheap and 10 is very expensive; b: Annual net income. c: Number of days in Norway. d: Number of activities per day. e: Total spending per day and person; f: number of activities considered attractive for participation.

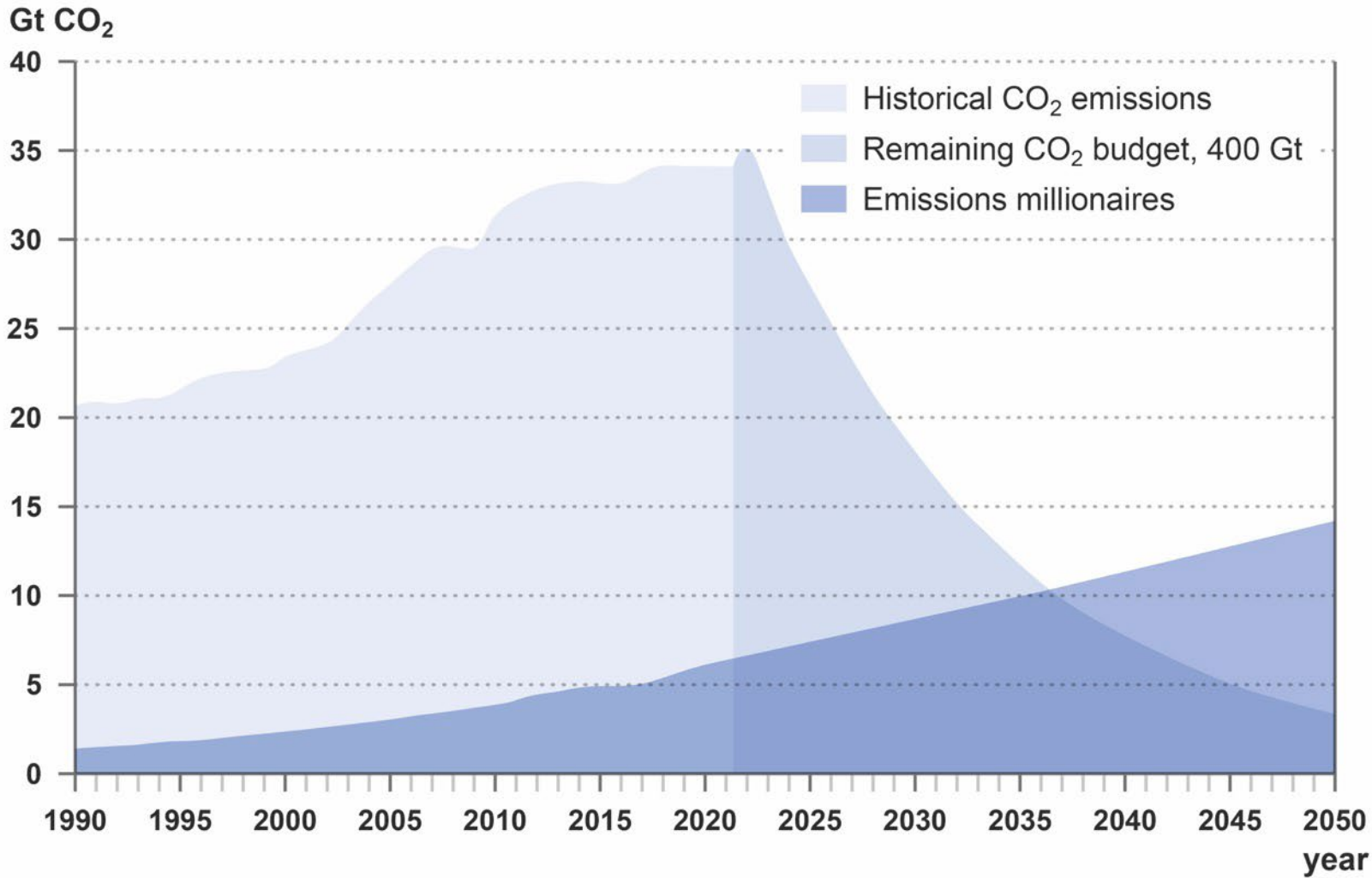
Spending – is money = money?



Format Extraordinaire

	600CL	1500CL	3000CL
 Perrier Jouët "Belle Époque"	14000		
 Perrier-Jouët "Belle Époque Blanc de Blancs"	21000		
Armand de Brignac "Ace of Spades"		56000	125000
Armand de Brignac "Ace of Spades" Rosé		75000	250000
Louis Roederer "Cristal Rosé"	55000		
Dom Pérignon "Rosé Gold"	125000		

Growth in wealth: Implications for emissions



Gössling, S. and Humpe, S. 2022. Millionaire spending incompatible with 1.5°C ambitions. Cleaner Production Letters, in press.



BUSINESS | GLOBAL ISSUES

What a carbon tax for the superrich could look like

Sergio Matalucci

19 hours ago

The superrich — sometimes defined as the top 1% of earners — are responsible for a huge share of global carbon emissions. Without targeted schemes, their footprint is likely to increase.



© Mischa Keeminiz/PRO SHOTS/picture all

Conclusions

- Even though climate risks may be small for tourism within Norway, this is not necessarily true when looking at incoming international tourism;
- Climate risks will increase, and so will calls for policy-makers to act;
- Political measures to be taken should include a continuation of CO₂ taxes, possibly at even more ambitious levels;
- The fuel transition in aviation is an Achilles heel; a national feed-in quota at more ambitious level than EU proposal is needed for this sector;
- Changes in the tourism system need to be anticipated, but this is not necessarily negative for Norway;
- Furthermore: consideration of the super emitters is key; ethical debates on the super emitters will continue and become more urgent.