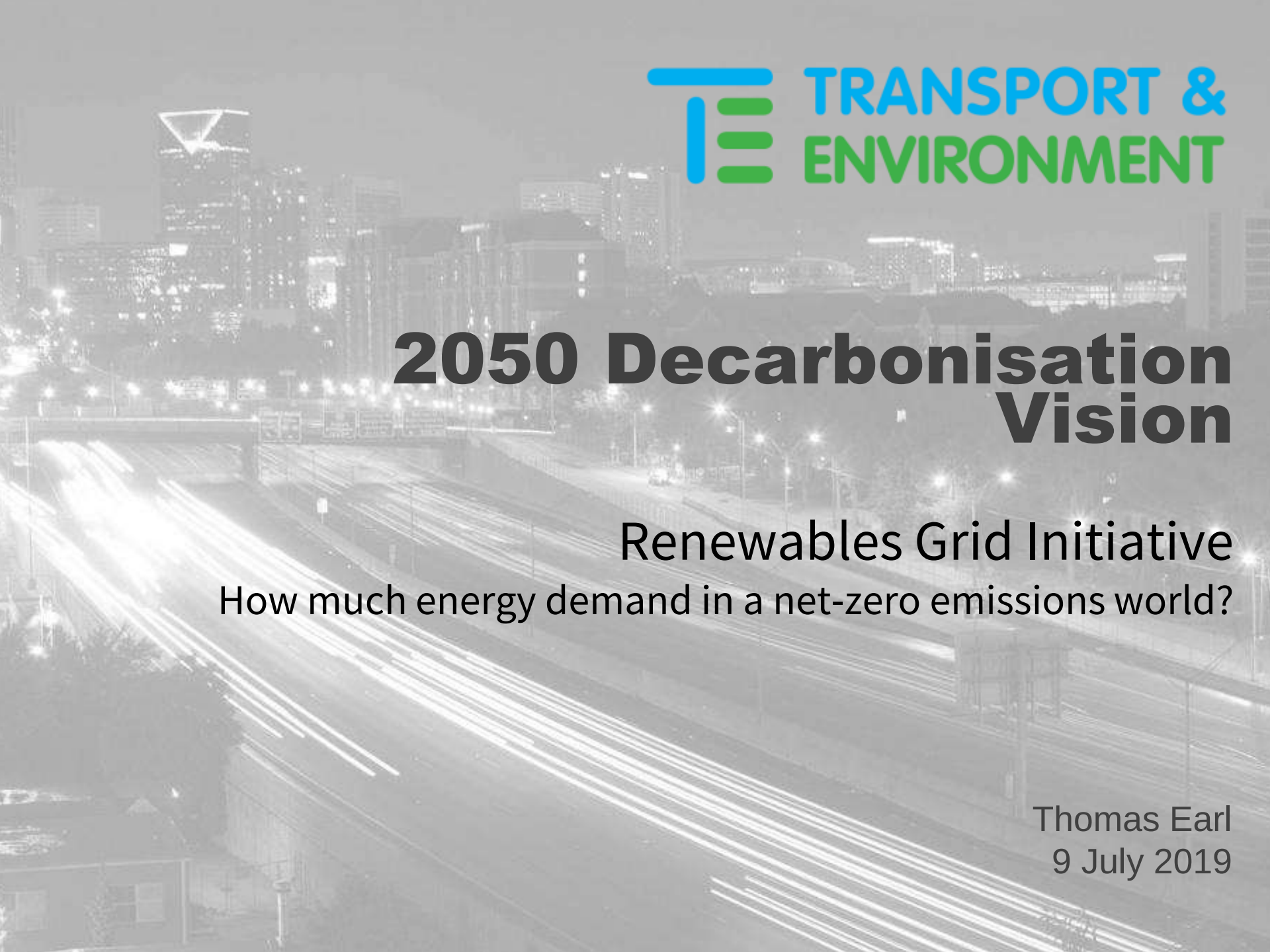


2050 Decarbonisation Vision

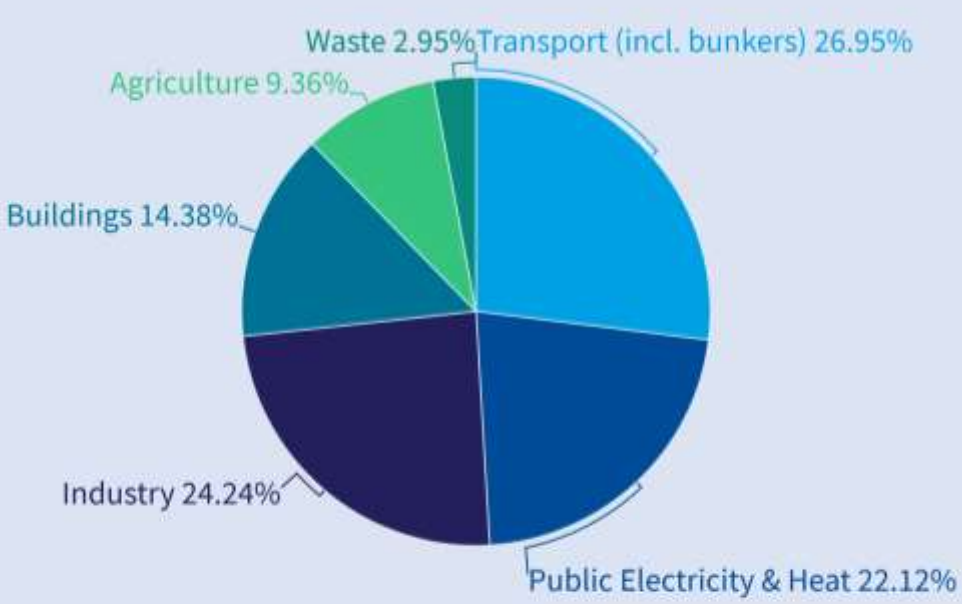
Renewables Grid Initiative

How much energy demand in a net-zero emissions world?

Thomas Earl

9 July 2019

Largest climate problem

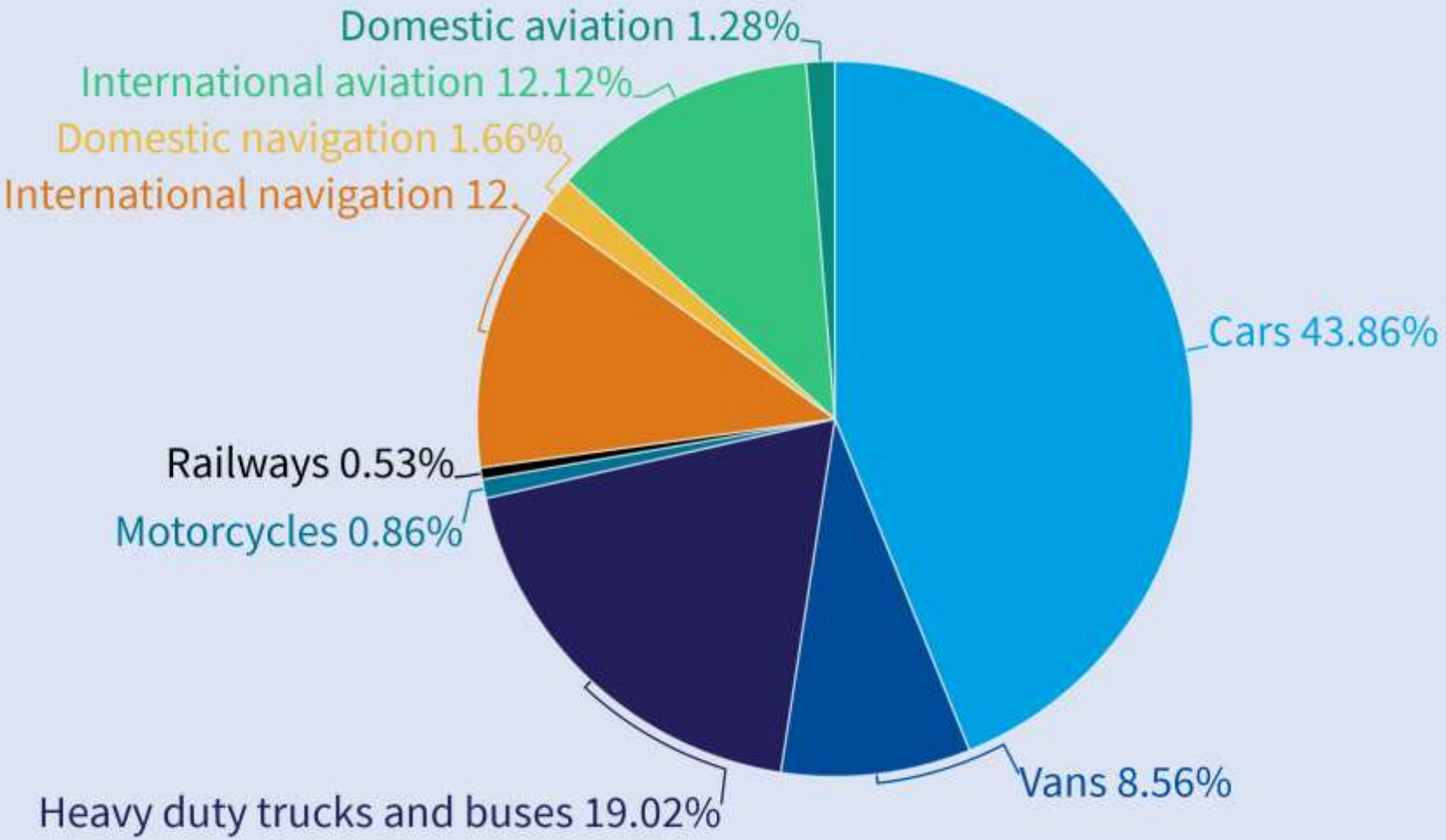


Source: Adapted by T&E from EEA, Approximated EU greenhouse gas inventory 2017

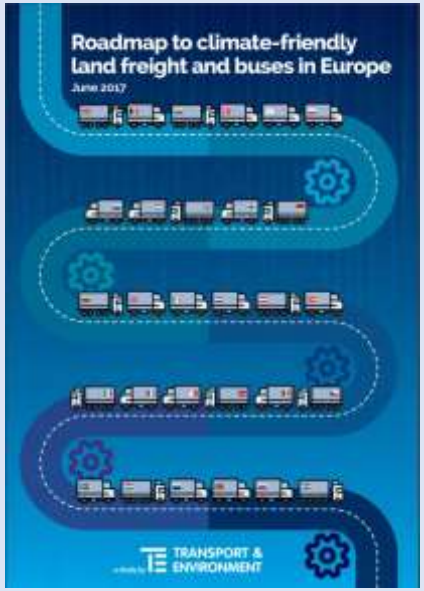
Notes: Sectors by IPCC codes: Public Electricity & Heat (1.A.1.a); Industry (1.A.1.b-c, 1.A.2, 1.B, 2); Transport incl. bunkers (1.A.3, 1.D.1), Buildings (1.A.4, 1.A.5), Agriculture (3), and Waste (5). Subsector splits for 1.A.1 use 2016 emission shares as a proxy.

Source: Transport & Environment from Member States' reporting to the UNFCCC (1990-2016 data) and EEA's approximated EU greenhouse gas inventory (2017 data)

Transport split



Papers published



EU TRANSPORTATION ROADMAP MODEL
Powered by T&E

Land transport

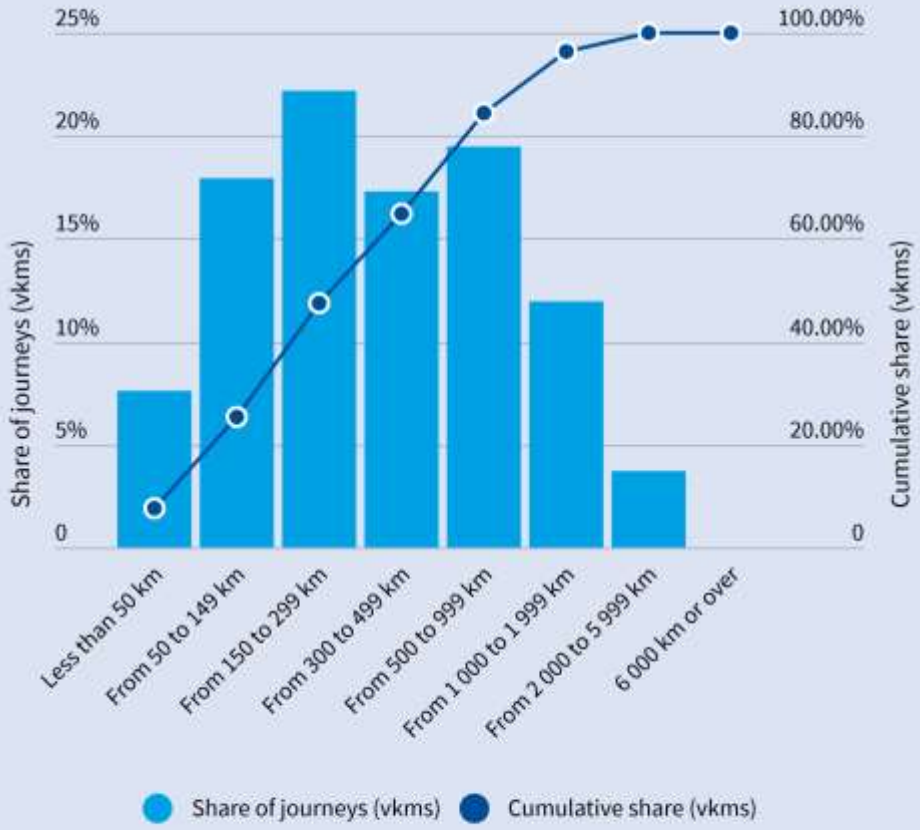
DEMAND MANAGEMENT

MODAL SHIFT

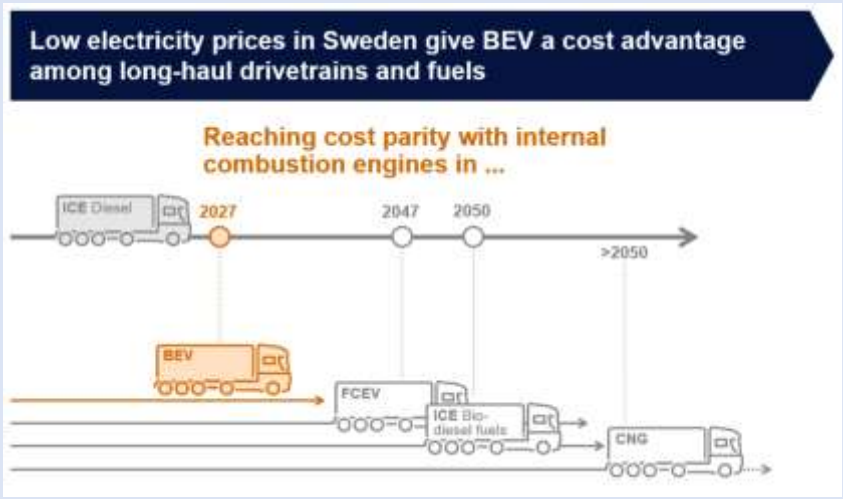
Sales of Zero Emission Vehicles	2025	2030	2035	2050
Motorcycles & mopeds	50%	100%	100%	100%
Passenger cars	15%	40%	100%	100%
Vans	20%	50%	100%	100%
Urban buses	50%	100%	100%	100%
Coaches	10%	25%	50%	100%
HGVs (<16t)[3]	10%	30%	80%	100%
HGVs (>16t)[4]	5%	30%	80%	100%
Rail (passenger and freight)[§]	70%	80%	90%	100%

Long haul road freight

European operations and total cost of ownership



Source: Eurostat table road_go_ta_dc, accessed June 2018

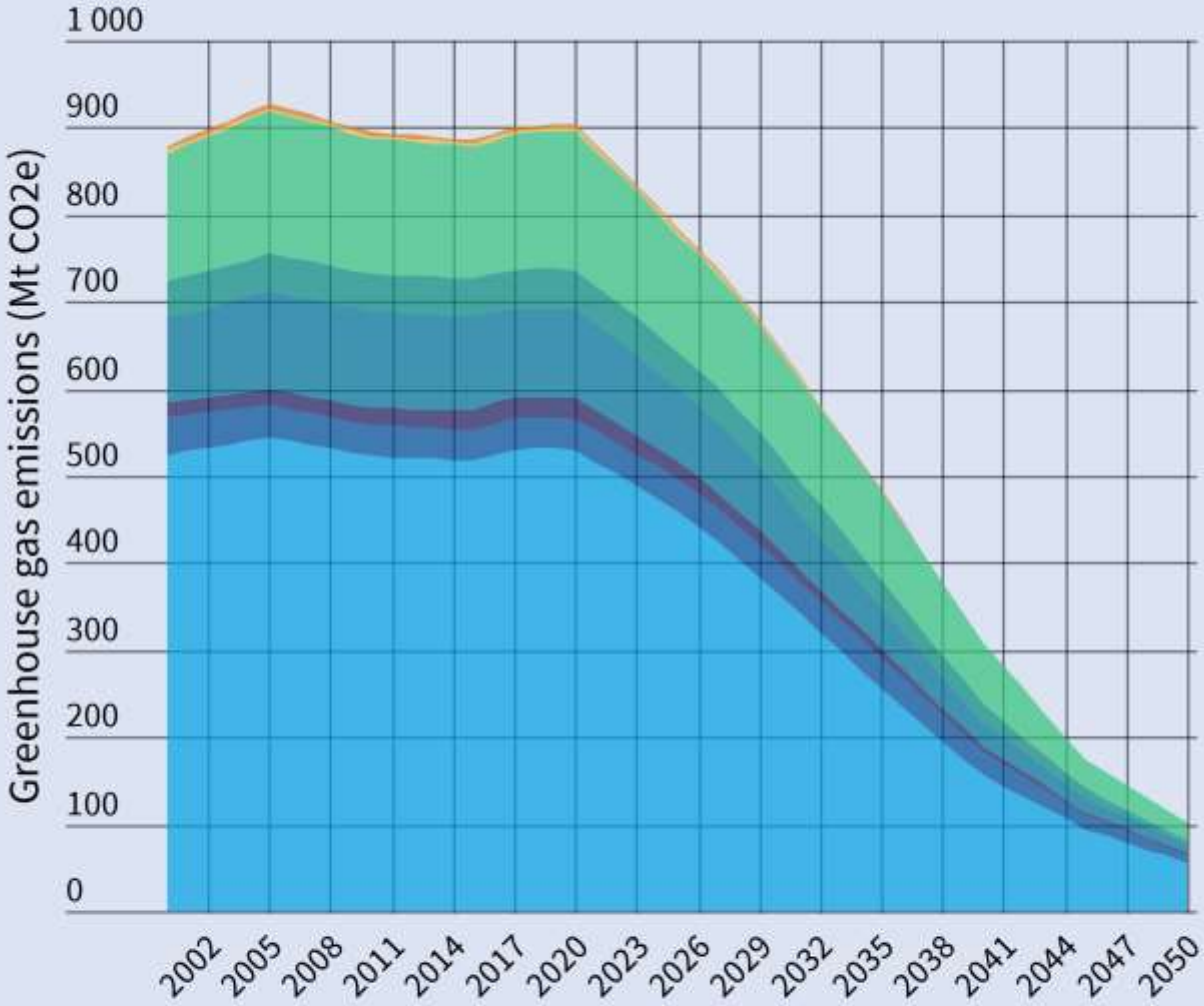


Scania (2018): THE PATHWAYS STUDY: Achieving fossil-free commercial transport by 2050

See also:

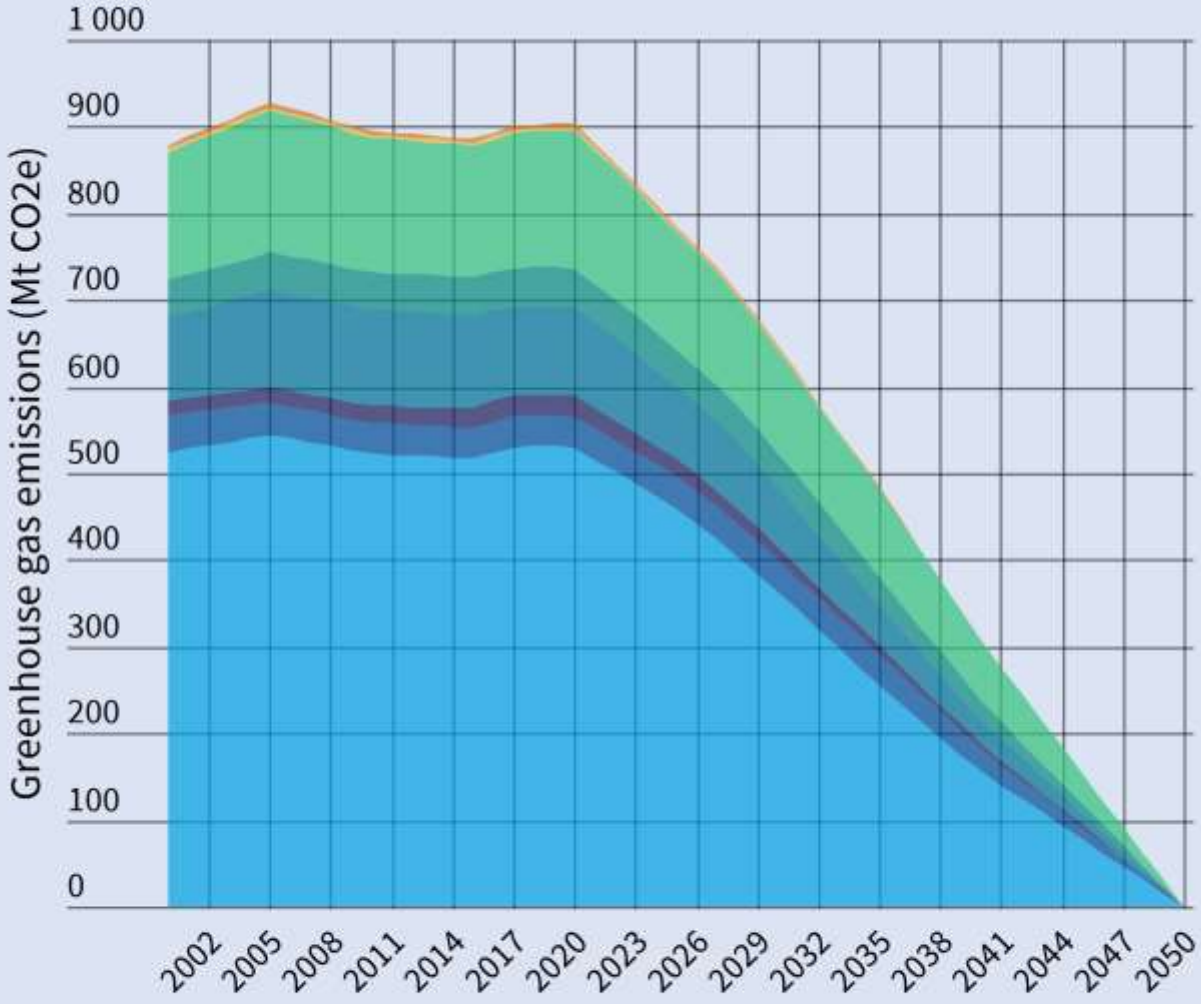
Analysis of long haul battery electric trucks in EU
www.transportenvironment.org/publications/analysis-long-haul-battery-electric-trucks-eu

Not enough to get to zero



EU TRANSPORTATION ROADMAP MODEL

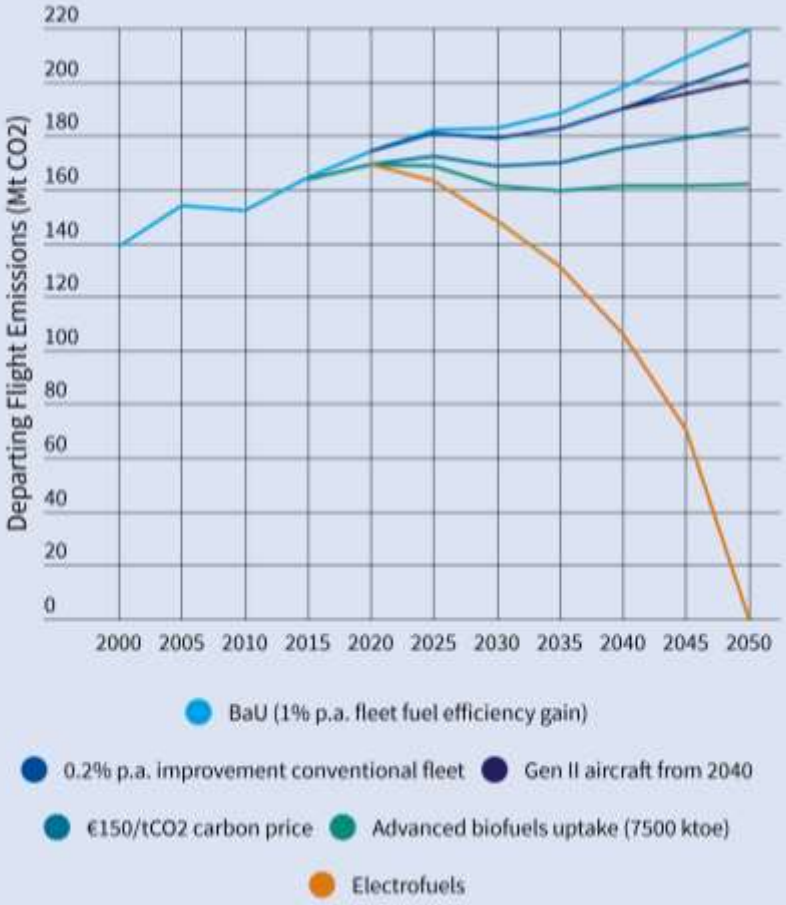
Legacy fleet phase out

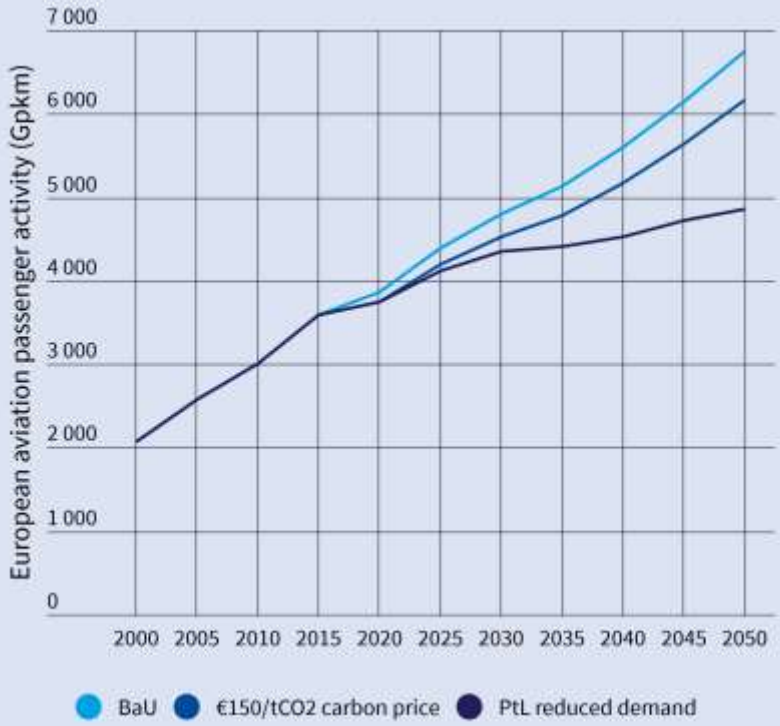


EU TRANSPORTATION ROADMAP MODEL

European aviation

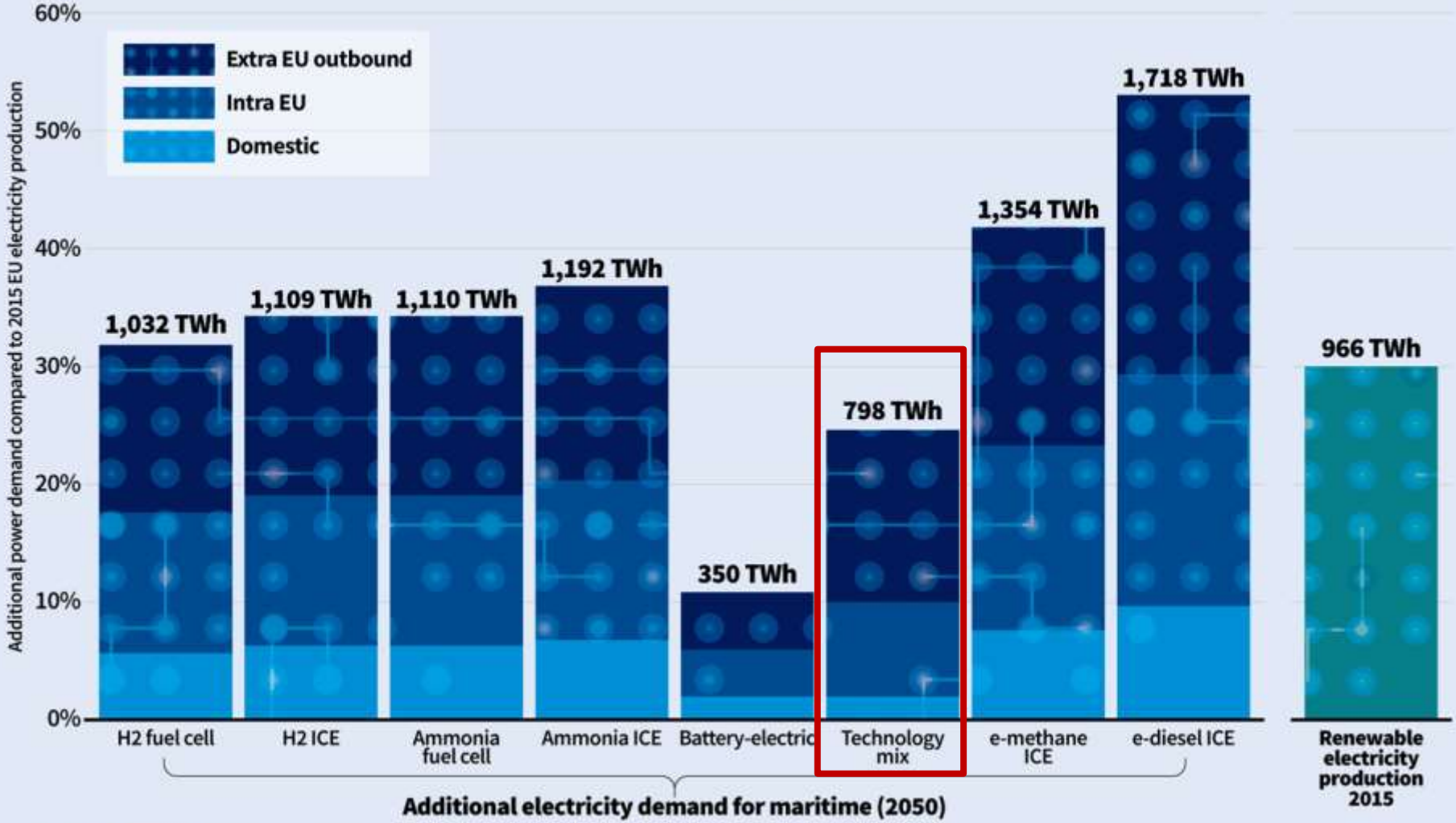
Demand reduction and synthetic fuels





	2020	2025	2030	2035	2040	2045	2050		
PtL in the fuel mix	0.0%	1.7%	4.7%	12.1%	27.0%	50.1%	100.0%	39.2 Mtoe	912 TWh (28.2%)

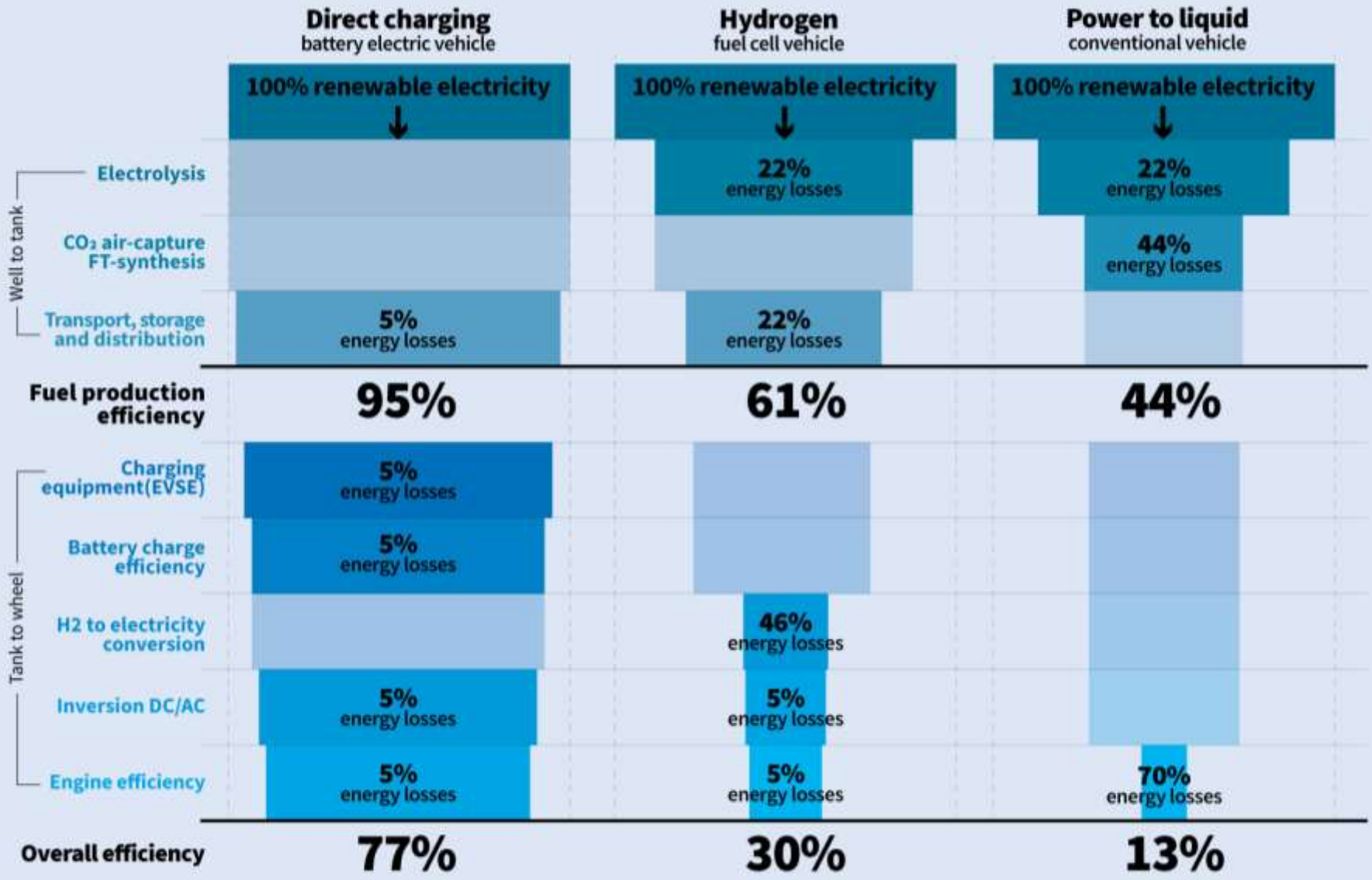
Shipping's additional electricity demand under different technology pathways in 2050



TRANSPORT & ENVIRONMENT @transenv @transenv transportenvironment.org

Source: Transport & Environment (2018)

Efficiency first

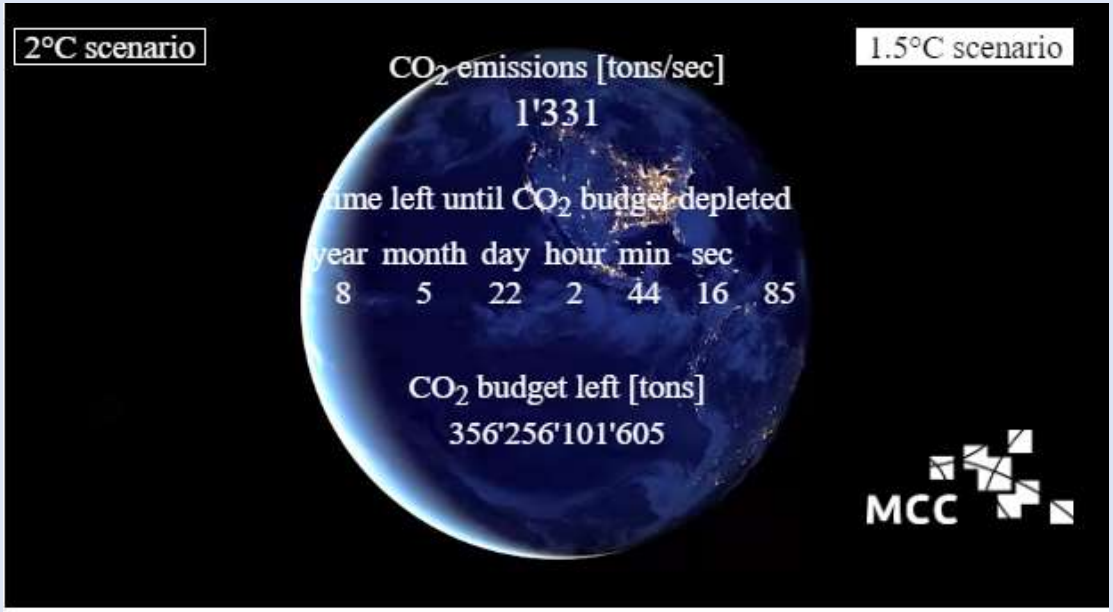


Source: WTT (LBST, IEA, World bank), TTW, (IEA, DOE, Transport & Environment calculations)
Note: values displayed here are on the higher side (optimistic) of the ranges found in the bibliography

Additional clean electricity

Transport mode	Electricity Generation for electric vehicles (TWh)	Electrofuels		Optimal pathway (TWh)
		Hydrogen/ Ammonia[5] (TWh)	Synthetic fuels (diesel, petrol, gas and kerosene) (TWh)	
Motorbikes	34 (1.1%)	90 (2.8%)	203 (6.3%)	34 (1.1%)
Cars	475 (14.7%)	1236 (38.3%)	2187 (67.6%)	475 (14.7%)
Vans	146 (4.5%)	381 (11.8%)	672 (20.8%)	146 (4.5%)
Buses	119 (3.7%)	310 (9.6%)	547 (16.9%)	119 (3.7%)
Trucks (<16t)	112 (3.5%)	292 (9.0%)	515 (15.9%)	112 (3.5%)
Trucks (>16t)	364 (11.2%)	949 (29.4%)	1676 (51.8%)	364 (11.2%)
Trains	145 (4.5%)	219 (6.8%)[§]	NA	145 (4.5%)
Total land transport:	1395 (43.1%)	3479 (107.6%)	5799 (179.3%)	1395 (43.1%)
Shipping	350 (11%)	1032-1192 (32-37%)	1718 (53%)	798 (25%)
Aviation	N/A	N/A	912 (28.2%)	912 (28.2%)

CO_2 budget



Transport mode	Share of EU emissions in 2016	Carbon Budget from 2018 (Mt CO_2 eq.; 66% probability)		Cumulative emissions 2018 to 2050 (Mt CO_2 eq)
		1.5°C	2°C	
Motorbikes	0.23%	89	227	439
Cars	11.90%	4564	11628	9225
Vans	2.32%	891	2269	1721
Trucks & buses	5.16%	1979	5041	4976
Trains	0.14%	55	139	112
Aviation	3.64%	1395	3553	3861
Total§	23.39%	8972	22857	20310