Road Transport Decarbonization Options

Emission reduction pathways for your transport

March 2021

Without immediate action, global CO_2 budgets for limiting future temperature increase to 1.5°C will be used most likely by 2023

Carbon countdown as of beginning 2017

[…] If the current trend continues we may see temperature increases **3-5°C by the end of the century**

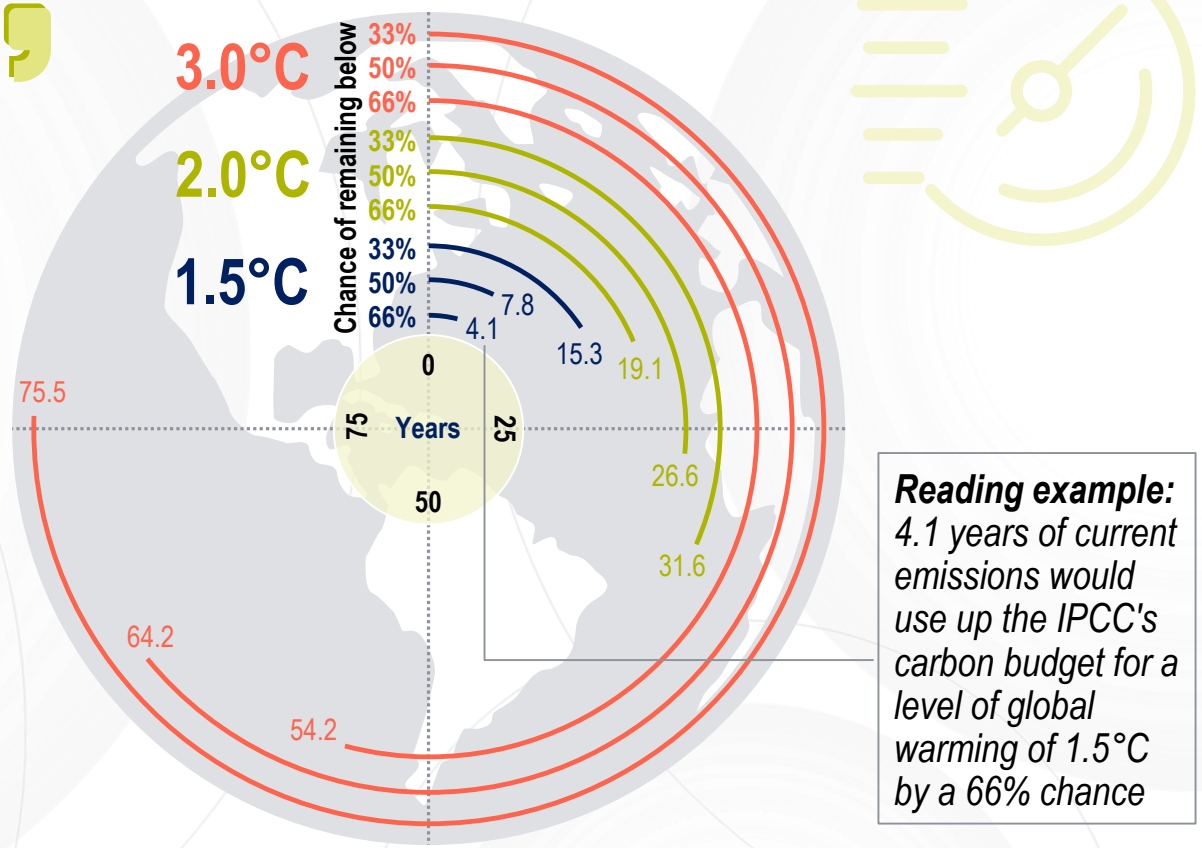
World Meteorological Organization, 2018

[…] Without significant reductions in emissions, average global temperatures could rise by 5ºC by the end of the century

U.S. Global Change Research Program, 2018

[…] we have at most 12 years to make the drastic and unprecedented changes needed to prevent average global temperatures from rising beyond the Paris Agreement's 1.5ºC target

IPCC, 2018



Note: Calculations are based on 2016 CO2 emissions and the synthesize of various scientific analysis and studies amongst others of the Earth Systems Models calculations used by the IPCC; Carbon budgets define how much CO2 the world can emit and still keep global average temperature rise to no more than 1.5°C or 2°C above pre-industrial levels

Source: Carbon Brief, IPCC, WMO, Roland Berger

Regulation, investors and customer behavior drive decarbonization – Analyzing your specific options today can optimize investment

Regulatory targets

Transport CO_2	Long-term	
-30% 2030		*Pathway to reaching climate neutrality by 2050* Ursula von der Leyen
-15-27% 2027		*Achieve net zero emissions by 2050* Joe Biden
-15% 2020		*Achieve carbon neutrality before 2060* Xi Jinping

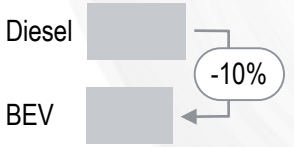
Climate Action for transport today can …

- Create transparency on upcoming trends and their impact on your business
- Optimize investments in alternative technologies and assets with long lifetimes/investment cycles
- Benefit from funding and policy momentum
- Position your company as frontrunner

Customer behavior

88 % of customers offset carbon for shipping to their bills by default in online shopping if they are given the option[2)]

Leveraging incentives can pay off already today



-10% TCO if bonus/ malus leveraged optimally[4)]

Best practice

DHL: -30% 2025

amazon: Shipment Zero[3)] 2030

PEPSICO: Net zero 2040

MAERSK: Net zero 2050

1) Fuel consumption standards; 2) Experiment by NREL researchers; 3) 50% of all shipments net zero carbon by 2030 4) Example trucks in Germany under specific circumstances

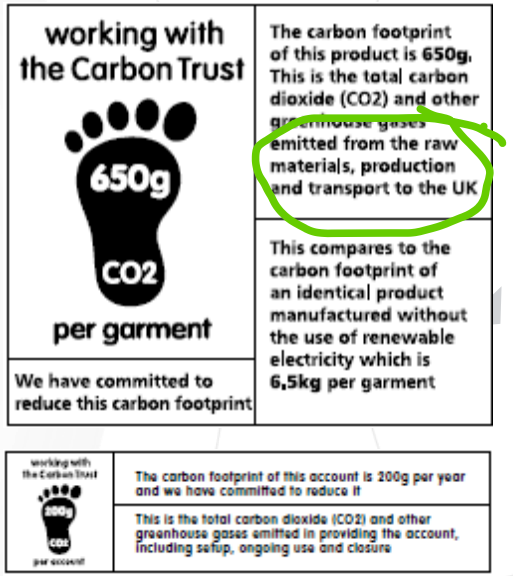
Customers are stepping up requirements on companies with reaction by the industry

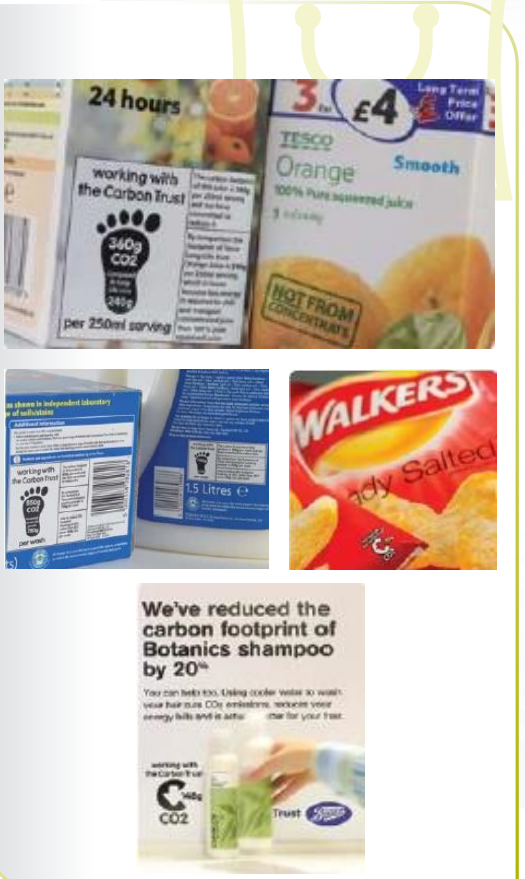
Example of products' carbon labelling – includes transport emissions

Unilever
recently announced the introduction of Carbon Labels on 70,000 products

L'Oreal's
pledge to gradually roll out environmental and social impact labelling for its products by 2030

Nestle
are reportedly considering putting carbon labels on their food



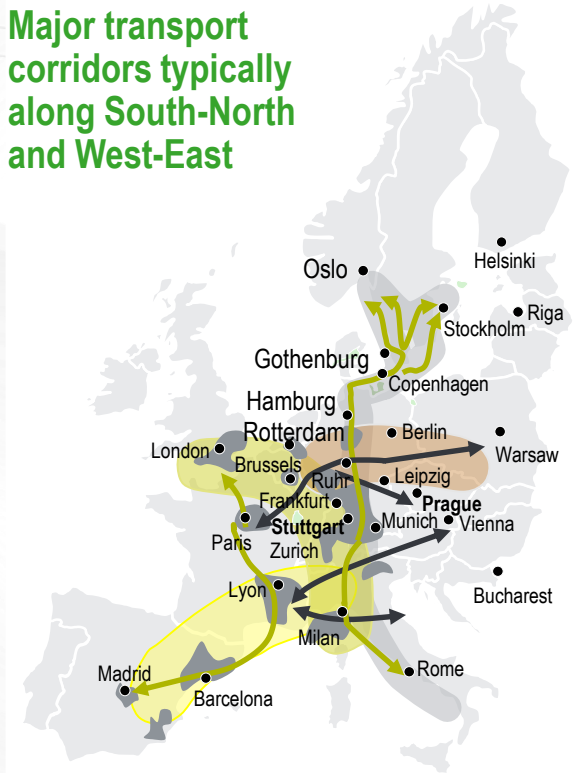


Source: desk research, Roland Berger

The road freight sector is an important pillar of the European economy, yet a significant source of CO_2 emissions

Road freight sector in the EU

Major transport corridors typically along South-North and West-East



6,6 m **trucks drive in the EU** (medium- and heavy-duty)

300 k **new heavy-duty trucks** are sold in Europe **every year**

~5% **of total EU CO_2 emissions** come from heavy-duty road transport

~27% of specific **road transport CO_2 emissions** in the EU come from **lorries, buses and coaches**

Transportation North-South
Transportation East-West
Conurbations and logistics hubs
Scandinavia-Mediterranean-corridor
'Blue Banana'-corridor (UK-BE-NL-GE-CH-IT)
'Golden Banana'-corridor (Mediterranean cost)
New East-West corridors, e.g. Germany-Poland

Source: European Commission; EEA; ACEA; Colliers; Savills; desk research; Roland Berger

Public discussions and legislation increasingly push for higher decarbonisation ambition, including emission targets for HD trucks

HD road freight decarbonisation trajectory

Markets		HDT CO_2 standards	Long-term target
North America	USA	**2027 GHG Phase 2 standards** [-15-27% compared to 2018 baseline]	n/a
	Canada	**2027 GHG Phase 2 standards** [-15-27% compared to 2018 baseline]	**2050** Net-Zero Emission target
Europe	EU	**2030 CO_2 standards** [-30% compared to 2019/20 baseline]	**2050** Net-Zero Emission target with a 90% reduction in transport emissions
Asia	China	**2020 Fuel consumption standards** [-15% compared to 2015 baseline]	**2030** expected CO_2 emission peak, no overall reduction target
	South Korea	Euro VI based overall emission standards (no specific CO_2 regulation)	**2050** Discussion on net-zero emission target
	Japan	**2025 Fuel economy standards** [avg. -13% compared to 2015 baseline]	**2050** 80% reduction of transport emissions

> **Increasingly stricter CO_2 emission targets** are implemented for key HDT markets worldwide

> **Country-specific factors** make for a **difficult direct comparison of stringency** across standards and long-term targets:
  - Technology baselines
  - Testing methodologies
  - Test cycles
  - Allowed payloads

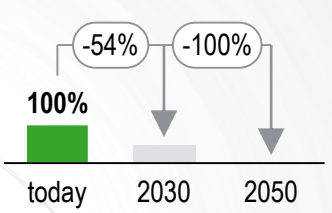
Note: Emission reduction targets refer to different baseline years and technologies and are as such not like for like comparable

Source: UN, United States Environmental Protection Agency; Government of Canada; European Commission; Statista; ICCT; Desk research; Roland Berger

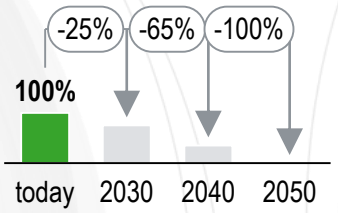
Low emission transport technologies are increasingly becoming available in all modes

Decarbonization targets[1)]

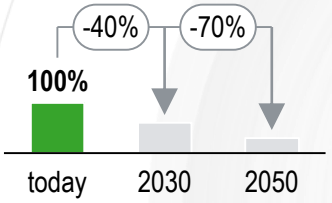
Road



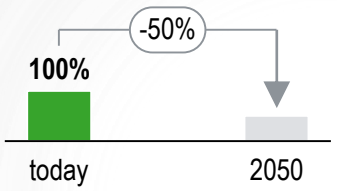
Rail



Marine



Aviation



Propulsion technology

		Road	Rail	Marine	Aviation
1	**Battery electric**	High adoption of BEV especially in Europe	First commercial applications in the next few years	First battery electric ferries and sport boats	First prototypes of VTOL
2	**Fuel cell electric**	Advantages for heavy duty, long range transport	First commercial applications for reg. multiple units	First small-scale fuel cell ships, large announcements	No commercial applications
3	**Renewable fuels** – Bio/Waste	Widespread usage of drop-in Bio Me/EtOH	Usage of drop-in and pure biodiesels	First Bio-diesel usage by ferries	Usage of drop-in Bio-kerosene by multiple airlines
	Renewable fuels – E-fuels	First e-CNG and e-MeOH vehicles	No commercial applications	Adv. production processes for e-diesel	First projects for e-kerosene starting
...	**+ Other technologies**				

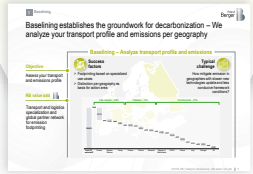
1) European commission, IATA, IMO, CER ● High readiness level ○ Low readiness level

Source: European Commission; International Air Transport Association; International Maritime Organization; Expert interviews; Roland Berger

You can assess your specific decarbonization options and define a climate action plan in five steps

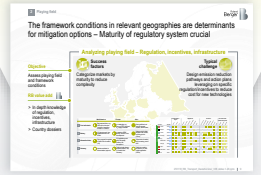
1 Baselining

Transport profile, use cases and emissions baseline



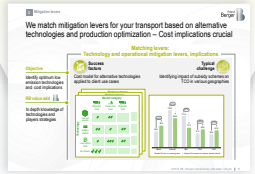
2 Analyzing playing field

Regulation, incentives, infrastructure



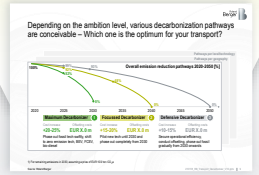
3 Matching levers

Technology and operational mitigation levers, implications



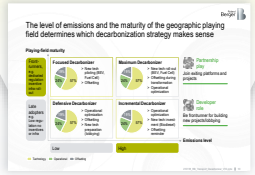
4 Defining pathways

Decarbonization pathways, cost / CO_2 implications



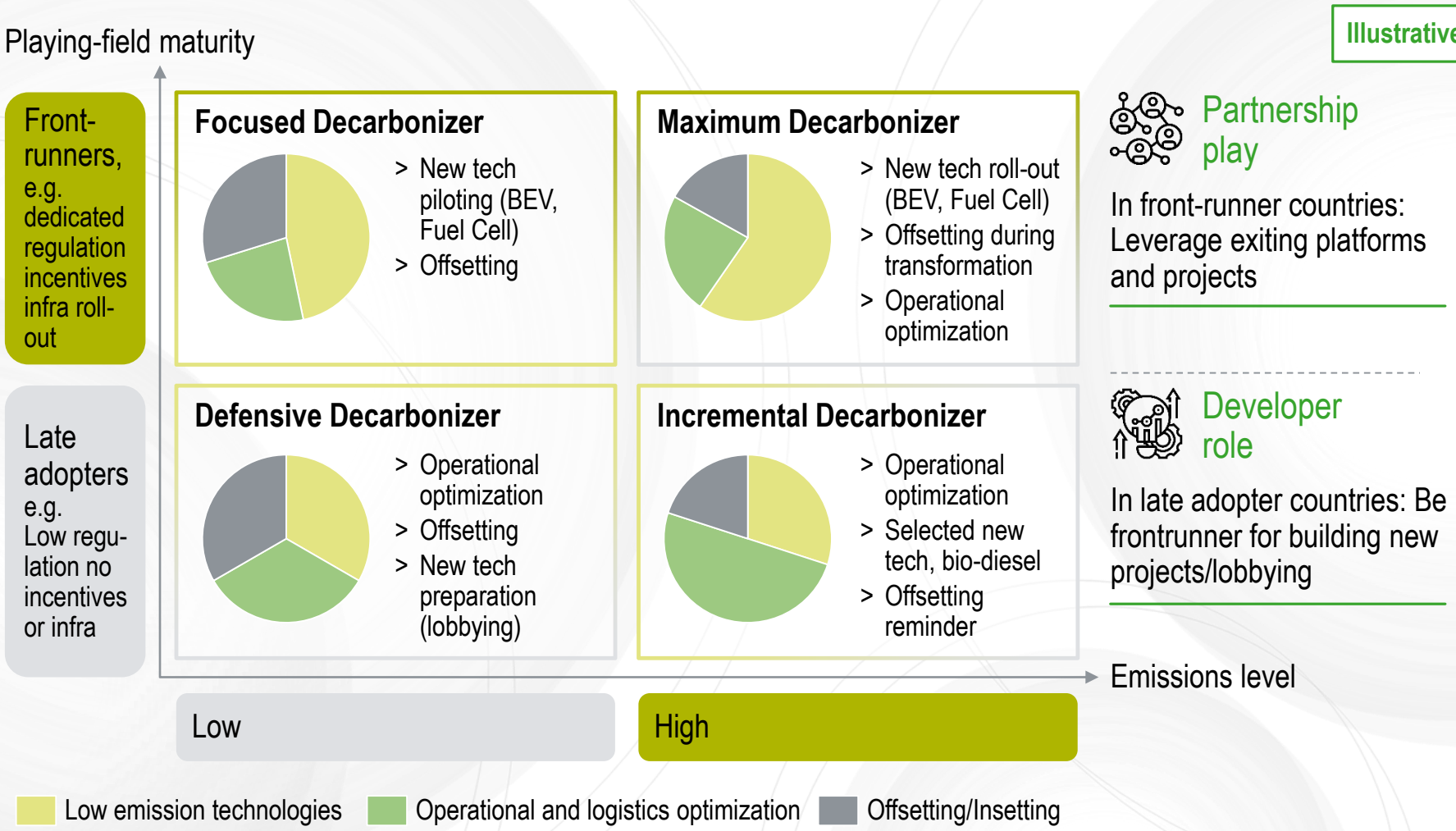
5 Implementing

Transport Climate Action Plan



The level of emissions and maturity of the geographic playing field determines a suitable mix of levers and decarbonization strategy

Illustrative



Partnership play

In front-runner countries: Leverage exiting platforms and projects

Developer role

In late adopter countries: Be frontrunner for building new projects/lobbying

We look forward to being in touch

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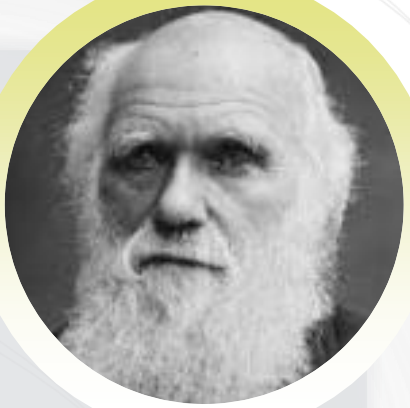

Charles Darwin

It is not the strongest of the species that survives, nor the most intelligent, but ***the one most adaptable to change***

Roland Berger

THINK:ACT

Source: desk research, Roland Berger