CLIMATE CHANGE VS CARMAKERS

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AUTOMOTIVE
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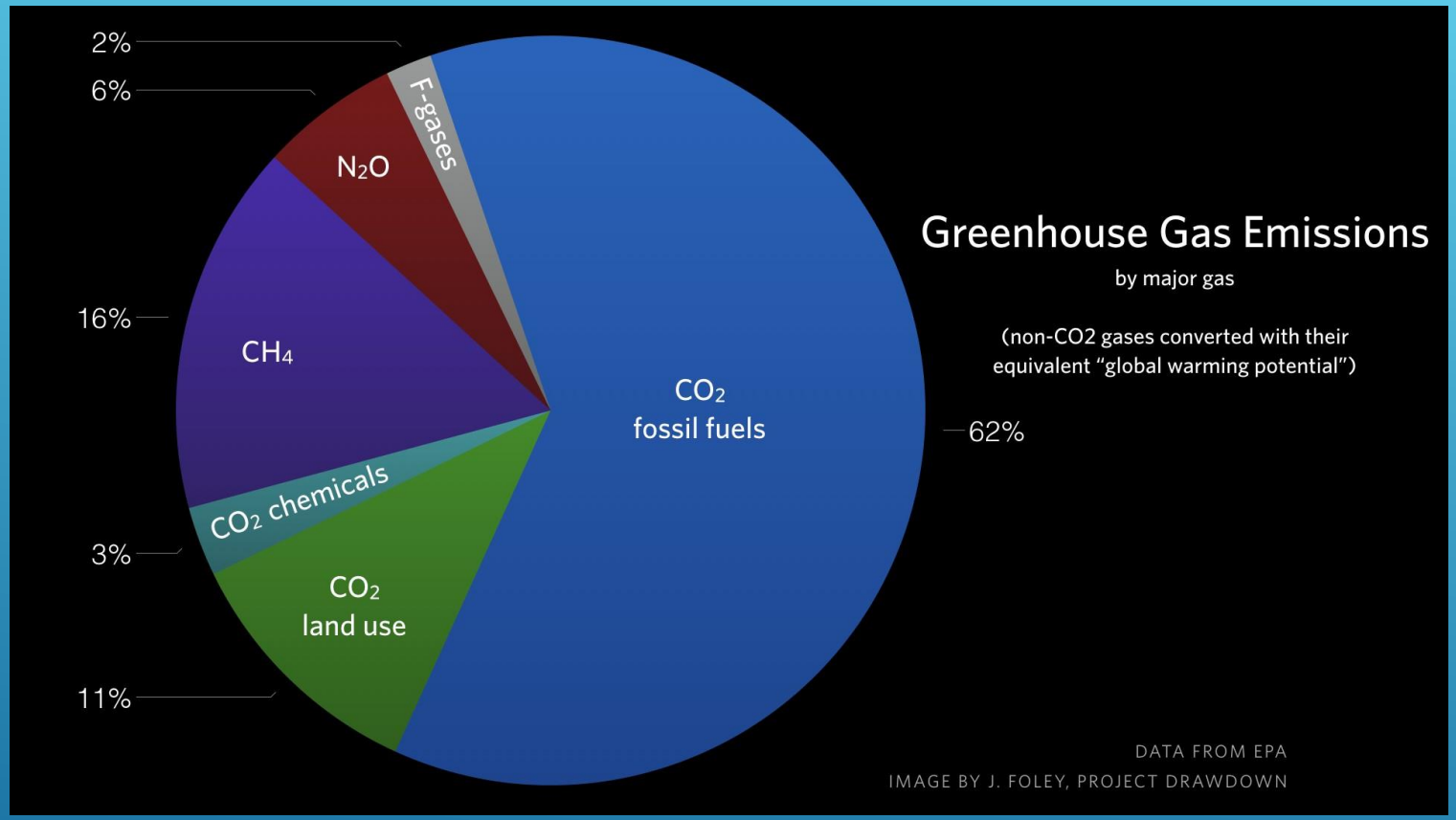
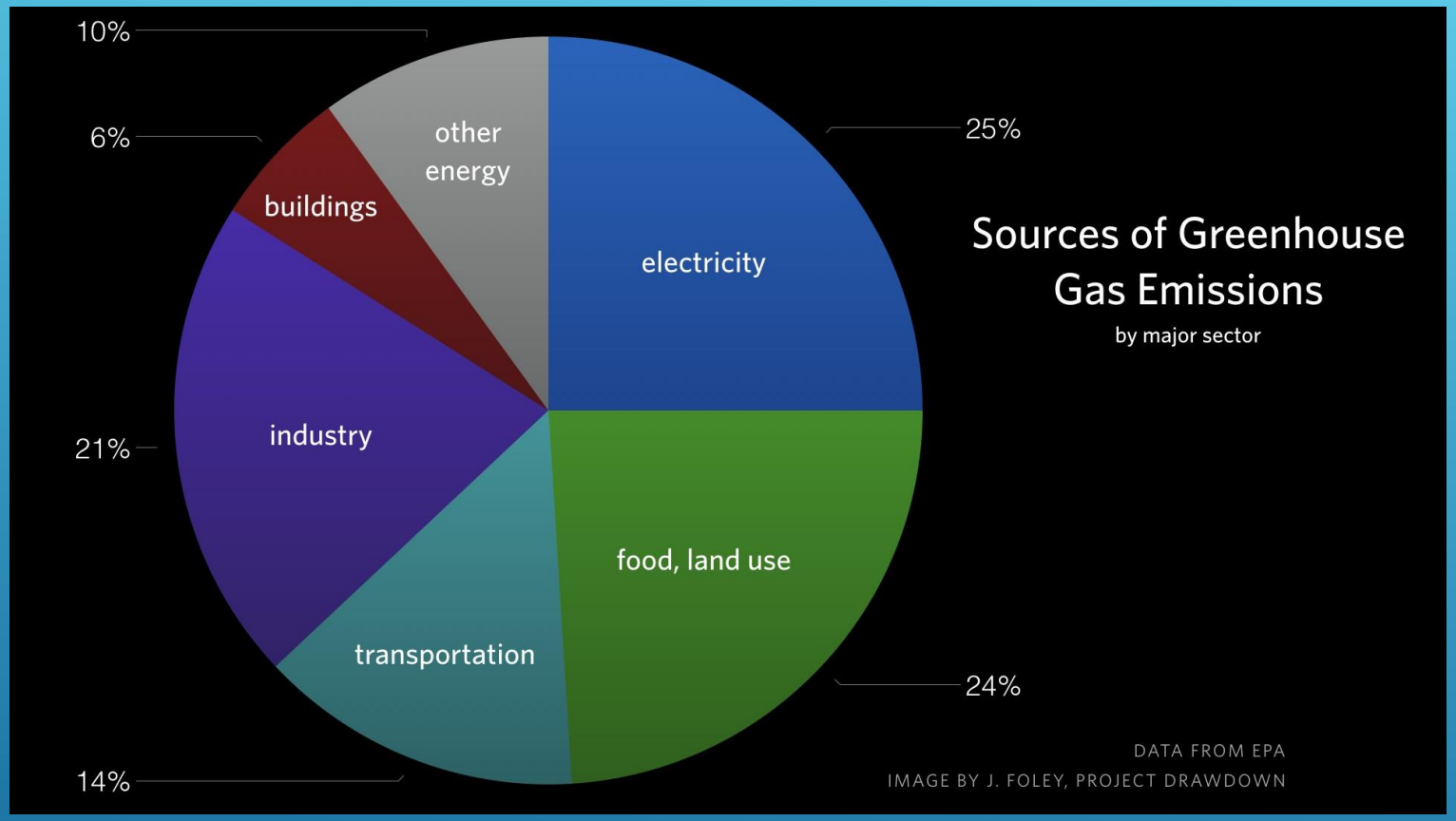
CLIMATE CHANGE IS NOT JUST ABOUT CO2



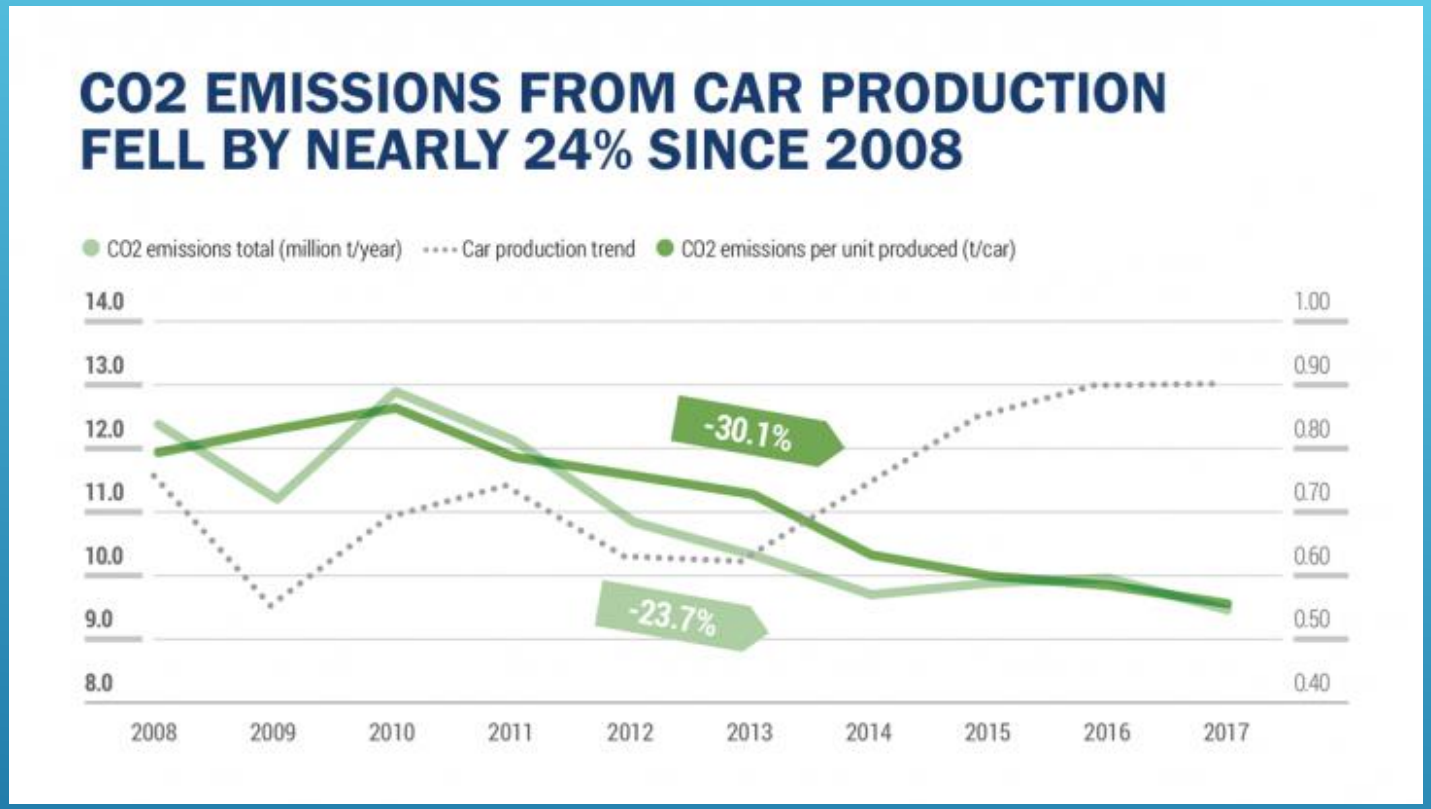
- Around 65% of climate change is caused by carbon dioxide (CO2).
- However, Methane (CH4) and Nitrous Oxide (N2O) have a disproportionate effect.
- Interestingly, diesel vehicles (with lower CO2) actually produce 10 times the amount of N20.

AUTOMOTIVE IS A LARGE CONTRIBUTOR TO GHG



- 'Transportation' segment appears to contribute only 14% of GHG emissions.
- **However**, the production of vehicles is also a large part of the other segments e.g. buildings, industry, electricity generation etc. so likely to contribute 20-25% of GHG.

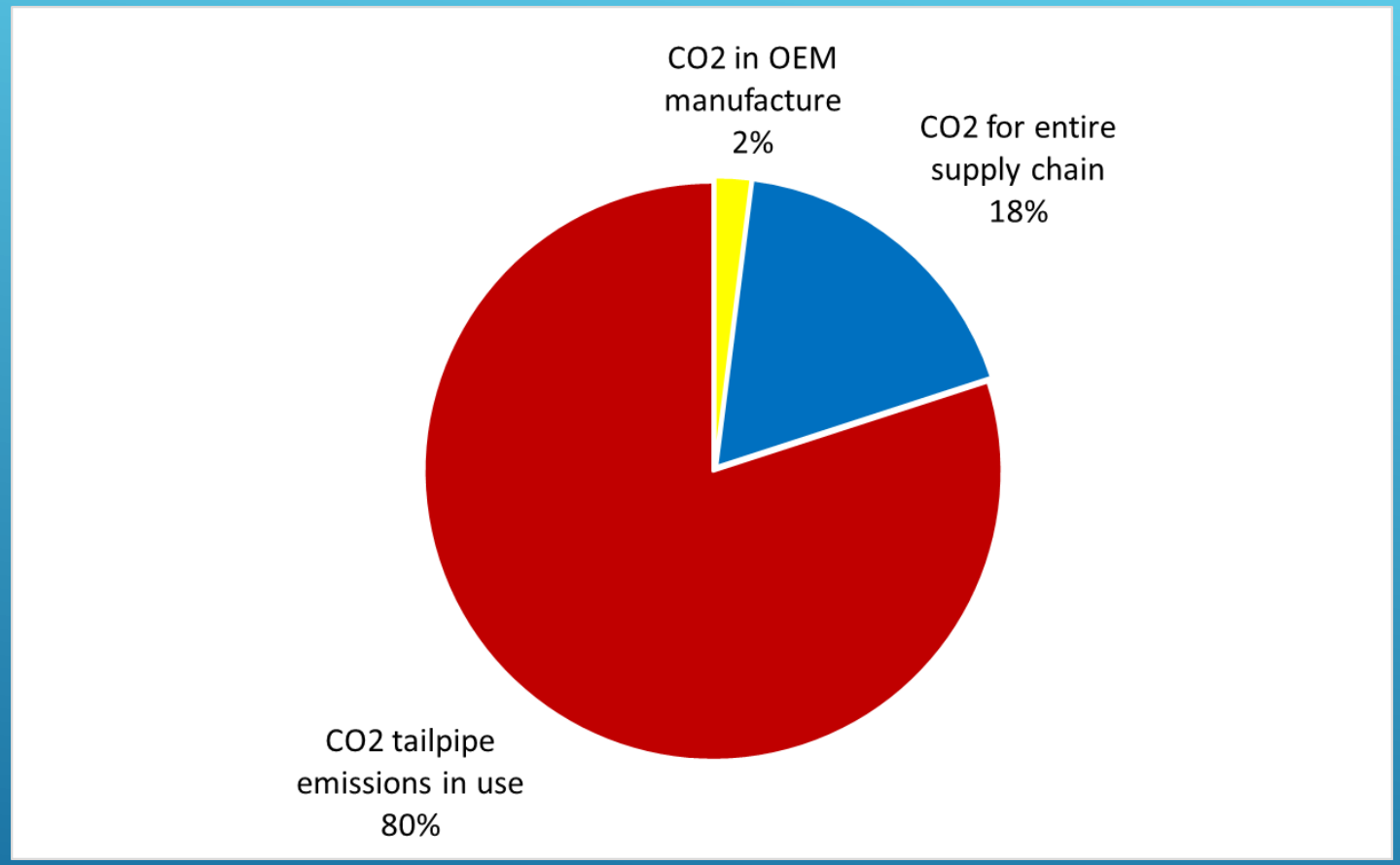
CO2 PRODUCED BY VEHICLE PRODUCTION IS LOW



- OEM manufacture of an average vehicle produces only **0.6 tons of CO2** (ACEA data).
- Entire supply chain e.g. raw materials, components, logistics : **6 tonnes** average per car.
- However, the average EU vehicle emits around **24 tons of CO2** during its lifetime.

(under real world conditions: 160g CO2 / km x 150,000 km)

VEHICLE EMISSIONS DOMINATE AUTOMOTIVE GHG



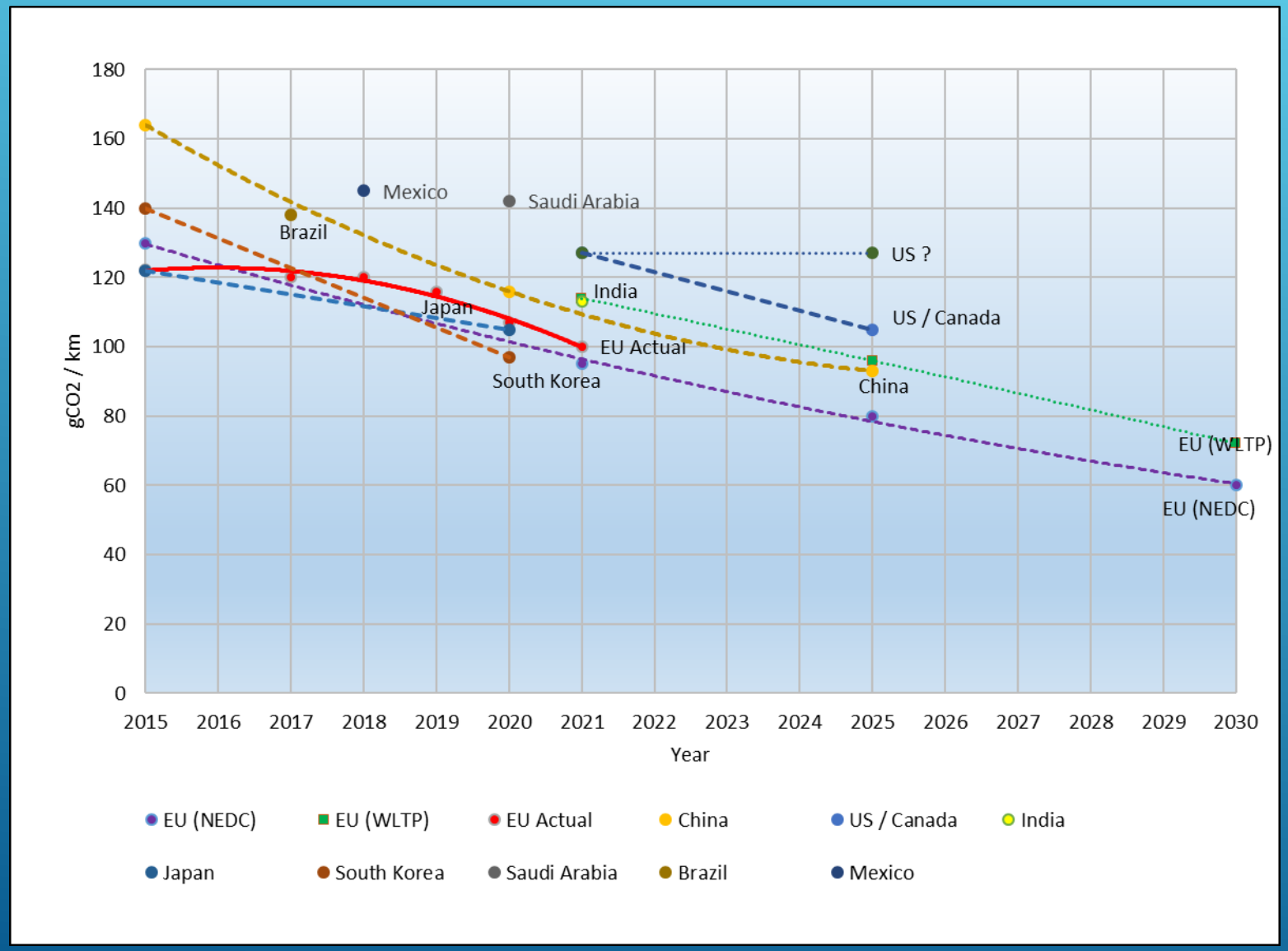
- Automotive manufacture accounts for just **2%** of a vehicles CO2 over its lifecycle.
- The entire supply chain including raw materials, manufacture & logistics accounts for only **20%.**
- Vehicle emissions account for **80%** of a vehicles CO2 lifecycle emissions.

FOCUS OF REGULATORS IS ON VEHICLE EMISSIONS

- Therefore, rather than take a wider holistic view of automotive emissions from the production / supply chain, EU regulators are focussing on vehicle emissions as that's the major sources of CO2.

- Raw materials / mining
- Component manufacturing
- Outbound / Inbound logistics–**"Sulphur 2020" shipping regulation**
- OEM manufacturing / assembly
- Finished vehicle logistics – **"Sulphur 2020" shipping regulation / Fret21 programme**
- Crude oil extraction / Fuel refining & production
- Vehicle emissions in use - **European Commission CO2 targets, US CAFE, Chinese CAFC**
- Recycling / end of life disposal

REGIONAL VEHICLE CO2 EMISSIONS TARGETS



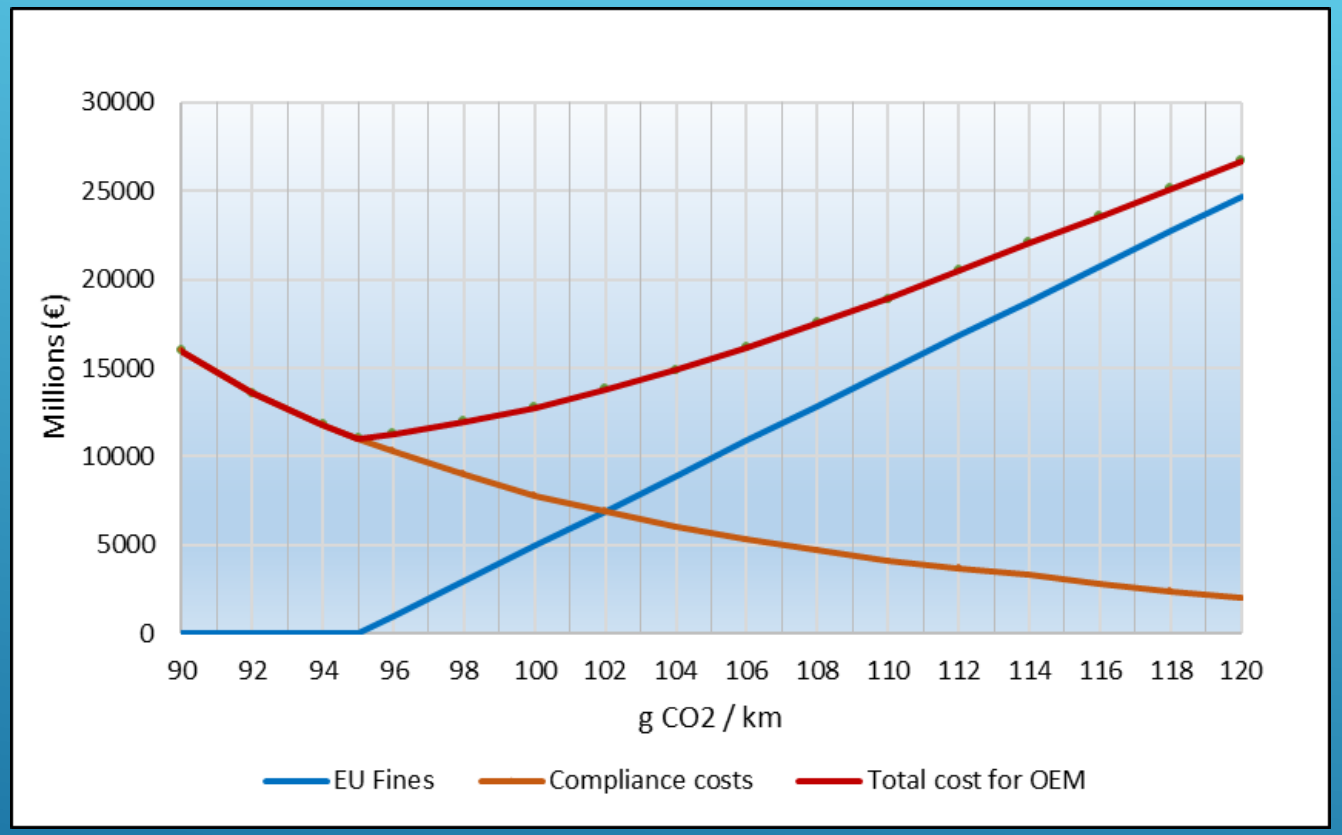
- European vehicle emissions target of 95 g CO2 / km for 2020/2021 is the strictest in the world and will get even tougher.
- Each OEM has its own individual CO2 target based upon the OEMs fleet average vehicle weight.
- We predict that many OEMs will fail to meet their individual emissions targets.
- This will result in severe fines for many OEMs.

FINANCIAL PAIN FOR MOST OEMS

	OEM EU Fleet CO2 Forecast					EU Fleet CO2 target*		EU Sales (million)	Fines	
OEM Group	**2017**	**2018**	**2019**	**2020**fines on 95%**	**2021**	**2020 *fines on 95%**	**2021**	**2018**	**2020 (€)**	**2021 (€)**
BMW	122	127	120	114	105	101	101	0.99	€143m	€376m
Daimler	127	132	125	116	106	102	102	0.94	€214m	€357m
FCA - Tesla	118	122	113	100 / 91*	96 / 91*	91	91	0.99	€900m*	€900m*
Ford	121	122	115	108	99	96	96	0.93	€108m	€265m
Honda	127	127	120	108	96	97	97	0.12 (Exempt)	OK	€0
Hyundai-Kia	122	123	113	105	96	93	93	0.92	€131m	€262m
JLR	151.4	155	147	140	130	130	130	0.23 (Exempt)	OK	€0
PSA	112	114	110	103	96	92	92	2.34	€155m	€889m
Renault – Nissan - Mitsubishi	112	113	106	100	92	93	93	2.02	OK	€0
Toyota - Mazda	110	110	105	98	92	94	94	0.85	OK	€0
Volvo	124	130	120	114	104	106	106	0.35	OK	€0
VW Group	122	123	116	108	102	96	96	3.30	€376m	€1,881m
Total	**120**	**120.5**	**116**	**107**	**100**	**95**	**95**	**15.6**	**€2,027m**	**€4,930m**

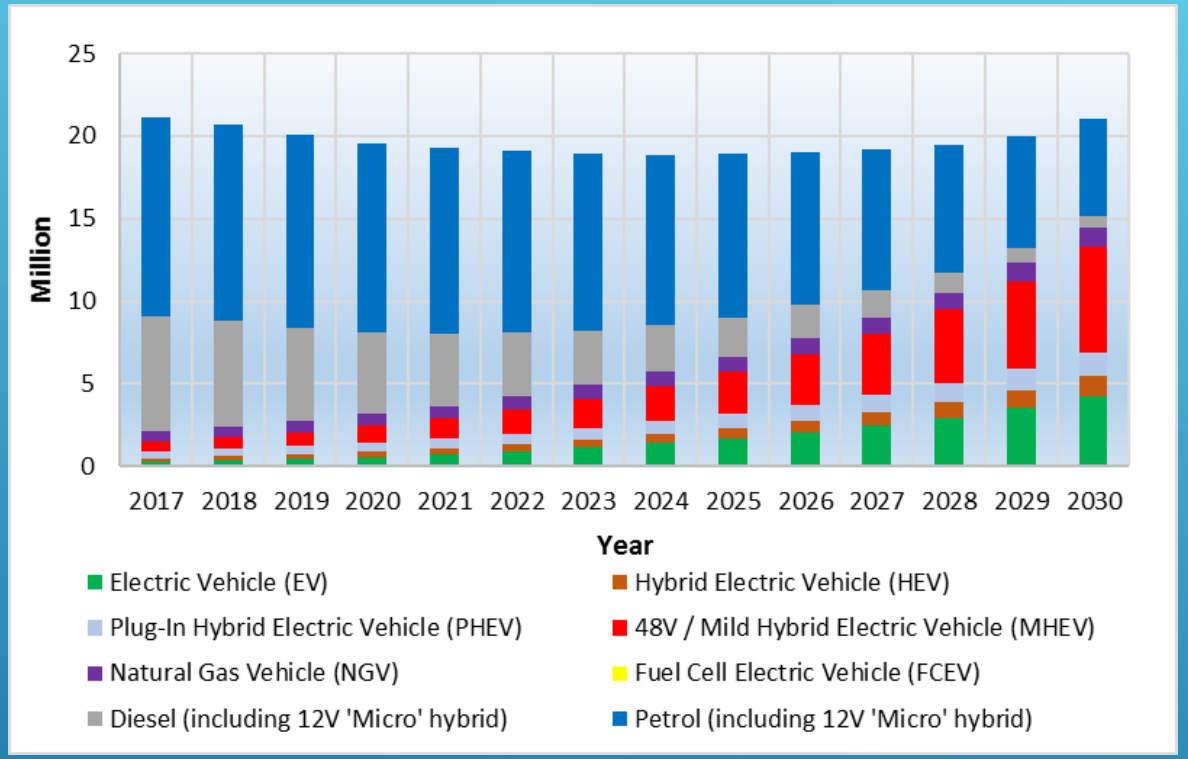
- We predict that collectively OEMs will face fines of **€2bn** in 2020 and **€5bn** in 2021.

TECHNOLOGY COMPLIANCE COSTS VS FINES



- However it is not just about meeting CO2 targets. OEMs must balance compliance costs vs. fines.
- We predict the EU fleet average will reach **100g CO2 / km** in 2021 missing the target by 5g CO2/ km.
- In 2021 automotive OEMs selling into the EU will have compliance costs of €7.8bn and fines of €4.9bn incurring a total **€12.7bn annual bill**, effectively halving their Eurozone profits of ~ **€25bn**

EVOLVING POWERTRAIN MIX



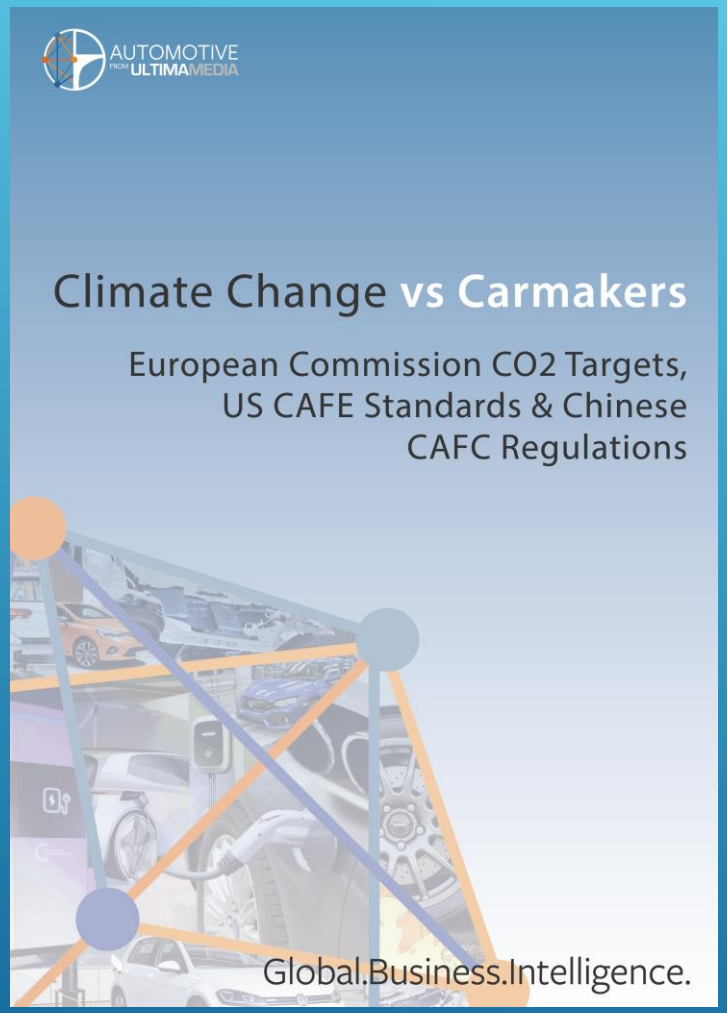
- Powertrain mix is more strongly driven by regulation & taxation policy in the EU than elsewhere.
- Regulation on CO2 emissions is forcing OEMs to rapidly shift to hybrid and full EV powertrains.
- Previous tax policy to encourage diesels led to high diesel penetration, but now that the policy has been reversed there will be a rapid decline in diesel penetration and phasing it out by 2035//2040.
- Fuel tax is amongst the highest in the world, making the lower running costs of EVs more attractive.

CONSEQUENCES

- Declining volumes and profits are putting pressure on costs & rates.
- Rapidly changing component supply chain logistics due to EVs especially with batteries and the regulation surrounding transportation of hazardous materials.
- Increasing % of finished vehicles will be HEV & EV.
- HEVs & EVs tend to be heavier due to the battery with implications for LSPs.
- Increasing pressure upon tier suppliers to provide affordable, low-emission technology.
- Shrinking margins at OEMs and tier suppliers likely to result in further cost pressures upon LSPs.
- Rising regulatory and compliance costs for logistics providers (i.e. low sulphur fuel).

OPPORTUNITIES

- Growth in HEV / EV sales and aggressive model launch cadence: opportunities for LSPs.
  - E.g. VW Group plans 70 new EV's with investment reaching >€30*bn* by 2023.
- Supply chain re-organisation: new giga-factories, battery & re-tooled assembly plants.
- New logistics services: e.g. module supply & delivery; high-value parts tracking; battery recycling
- New EV players & start-ups – lower capacity for in-house logistics, providing opportunities.
- New powertrain plants in Central & Eastern Europe (CEE).



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THANK YOU