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The Transport Emissions Roadmap for London

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Workshop Effort Sharing Decision, Warsaw, 1st October 2014

Contents

1) Introduction

2) Emissions in London – the challenge

   a. breakdown of emissions sources in London

   b. detailed transport emissions

3) Transport Roadmap

   a. Top Ten Measures

   b. London's Roadmap for Low Emission Vehicles - Scenarios

   c. Results

Governance of London

Mayor of London – Boris Johnson – City Hall (the GLA)

- Greater London Authority (GLA)
- Transport for London
- London Fire and Emergency Planning Authority
- London Legacy Development Corporation
- London & Partners
- Mayor's Office for Policing and Crime

Population

- 8 million 2010
- 10 million 2030

The Mayor of London's Strategies

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Air Quality Strategy - Clearing the air

- *Policies and proposals to improve air quality by 2031*
- *European air pollutants limit values*
- *Transport sector contributes ~60% of total NO_x and ~50% of total PM_{10} emissions*

Transport Strategy

- *Support economic development and population growth*
- *Enhance the quality of life for all Londoners*
- *Improve the safety and security of all Londoners*
- *Improve transport opportunities for all Londoners*
- *Reduce transport's contribution to climate change and improve its resilience*

Climate Change Mitigation & Energy Strategy (1990 baseline)

- *Target to reduce CO_2 emissions by 60% by 2025*
- *Target to reduce CO_2 emissions by 80% by 2050*
- *Transport sector contributes ~20% of the overall greenhouse gas emissions*

RE:FIT

RE:NEW

HOME ENERGY EFFICIENCY FOR TOMORROW

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Emissions in London

NO_x emissions in London – LAEI 2010

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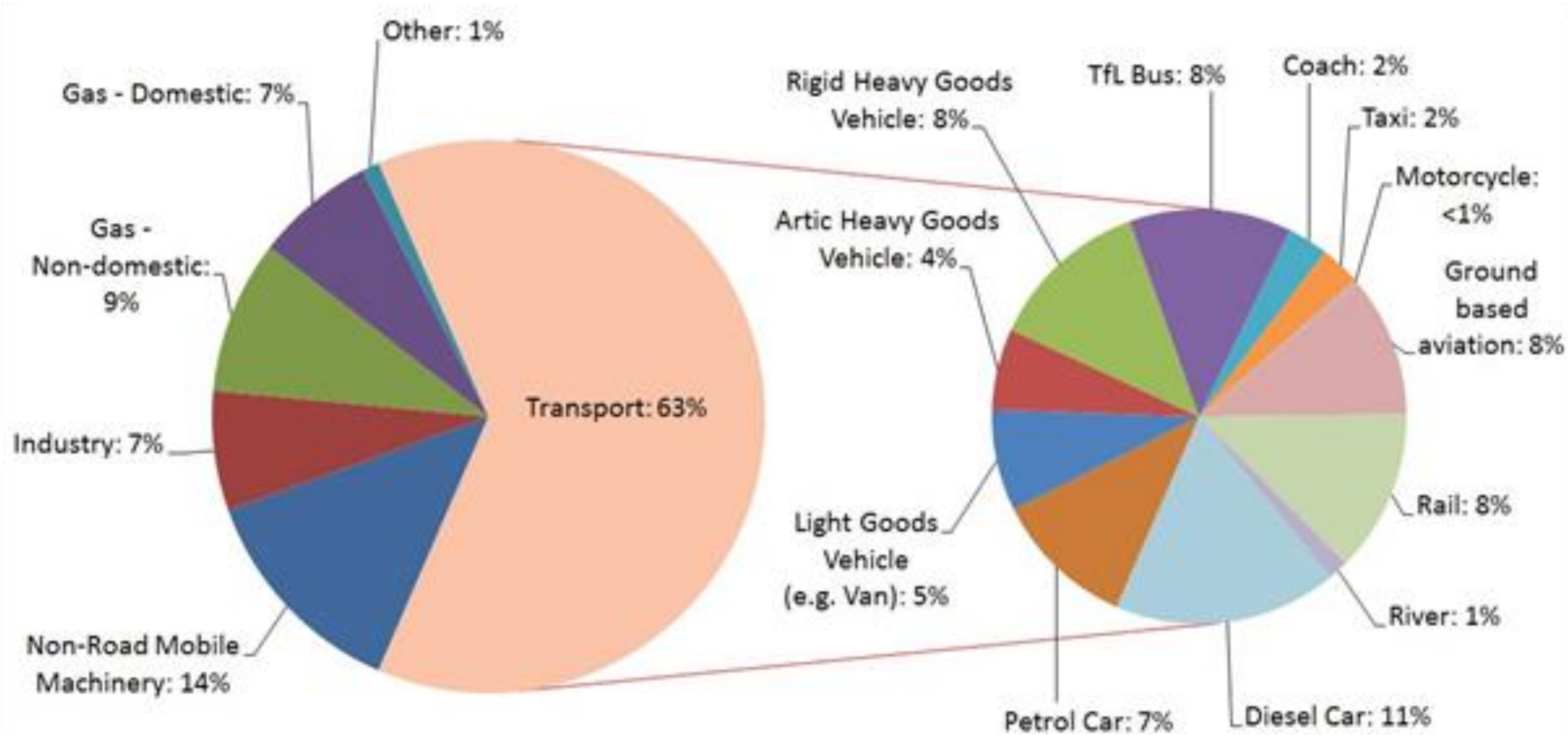

Source: Transport Emissions Roadmap, 2014

PM_{10} emissions in London – LAEI 2010

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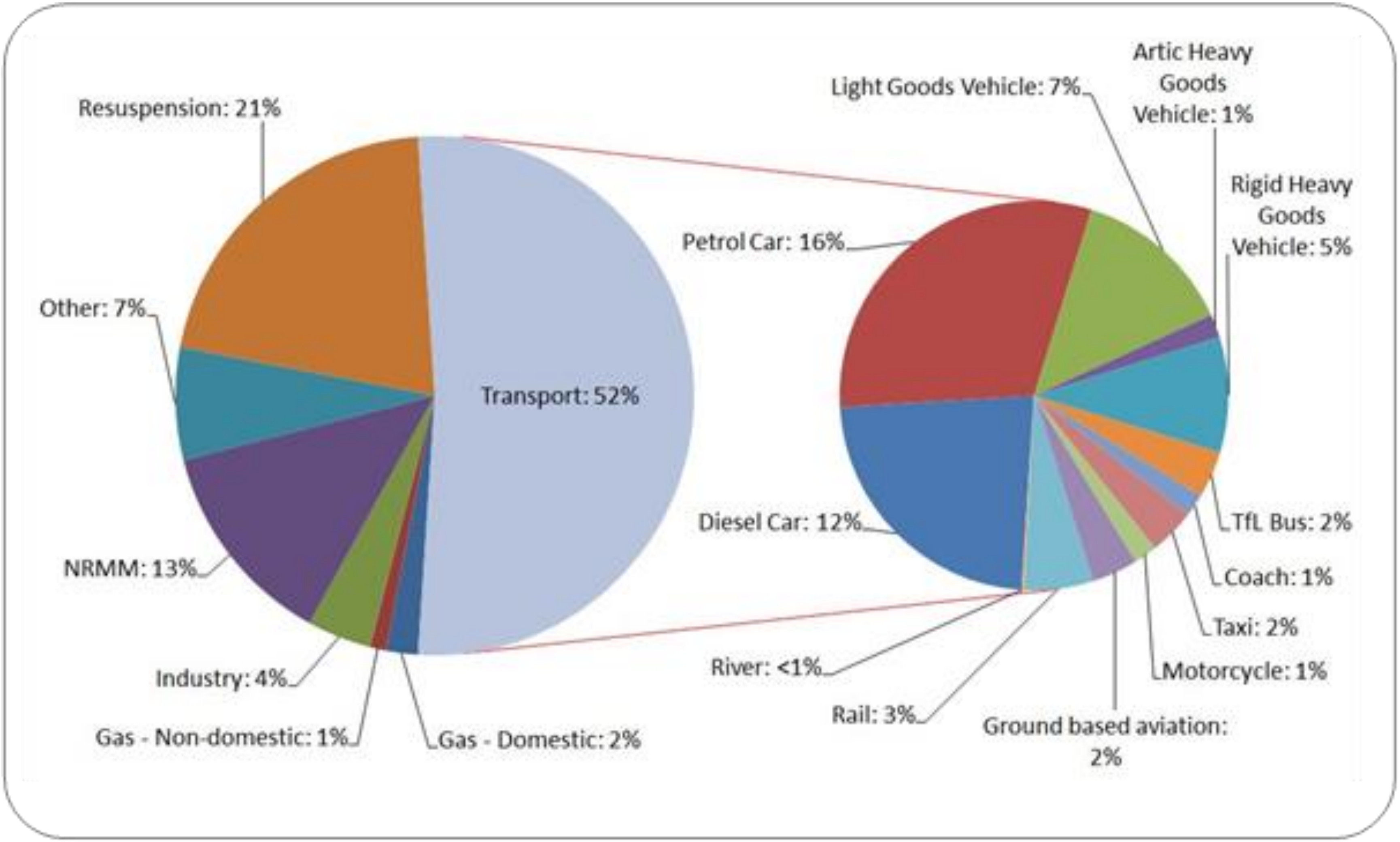

Source: Transport Emissions Roadmap, 2014

CO_2 emissions from transport – LAEI 2010

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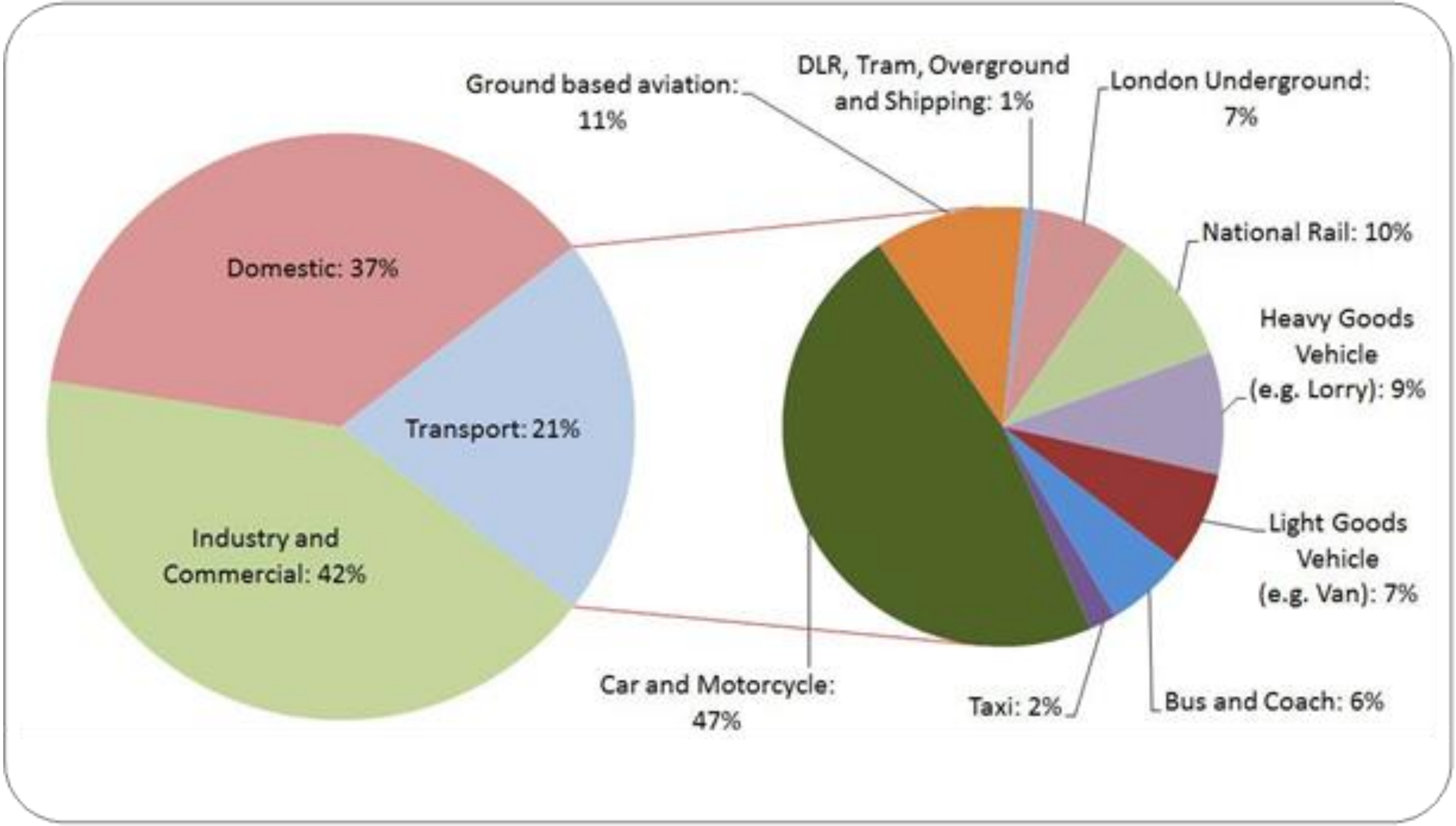
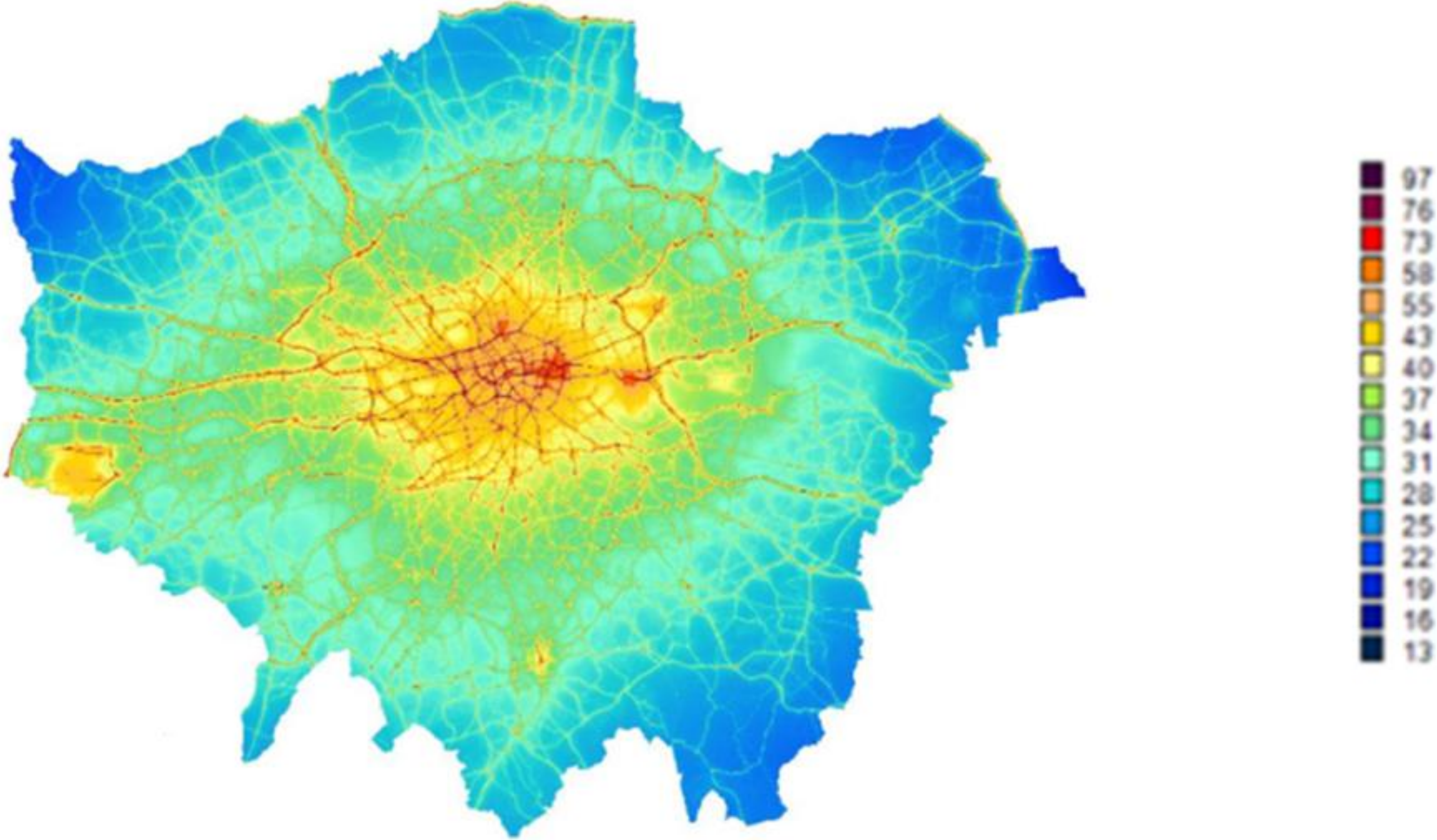


Source: Transport Emissions Roadmap, 2014

2010 Annual mean concentrations NO_2 (ug/m^3)



Source: LAEI, 2010

Road Transport - share of exhaust emissions of PM_{10}

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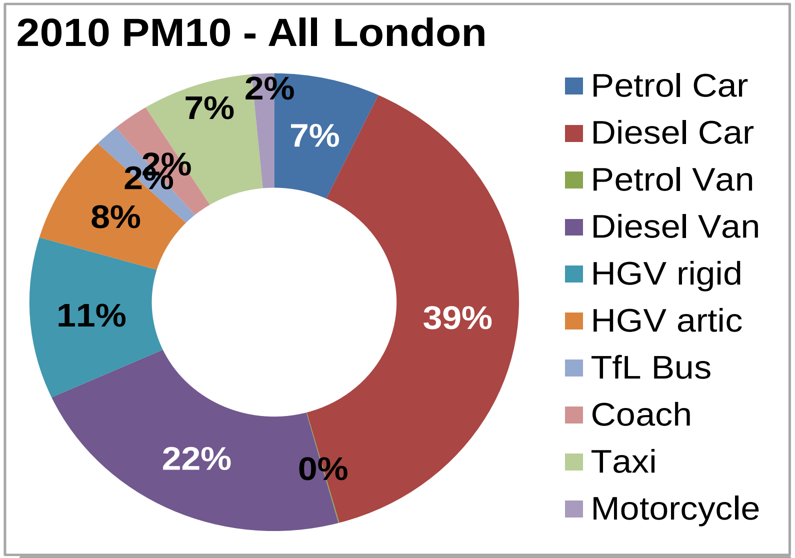

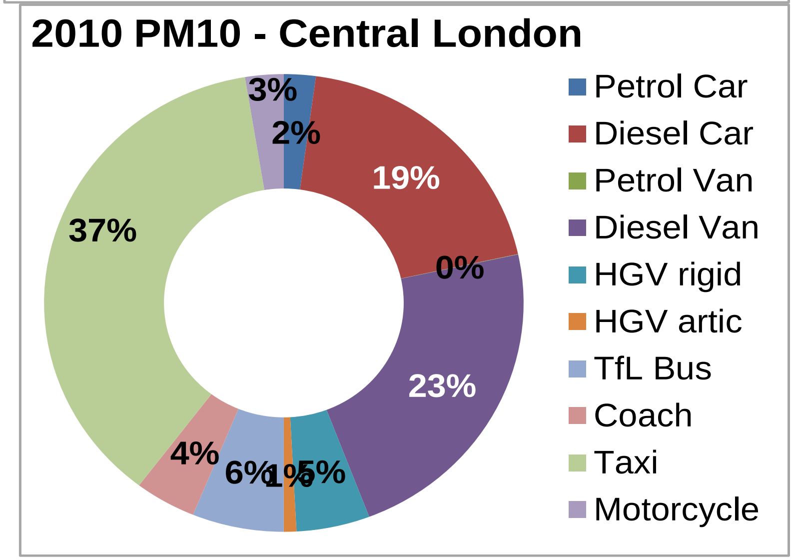

All London

- Diesel cars – 39%
- Diesel van – 22%
- Petrol cars – 11%

Central London

- Taxis – 37%
- Diesel van – 23%
- Diesel cars – 19%

Road Transport - share of exhaust emissions of NO_2

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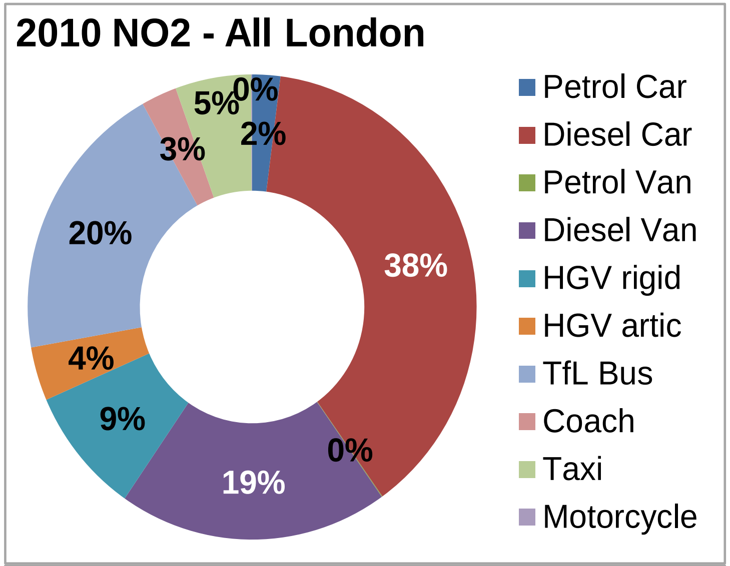

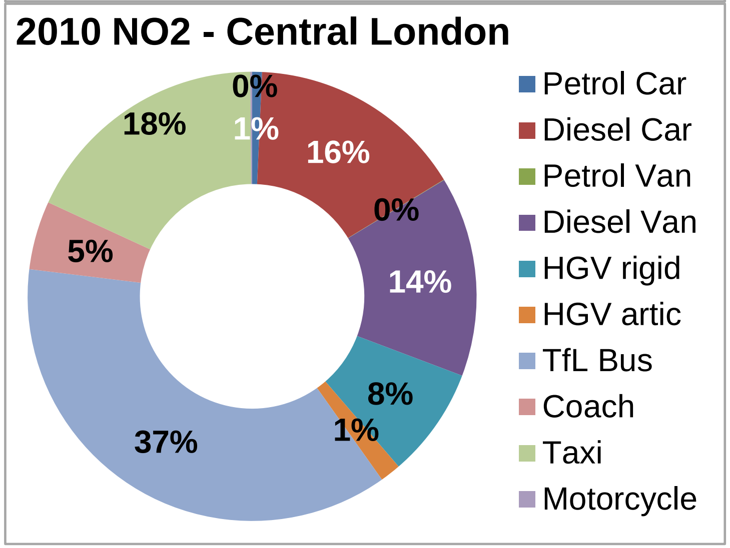

All London

- Diesel cars – 38%
- TfL bus– 20%
- Diesel van– 19%

Central London

- TfL bus– 37%
- Taxis– 18%
- Diesel cars – 16%

Road Transport - share of exhaust emissions of CO_2

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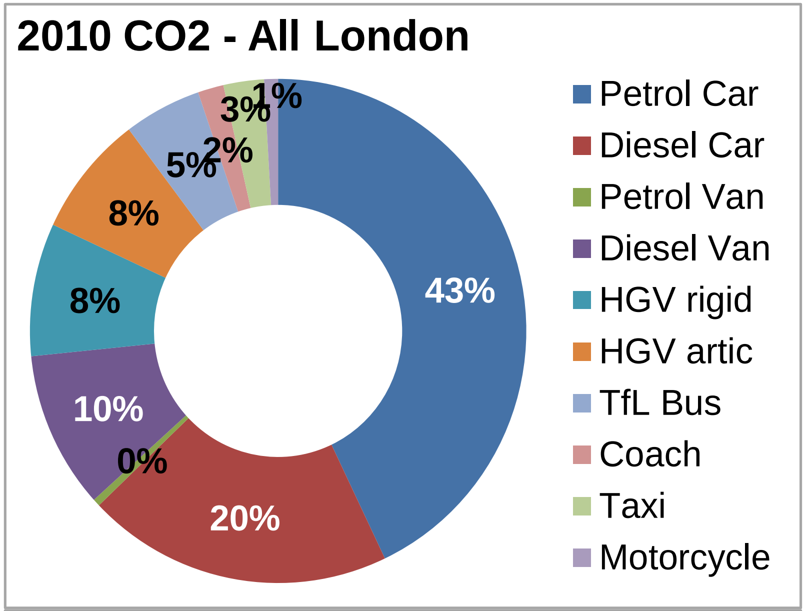

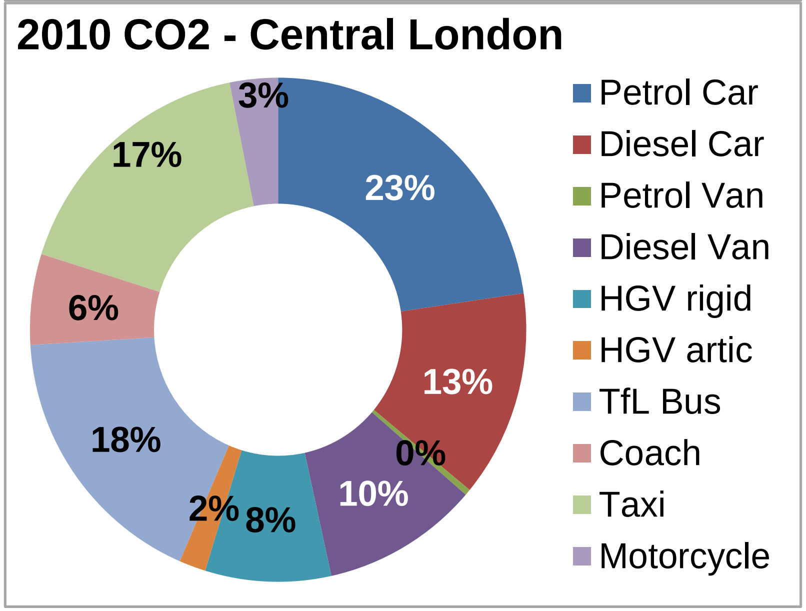

All London
- Petrol cars – 43%
- Diesel cars – 20%
- Diesel van – 10%

Central London
- Petrol cars – 23%
- TfL bus – 18%
- Diesel cars – 13%

Summary

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1. Challenging targets for AQ and GHG pollutants

2. Transport sector contributes

    63% of total NOx emissions

    52% of total PM_{10} emissions

    21% of total CO_2 emissions

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Transport Roadmap

Transport Roadmap: Top Ten Measures

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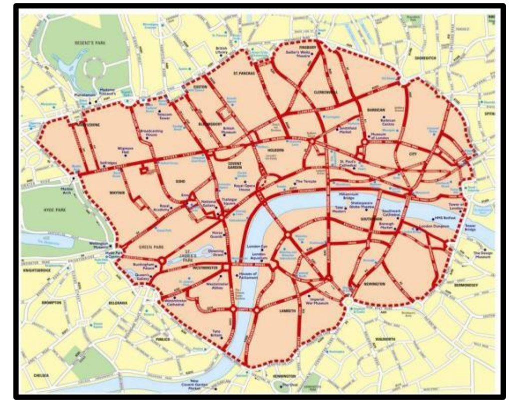
- Implementing an Ultra Low Emission Zone (ULEZ) in central London
- Tightening the Low Emission Zone
- Making traffic management and regulation smarter
- Helping Londoners tackle air pollution and climate change
- Driving the uptake of Low Emission Vehicles
- Cleaning up electricity for London’s transport
- Transforming London’s bus fleet
- Delivering zero emissions taxi and private hire fleets
- Transforming London’s public and commercial fleets
- Developing Low Emissions Neighbourhoods



Source: Transport Emissions Roadmap

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Roadmap for the uptake of Low Emission Vehicles

London's Roadmap for the uptake of Low Emission Vehicles

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The objective: to form a key evidence base for

- The London Low Emission Vehicles (LEV) Roadmap
- Transport Emissions Action Plan (TEAP) and
- The proposals for an Ultra-Low Emission Zone (ULEZ) for central London.

Key tasks:

- Lifecycle Impacts Assessment
- **Low Emissions Vehicles Deployment Scenarios and Uptake Trajectory**
- Infrastructure Requirements
- Conditions Required for Anticipated Uptake

Scenario Analysis – scenario modelling methodology

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Scenario	Description
BAU	The BAU case assumes no direct intervention by TfL or other authorities beyond existing commitments. The uptake of LEV cars has been estimated using SMMT sales data from 2010-2012. This data has been projected forward to 2050 to represent the market penetration of each technology type, based upon the historic sales growth and TfL experience of the market for these vehicle types, and impending measures. Cars: 48.1% petrol, 50.5% diesel, 1.3% petrol HEV, 0.03% petrol PHEV, 0.06% BEV (DfT vehicle licencing statistics); Vans: 1.3% petrol, 98.5% diesel, 0.17% BEV; Small trucks: 100% diesel; Large trucks: 100% diesel; Taxis: 100% diesel; Motorcycles:; 100% petrol; TfL buses: 45% HEVs currently; Coaches/non-TfL buses: 100% diesel
Low	The scenario has moderate of LEV uptake rate, falling around the middle of in the range of market projections and scenarios identified in the literature for uptake of BEV/PHEV/FCEV in light duty vehicles (LDVs). The scenario also assumes moderate rates of uptake of gas-fuelled heavy duty vehicles (using 25% biomethane by 2025) and relatively more rapid uptake of BEV/PHEV technologies by taxis and TfL buses.
Medium	The scenario has been developed as a more challenging evolution of the low scenario, presenting above average rates of introduction of electrified vehicles and more rapid uptake of a range of LEV technologies for heavy duty vehicles. The scenario also assumes 50% biomethane substitution for gas-fuelled vehicles by 2025.
High	The scenario has been developed with extremely rapid deployment of the lowest emission LEVs necessary to achieve the 2025 GHG reduction target. BEV/PHEV/FCEV technology deployment in LDVs is near the upper edge of credible scenarios from the literature. LEV fuels/technologies are also deployed very rapidly in heavy trucks. The scenario assumes 80% substitution for gas-fuelled vehicles by 2025.

Source: Environmental Support to the Development of a London Low Emission Vehicle Roadmap

Low scenario for different modes – new vehicle deployment

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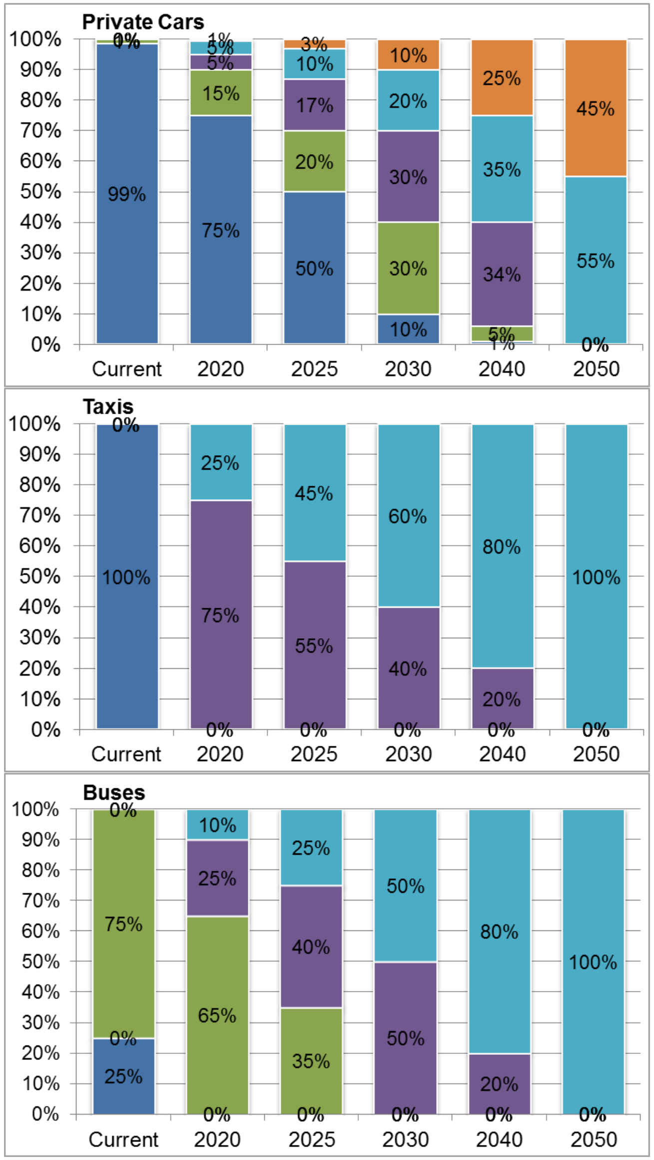


Private cars

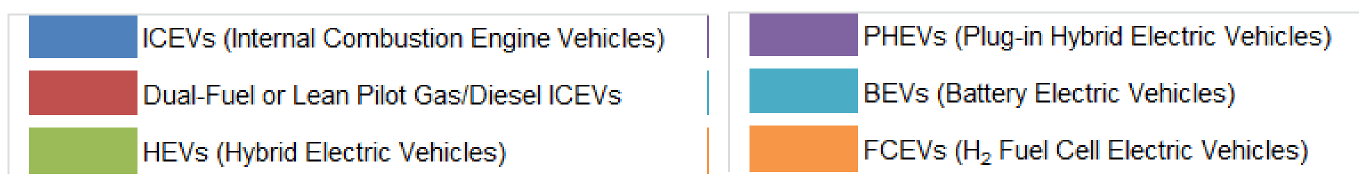
- Current: 99% Internal Combustion Engine Vehicles (ICEVs)
- 2020: 75% (ICEVs), 15% Hybrid Electric Vehicles
- 2050: 55% Battery Electric vehicles, 45% H2 Fuel Cell Electric Vehicles

Taxis

- Current: 100% Internal Combustion Engine Vehicles (ICEVs)
- 2020: 75% Plug-in Hybrid Electric vehicles, 25% Battery Electric Vehicles
- 2050: 100% Battery Electric vehicles

Buses

- Current: 75% Hybrid Electric Vehicles, 25% ICEVs)
- 2020: 65% Hybrid Electric vehicles, 25% Plug-in Hybrid Electric vehicles, 10% Battery Electric Vehicles
- 2050: 100% Battery Electric vehicles



Low scenario for different modes– new vehicle deployment

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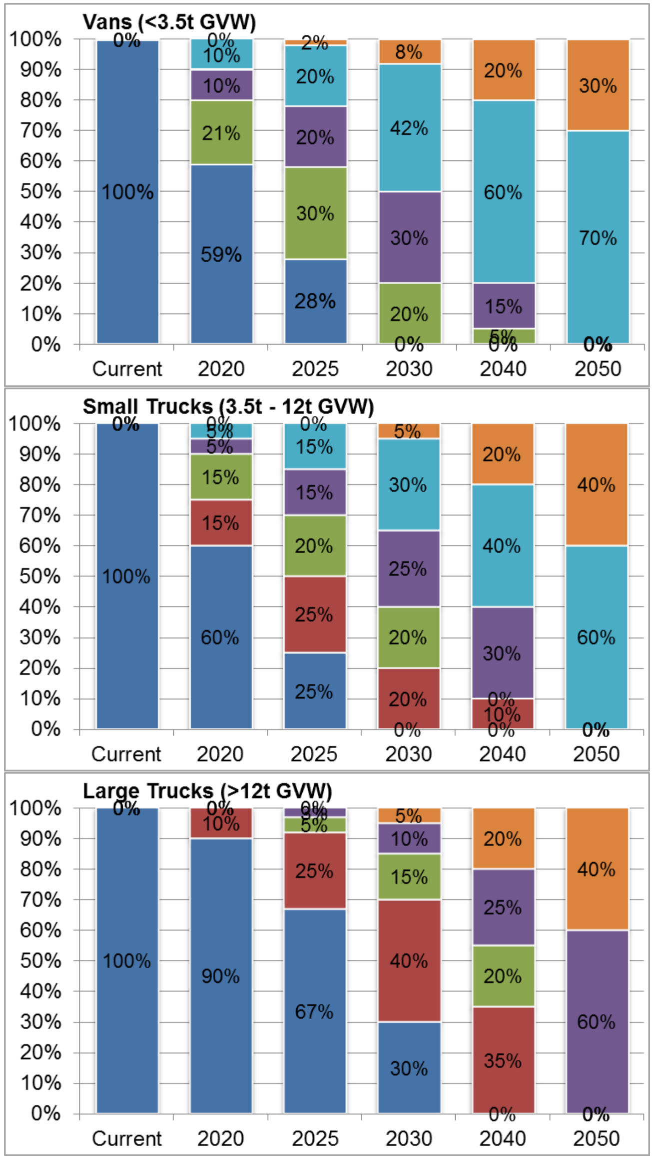


Vans

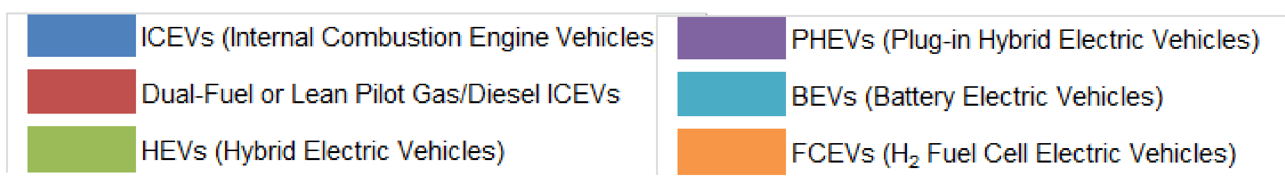
- Current: 100% Internal Combustion Engine Vehicles (ICEVs)
- 2020: 59% (ICEVs), 21% Hybrid Electric Vehicles
- 2050: 70% Battery Electric vehicles, 30% H2 Fuel Cell Electric Vehicles

Small Trucks

- Current: 100% Internal Combustion Engine Vehicles (ICEVs)
- 2020: 60% (ICEVs), 15% Hybrid Electric Vehicles; 15% Dual-Fuel or Lean Pilot Gas/Diesel ICEEVs
- 2050: 60% Battery Electric vehicles, 40% H2 Fuel Cell Electric Vehicles

Large Trucks

- Current: 100% Internal Combustion Engine Vehicles (ICEVs)
- 2020: 90% (ICEVs), 10% Dual-Fuel or Lean Pilot Gas/Diesel ICEEVs
- 2050: 60% Plug-in Hybrid Electric vehicles, 30% H2 Fuel Cell Electric Vehicles



Low scenario for different modes– new vehicle deployment

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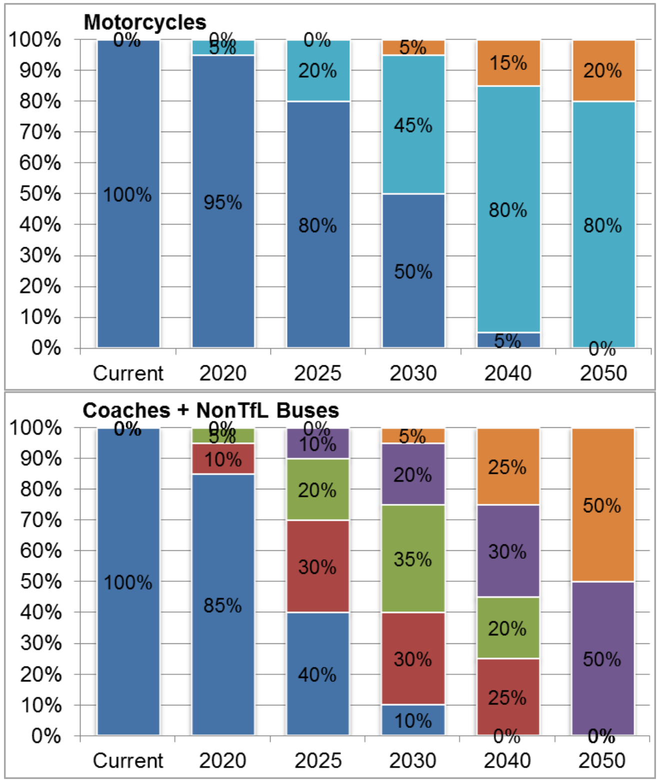
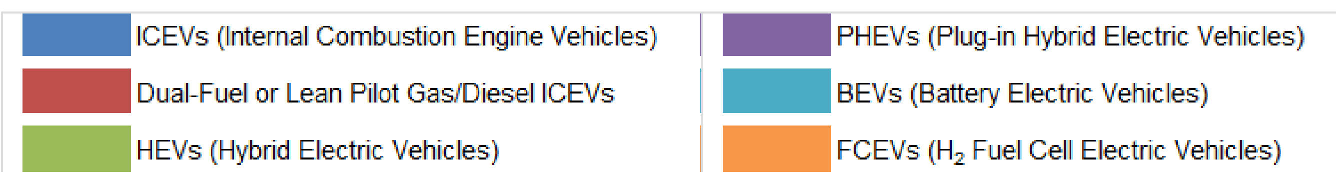


Motorcycle

- Current: 100% Internal Combustion Engine Vehicles (ICEVs)
- 2020: 95% (ICEVs), 5% Battery Electric Vehicles
- 2050: 80% Battery Electric vehicles, 20% H2 Fuel Cell Electric Vehicles

Coaches/non TfL buses

- Current: 100% Internal Combustion Engine Vehicles (ICEVs)
- 2020: 85% (ICEVs), 10% Dual-Fuel or Lean Pilot Gas/Diesel ICEEVs
- 2050: 50% Plug-in Hybrid Electric vehicles, 50% H2 Fuel Cell Electric Vehicles



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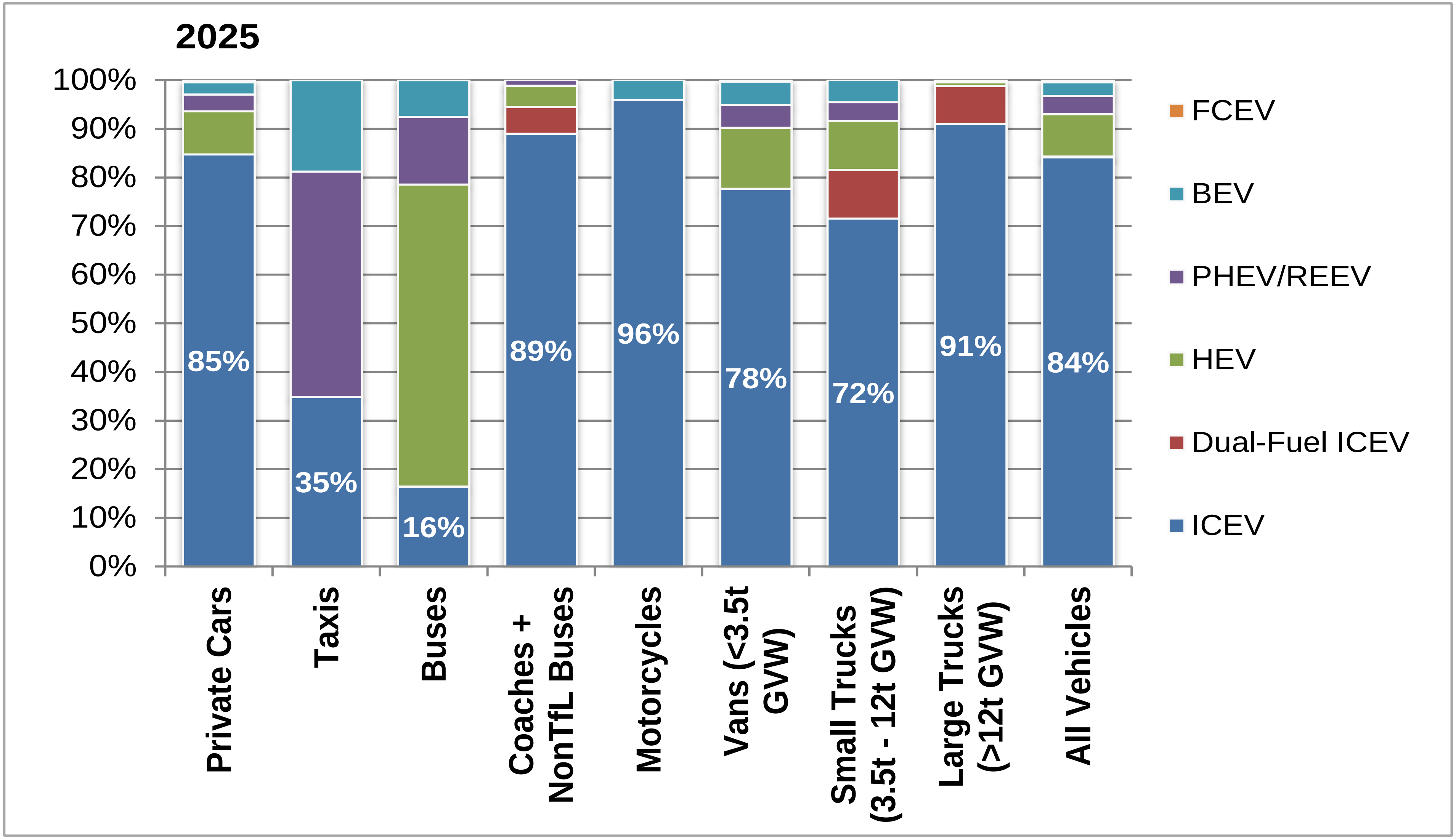
Scenario Analysis –vehicle fleet deployment scenarios:

Vehicle fleet share by vehicle and powertrain type in 2025 - Low Scenario



- Early introduction leads to significant uptake in taxi and bus fleet by 2025

Scenario Analysis – scenario results summary

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- Baseline GHG emissions reductions are based on anticipated improvement in LDVs driven by current regulations and also significant improvements to HDVs => appropriate measures needed to help lock this in.
- Summary of impacts at 2025 time horizon:

2025	Target	Baseline	Low	Medium	High
LEV new vehicles share	N/A	13%	35%	50%	74%
(EVs only share)		*(2.6%)*	*(18%)*	*(31%)*	*(49%)*
LEV whole fleet share	N/A	13%	35%	50%	74%
(EVs only share)		*(2.6%)*	*(18%)*	*(31%)*	*(49%)*
Target GHG vs 1990	-48%	-35%	-39%	-42%	-48%
(versus BAU)		*(0%)*	*(-7%)*	*(-11%)*	*(-20%)*
Energy consumed vs 2012	N/A	-26%	-30%	-33%	-38%
(versus BAU)		*(0%)*	*(-6%)*	*(-10%)*	*(-16%)*
Total NO_x vs 2012	-83%	-61%	-65%	-68%	-71%
(versus BAU)		*(0%)*	*(-10%)*	*(-16%)*	*(-25%)*
Total PM vs 2012	N/A	-79%	-82%	-83%	-84%
(versus BAU)		*(0%)*	*(-10%)*	*(-16%)*	*(-24%)*

Scenario Analysis – Results

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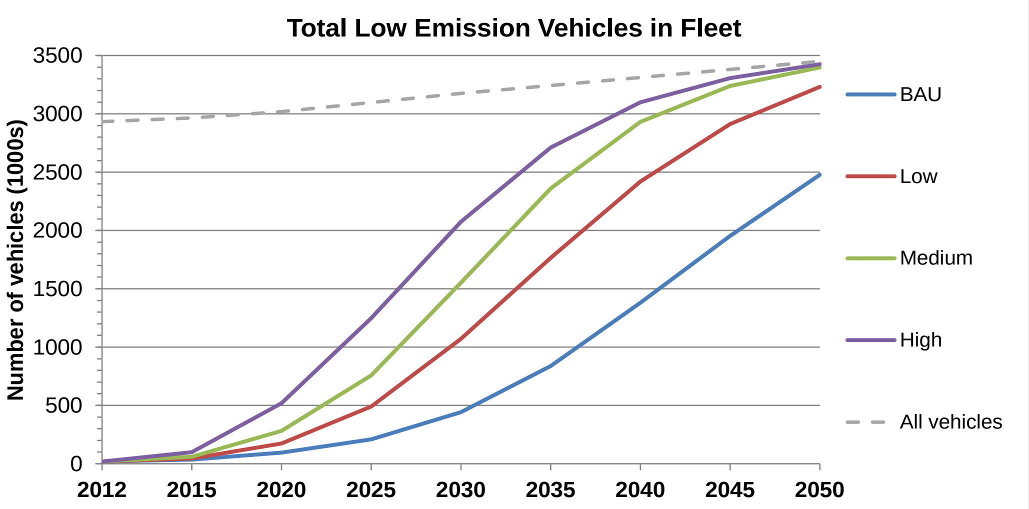
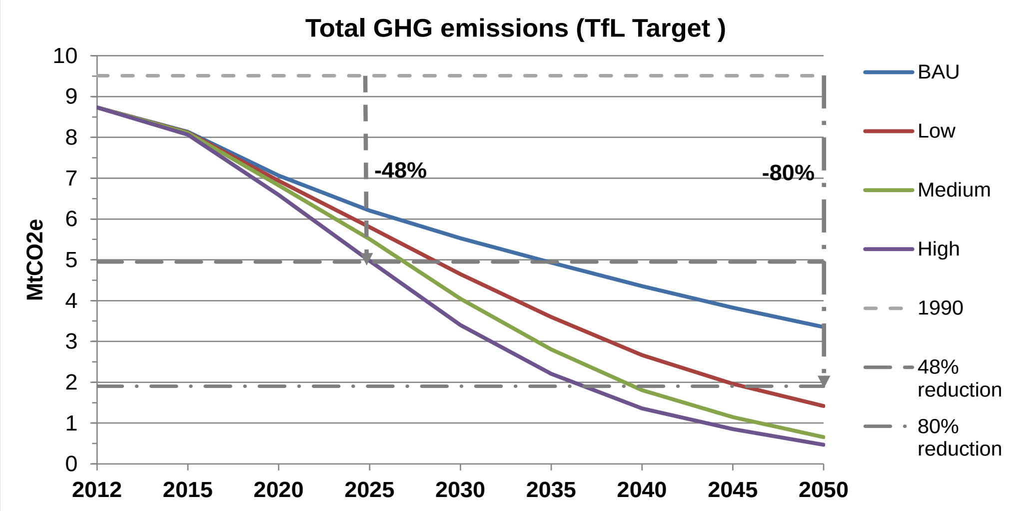
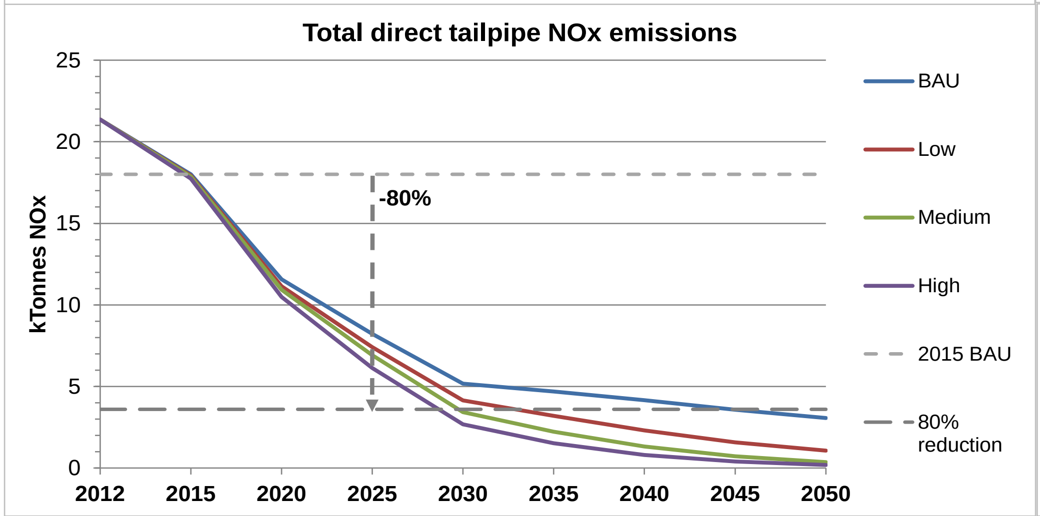
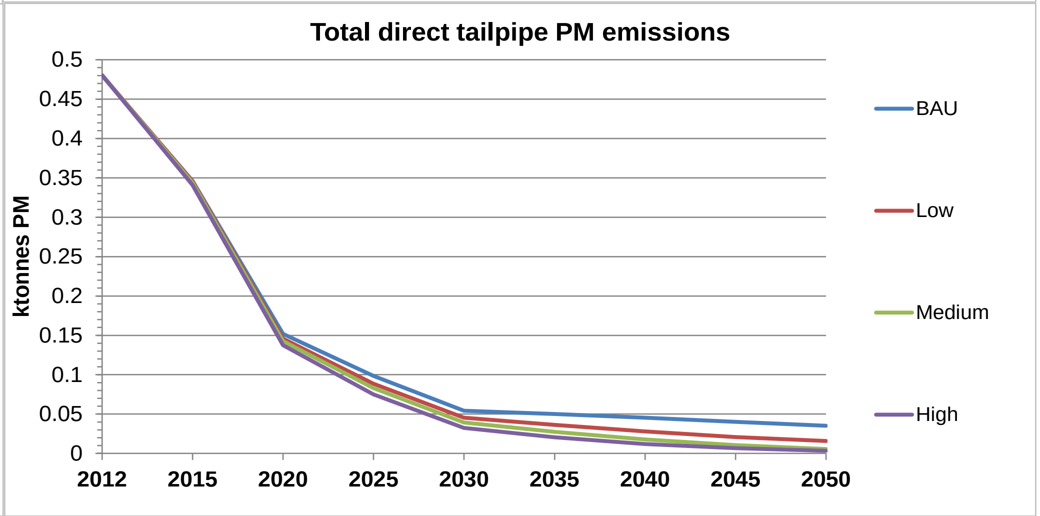
- 15%-24% LEVs (12-21% EVs) in the vehicle fleet possible by 2025 (low /medium sc); 40% high sc
- -39-42% TfL Target GHG possible by 2025 (low /medium sc), very challenging high sc = -48%
- 2025 NOx -61%, PM -79% in the BAU alone; even high achieves -80% NOx only by 2028
- Energy -30-33% by 2025, with biofuels peaking by 2020 due to advanced EV uptake









Summary

- Emission reduction targets set in the Mayoral Strategies cannot be met solely through the uptake of low emissions vehicles
- Additional measures (e.g. demand management, modal shift, reductions in emissions from other sources, specific measures in the vicinity of hot-spots, etc.) to LEV deployment will be required to reduce levels of AQ and GHG in London
- High scenario represents the limit of what is technologically possible
- Low/Medium/High scenarios show significant savings in CO_2, NOx and PM_{10}
- All scenarios capable of achieving longer term 2050 objectives, in line with national-level expectations on the GHG reductions needed from road transport.

Any questions?

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