

The European Commission's science and knowledge service

Joint Research Centre



The JRC-IDEES TRANSPORT

Brussels, 12 Oct 2017

JRC-IDEES

Integrated
Database of the
European
Energy
System

SCOPE OF JRC-IDEES TRANSPORT

Passenger transport

Freight transport

Road transport

Powered 2-wheelers
Private cars
Buses and coaches

Light commercial vehicles
Heavy goods vehicles

Rail, metro and tram

Metro and tram, urban light rail
Conventional passenger trains
High speed passenger trains

Conventional trains

Aviation

Domestic
International – Intra-EU
International – Extra-EU

Domestic and International - Intra-EU
International – Extra-EU

Coastal shipping and inland waterways

Domestic coastal shipping
Inland waterways

Bunkers

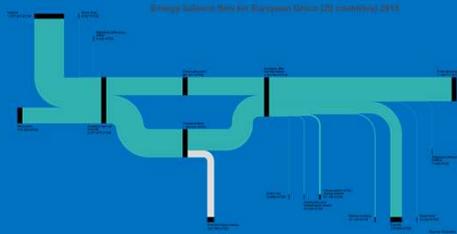
Bunkers – Intra-EU
Bunkers – Extra-EU

Building-up JRC-IDEES Transport

Activity data



Energy balances



Technology stocks / sales



Aggregate information

Top-down information

Decomposed, technology-level information: activity, unit consumptions, stock dynamics (existing and new equipment), load factors, annual mileages, CO₂ emissions...

Technologies



Usage



Dynamics models

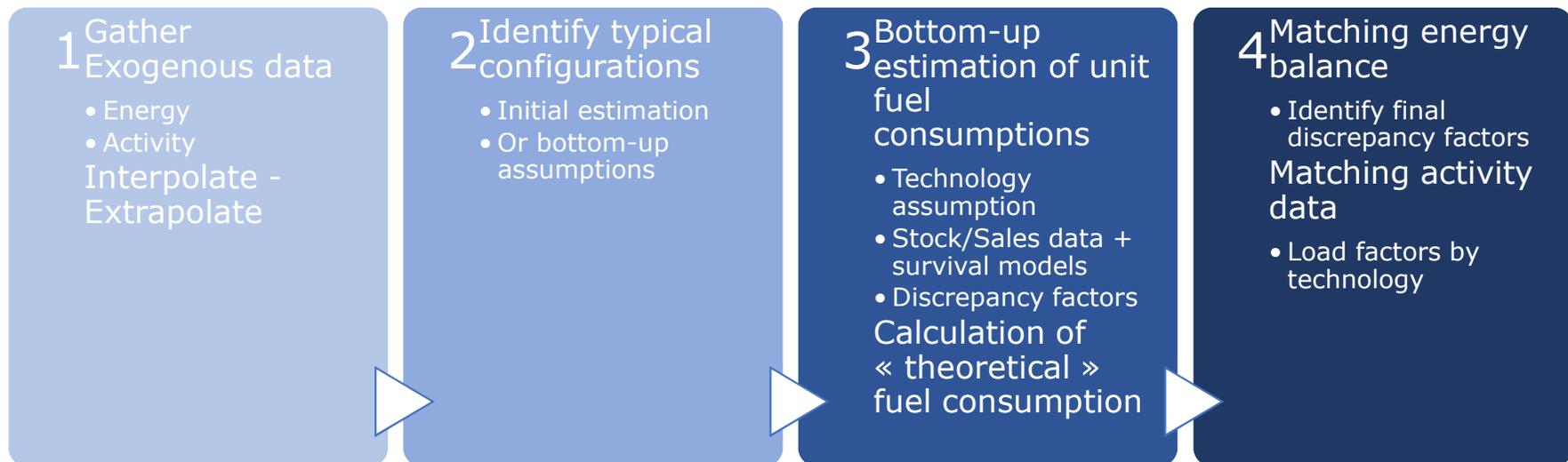


Hybrid JRC-IDEES

Bottom-up information / models

Building-up JRC-IDEES Transport: Process schematics

The decomposition process is many-to-many: many fuels to many modes and technologies



KEY FEATURES: ACTIVITY BREAKDOWN

Enhanced breakdown by transport mode

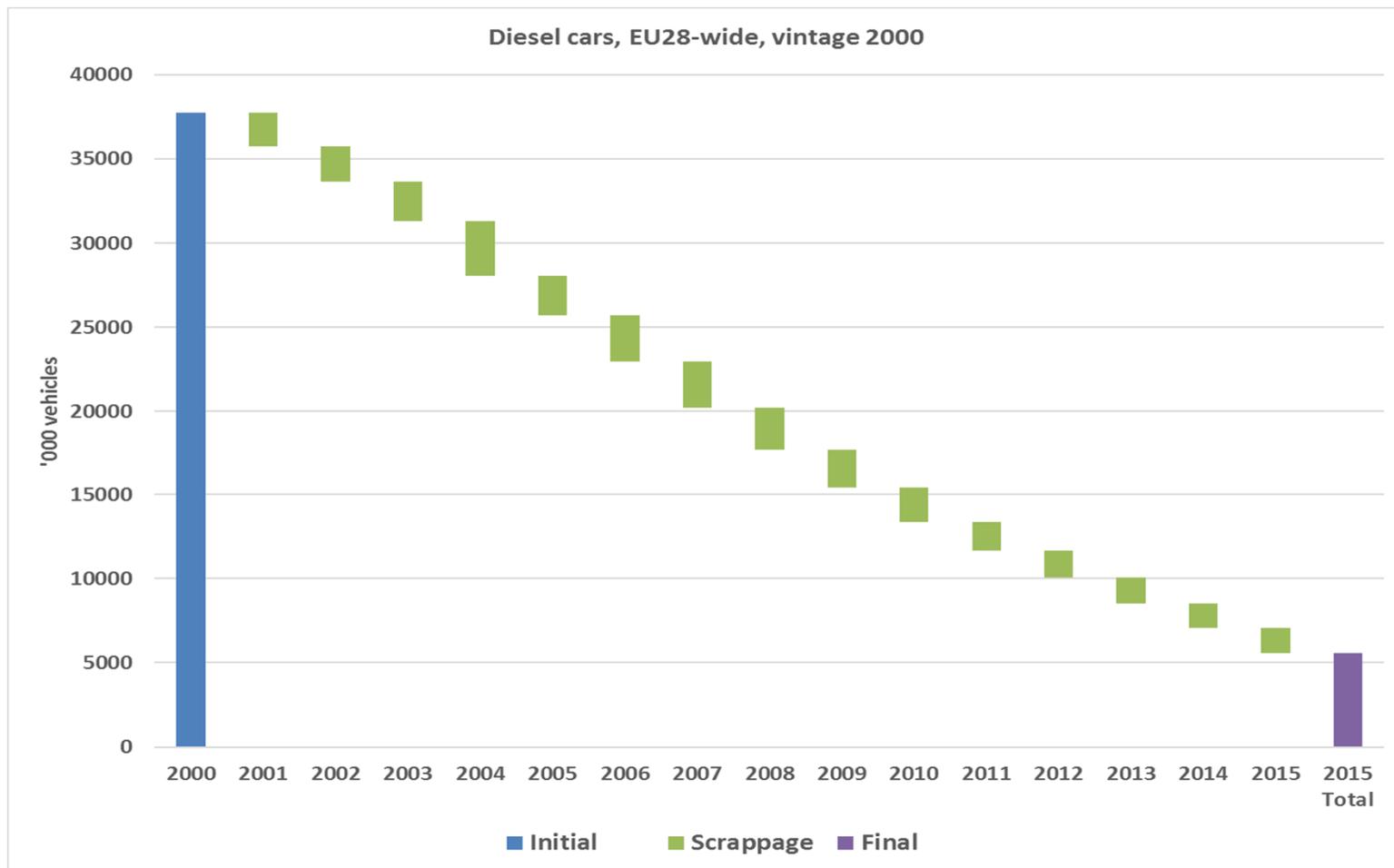
- Domestic vs international haulage for road freight
- Split of aviation activity between domestic, intra-EU and extra-EU (estimate)
 - Freight aviation (intra and extra EU)
 - Better matches the scope of EU-ETS
 - Captures differences in trip lengths
- Split of inland navigation in domestic coastal sea shipping and inland waterways
- Bunkers treated as a transport mode (distinction between intra- and extra-EU)

KEY FEATURES: STOCKS & TYPICAL EQUIPMENT CONFIGURATIONS

Vehicle stocks are identified by technology type

- Different treatments for the stocks for road and other transport modes
 - Real stock vs. **representative vehicle configuration** (freight road, aviation, rail) defined by average
 - Annual mileage
 - Number of seats / cargo capacity
- Explicit considerations of stocks & new registrations statistics for road transport modes, whenever possible

KEY FEATURES: STOCKS DYNAMICS EXAMPLE



KEY FEATURES: ROAD FREIGHT ACTIVITY

Activity data for freight transport reviewed to better approach the specificities of the sector, using a 2-steps procedure

1. International truck fleet described as homogenous across Europe – reference truck –bottom-up)
 - Unit fuel consumption
 - Annual mileage
 - Average load
2. Stock of trucks operating domestic movements
 - derived from reported mobility data, annual mileages and load factors
 - Small deviations from the data reported for the national trucks stock but
 - **better depicts the actual activity of road-based freight transport**

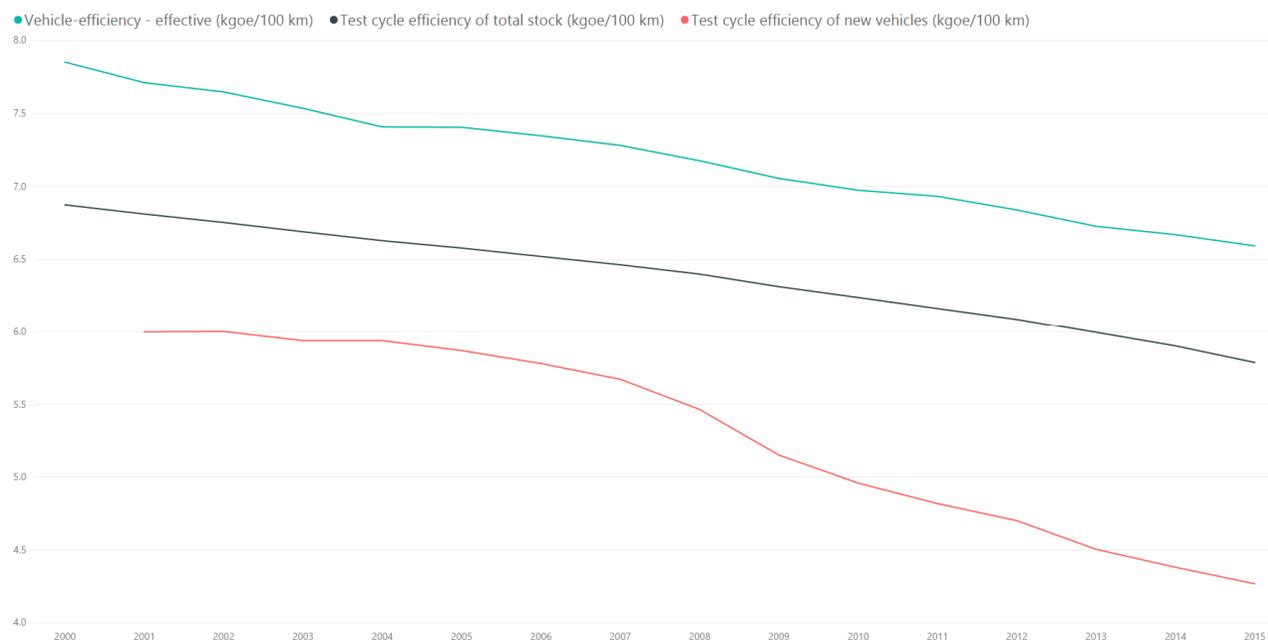
KEY FEATURES: ROAD FREIGHT ACTIVITY



KEY FEATURES: STOCKS AND CONSUMPTIONS

Bottom-up estimations of fleet dynamics and technical characteristics of technologies for road, rail and aviation

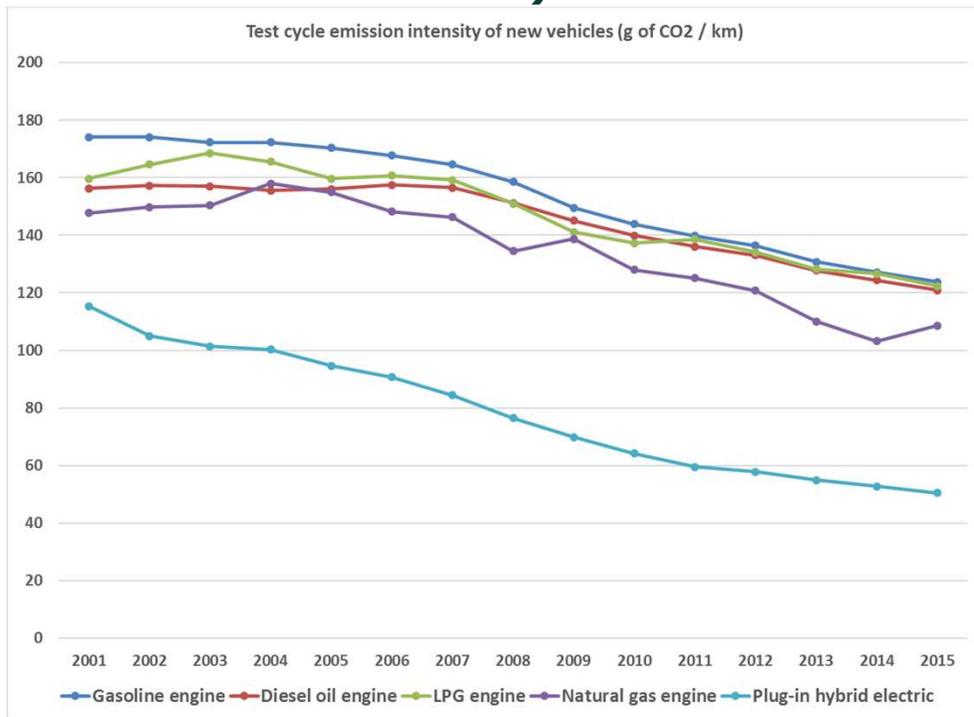
- **Stocks and sales** at the technology level
- **Disaggregated unit consumption** of a given technology stock



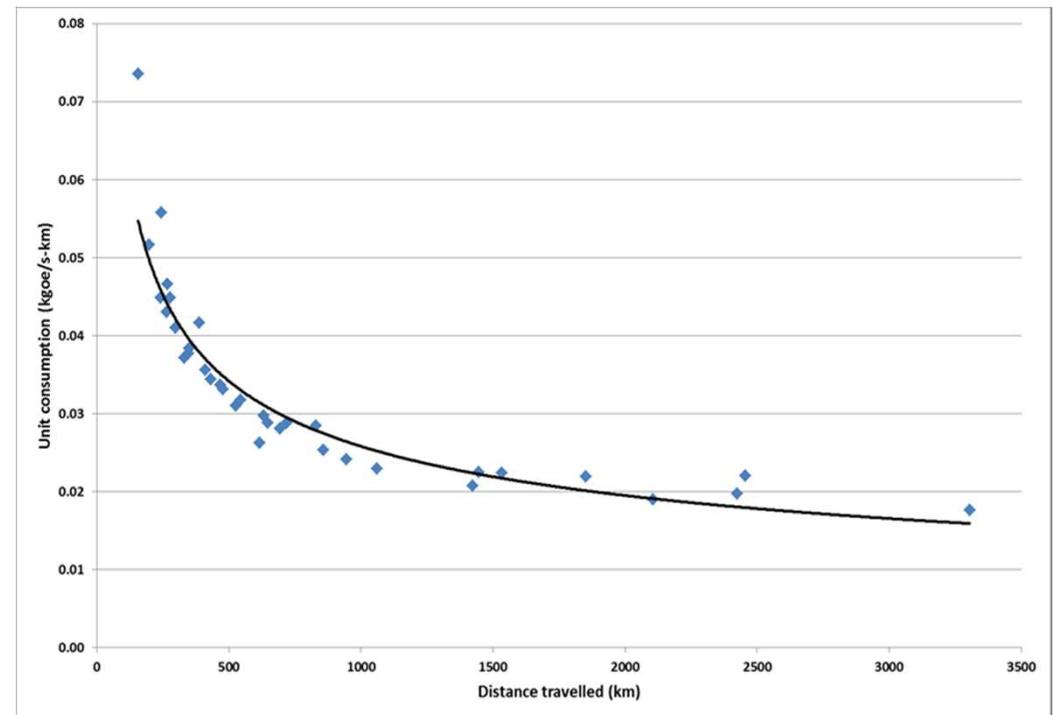
- The procedure also allows for the identification of the "idle stock" of vehicles

EXAMPLE: UNIT CONSUMPTIONS FROM THE BOTTOM-UP

Passenger cars, test-cycle efficiency of new in EU28 (source: EEA)



Aircrafts (source: ICAO)



WHAT CAN BE FOUND IN JRC-IDEES

Activity data by transport mode and technology type

- Passengers and Ton-Kilometres
- Vehicle-Kilometres
- Load factors

Vehicle related data

- Stock of vehicles
- New registrations
- Idle stock
- Unit consumption / emissions (real life)
- Annual mileage
- Number of trips and average trip distance (for aviation)

Various indicators

Full consistency between EUROSTAT energy and activity statistics

- Use of the newly available very detailed EUROSTAT statistics
- Territoriality principle applies for road freight

WHAT CAN BE FOUND IN JRC-IDEES

- Final energy consumption
 - Eurostat structure
 - Split into transport modes, transport means, technologies and fuels
- CO₂ emissions
- Activity data
 - Passenger-km / tonne-km
 - Total mileage
- Vehicle stock
 - Total stock, new vehicles, age structure
- Technology data
 - Effective efficiencies and emissions
 - Test-cycle / theoretical efficiencies and emissions
 - Discrepancy indicators
- Indicators
 - Load factors
 - Annual vehicle activities, energy consumptions, emissions
 - Flight indicators
 - Intensities

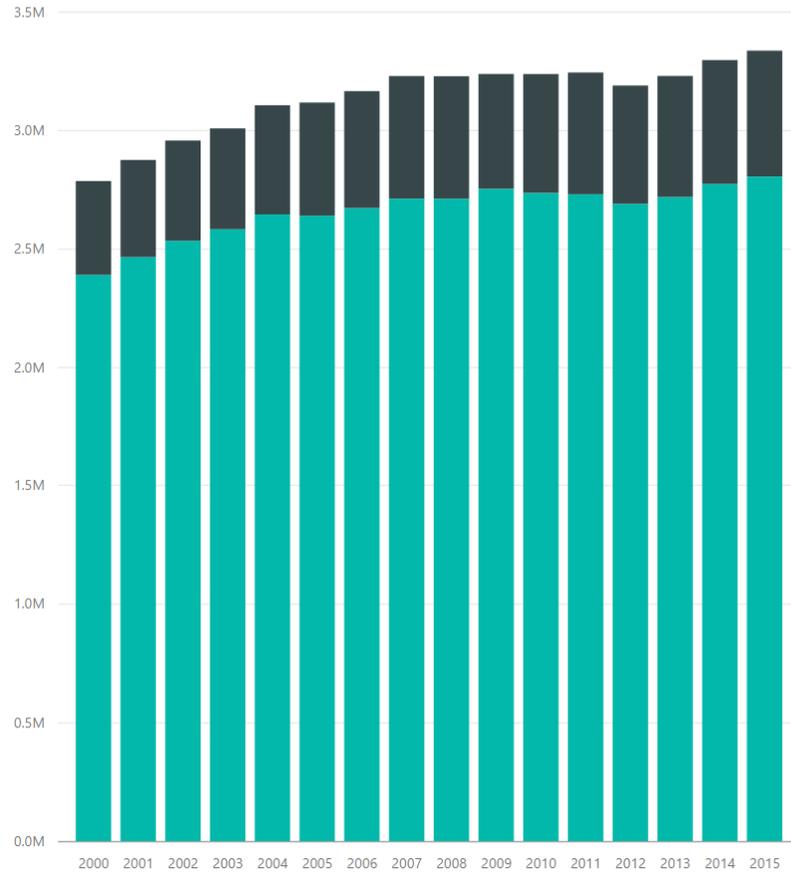
FILE STRUCTURE

Sheet	Description
TransportAndBunkers Transport	Overview: Transport sectors and Bunkers Overview: Transport sectors
TrRoad_act <ul style="list-style-type: none">TrRoad_eneTrRoad_emiTrRoad_tech	Road transport - activity related data <ul style="list-style-type: none">Energy consumptionCO₂ emissionsTechnology data
TrRail_act <ul style="list-style-type: none">TrRail_eneTrRail_emi	Rail, metro and tram - activity related data <ul style="list-style-type: none">Energy consumptionCO₂ emissions
TrAvia_act <ul style="list-style-type: none">TrAvia_eneTrAvia_emiTrAvia_png	Aviation - activity related data <ul style="list-style-type: none">Energy consumptionCO₂ emissionspassenger transport specific data
TrNavi_act <ul style="list-style-type: none">TrNavi_eneTrNavi_emi	Coastal shipping and inland waterways - activity related data <ul style="list-style-type: none">Energy consumptionCO₂ emissions
TrBunk_act <ul style="list-style-type: none">TrNavi_eneTrNavi_emi	Bunkers - activity related data <ul style="list-style-type: none">Energy consumptionCO₂ emissions

ALL MODES

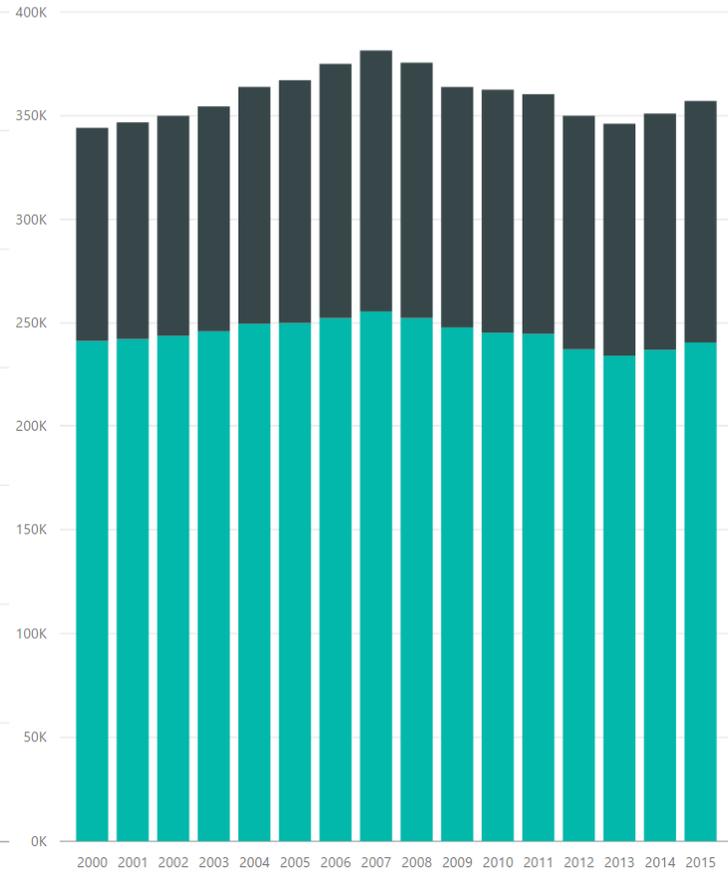
Vehicle-km driven

● Passenger transport ● Freight transport



Energy consumption

● Passenger transport ● Freight transport



Mode

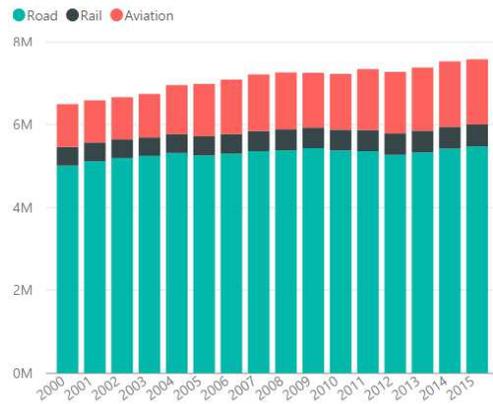
- Road
- Rail
- Aviation
- Navigation

country

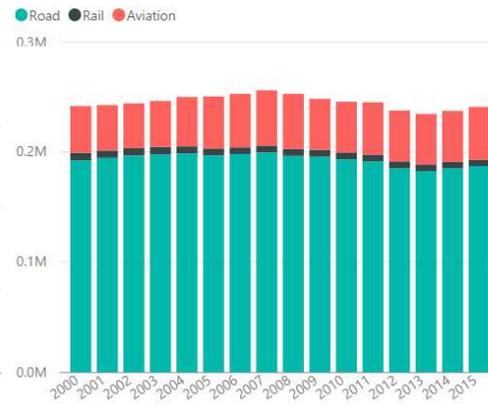
- EU28
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PASSENGERS MOBILITY – MAIN DASHBOARD

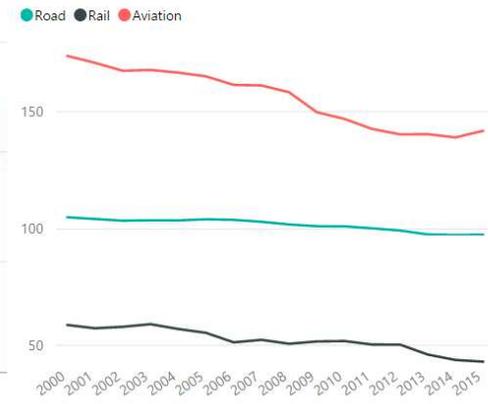
Transport activity



Energy consumption



Energy consumption over activity (kgoe / 00 pkm or tkm)



Category

- Passenger...
- Freight tra...

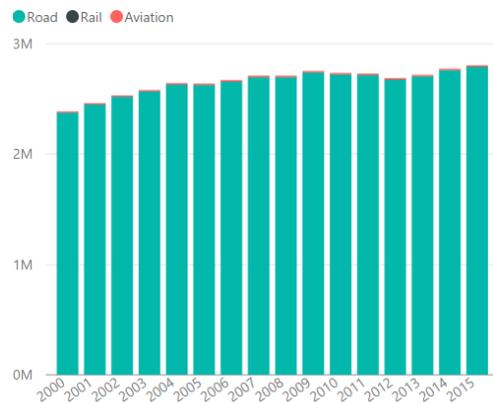
Mode

- Road
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- Aviation
- Navigation

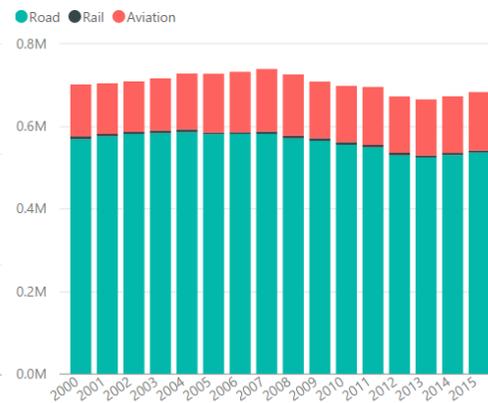
country

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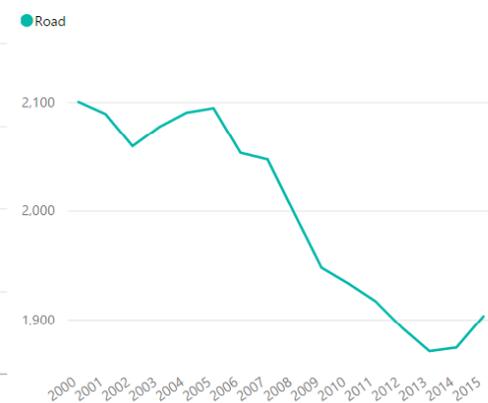
Vehicle-km driven



CO2 emissions

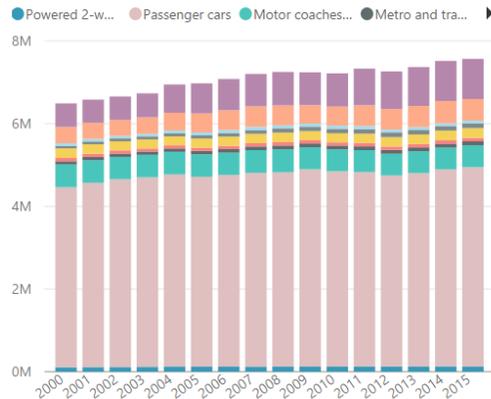


Emission intensity over activity (kg CO2 / 000 pkm or tkm)

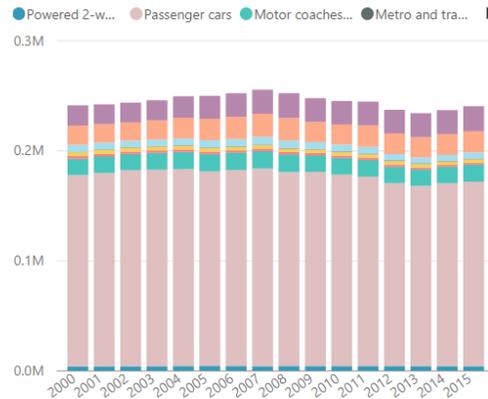


PASSENGERS MOBILITY – BY MEANS

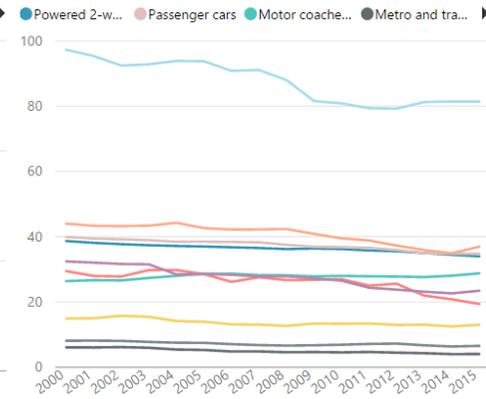
Transport activity



Energy consumption



Energy consumption over activity (kgoe / 00 pkm or tkm)



Category

- Passenger...
- Freight tra...

Mode

- Road
- Rail
- Aviation
- Navigation

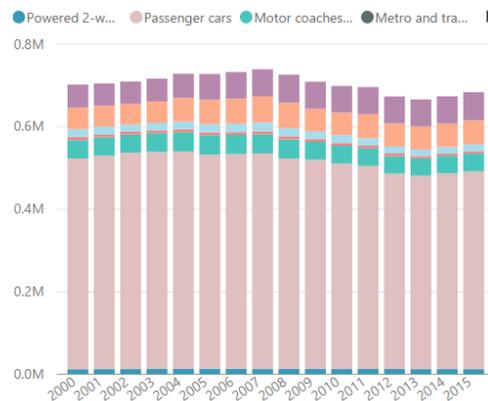
country

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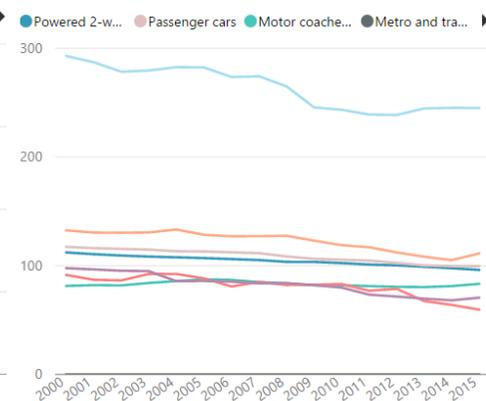
Vehicle-km driven



CO2 emissions



Emission intensity over activity (kg CO2 / 000 pkm or tkm)



PASSENGERS MOBILITY – HETEROGENEITY WITH LORENTZ-TYPE CURVES

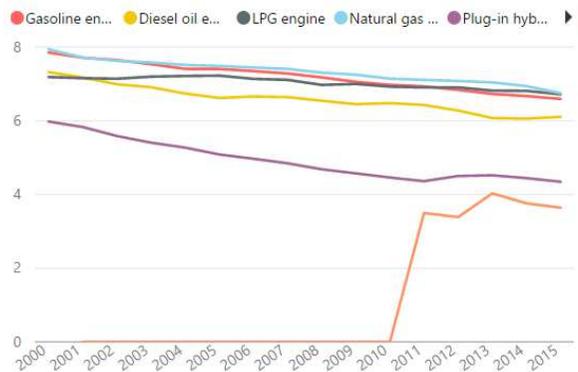


PASSENGERS MOBILITY – PASSENGER CARS

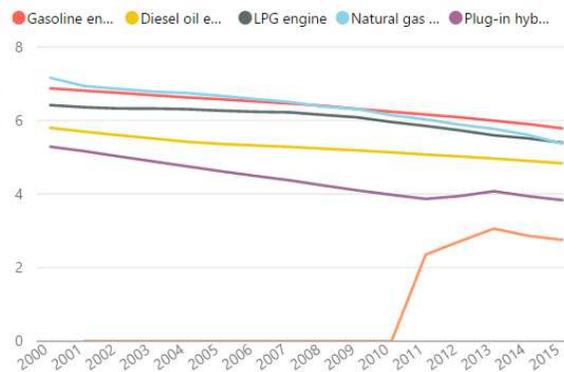
Passenger cars

EU28

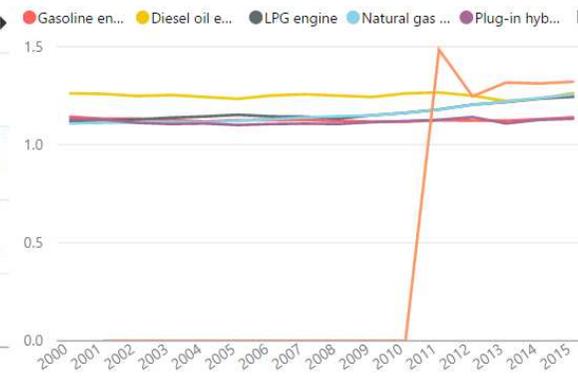
Effective efficiency of total stock (kgoe / 100 km)



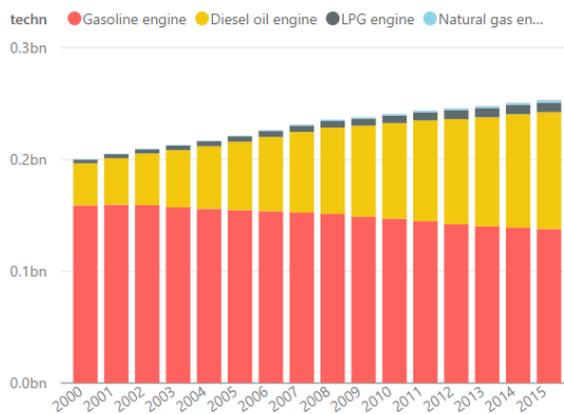
Test cycle efficiency of total stock (kgoe / 100 km)



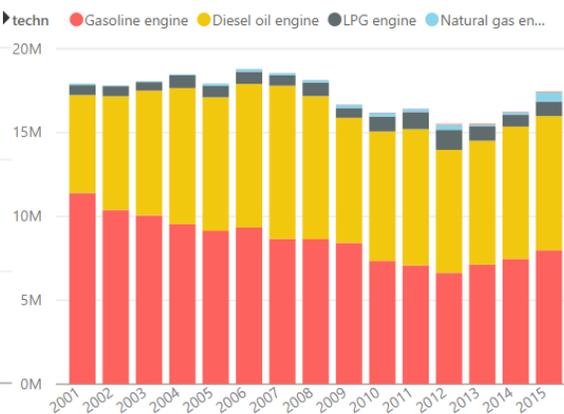
Discrepancy between effective and test cycle efficiencies



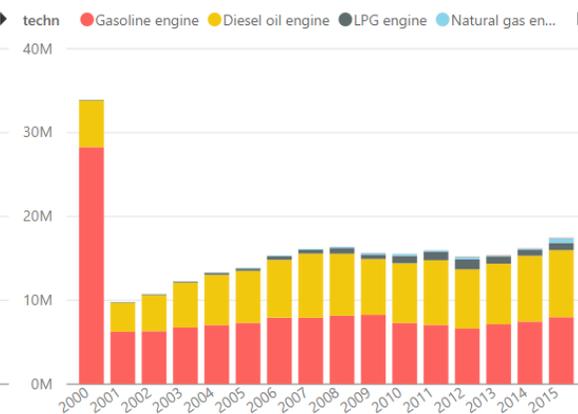
Stock of vehicles



New vehicle registrations



Age structure of 2015 stock



PASSENGERS MOBILITY – PASSENGER CARS ON MAP

Value by country



mode

■ Road

mean

◇ List ▾

■ Passenger cars

□ Motor coaches, buses and trolley buses

□ Light duty vehicles

techn

□ <all>

□ Gasoline engine

■ Diesel oil engine

variable

□ Total energy consumption (kgoe)

■ Transport activity

□ Vehicle-km driven

□ Vehicle-km driven per vehicle annum (k...

□ Vehicle-efficiency - effective (kgoe/100 k...

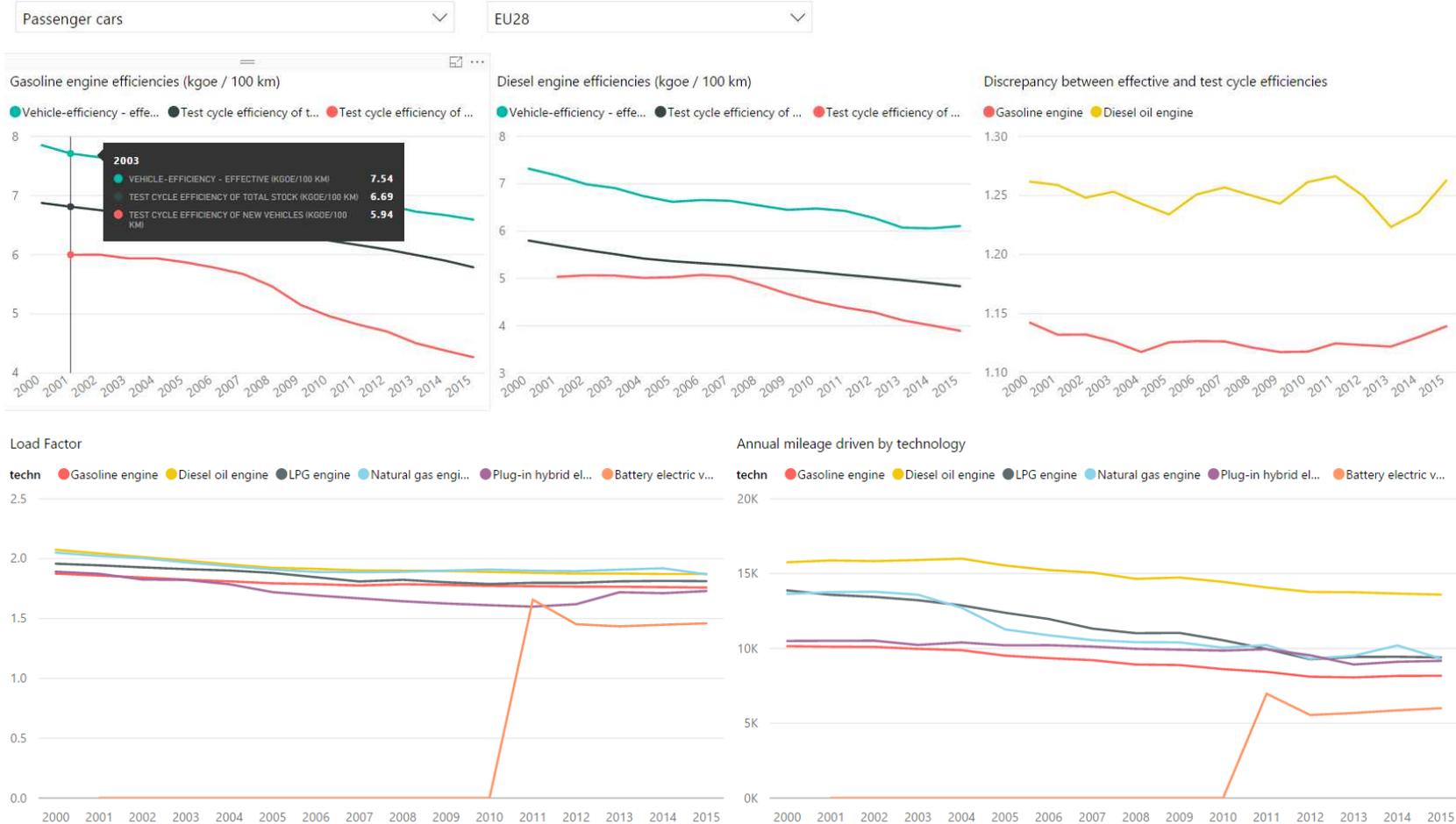
□ Test cycle efficiency of total stock (kgoe/...

□ Test cycle efficiency of new vehicles (kgoe/...

Year

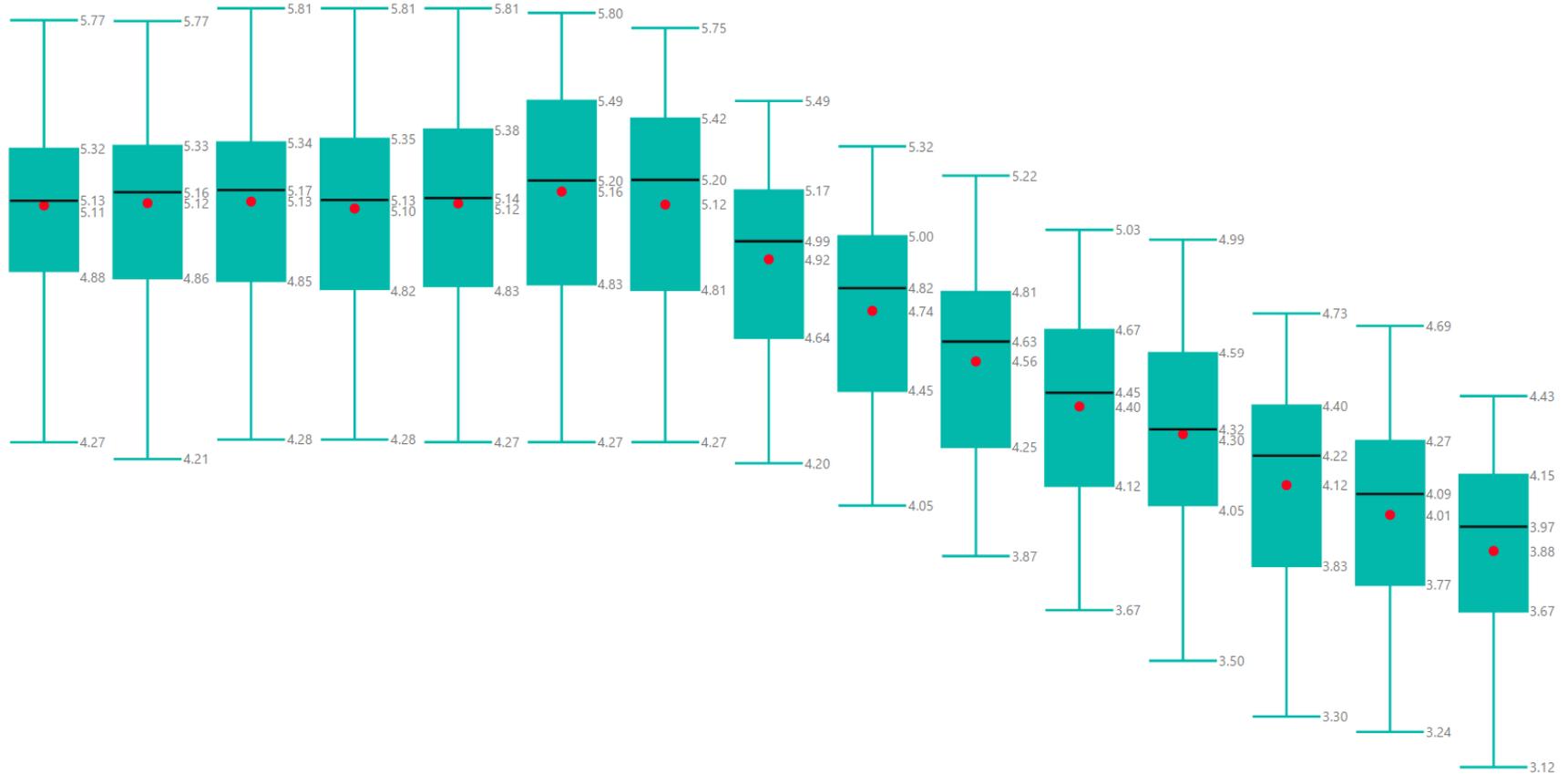
▶ || ◀ ▶▶ 2015

PASSENGERS MOBILITY – PASSENGER CARS INTENSITIES



PASSENGERS MOBILITY – DIESEL CARS FUEL CONSUMPTION OF NEW, ACROSS COUNTRIES

Value by Year and country

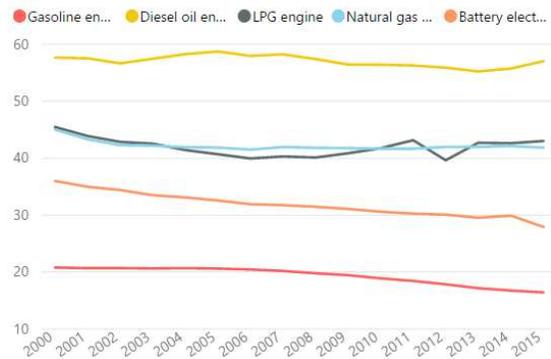


PASSENGERS MOBILITY – MBC

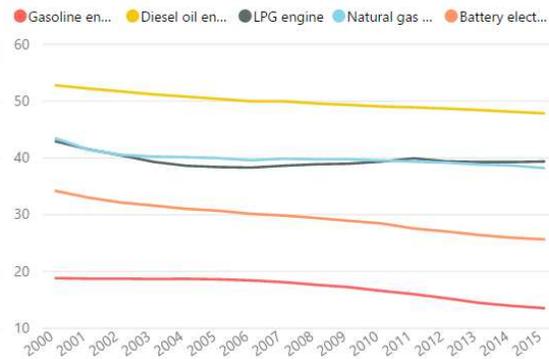
Motor coaches, buses and trolley buses

EU28

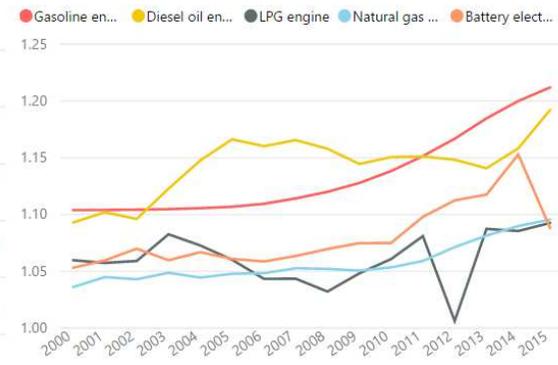
Effective efficiency of total stock (kgoe / 100 km)



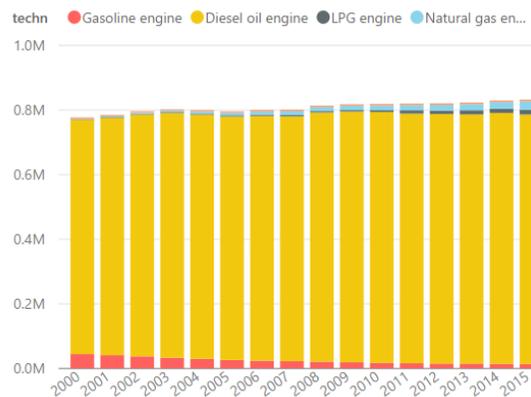
Test cycle efficiency of total stock (kgoe / 100 km)



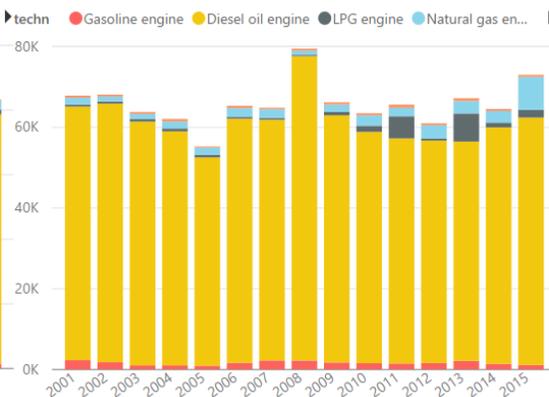
Discrepancy between effective and test cycle efficiencies



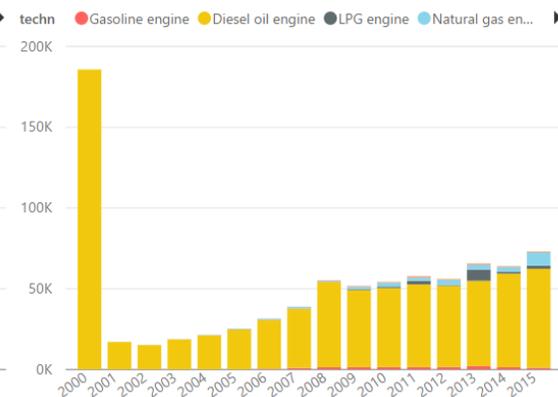
Stock of vehicles



New vehicle registrations



Age structure of 2015 stock

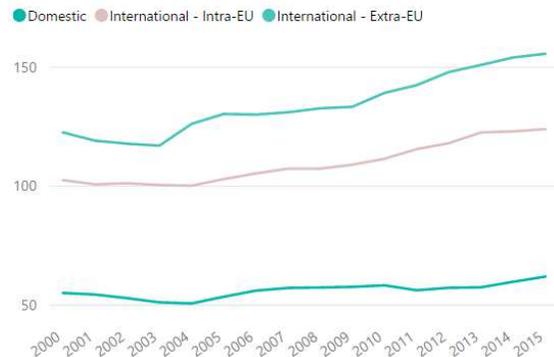


PASSENGERS MOBILITY – AVIATION

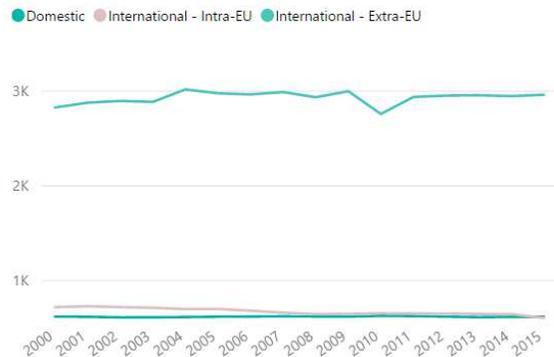
Passenger transport

EU28

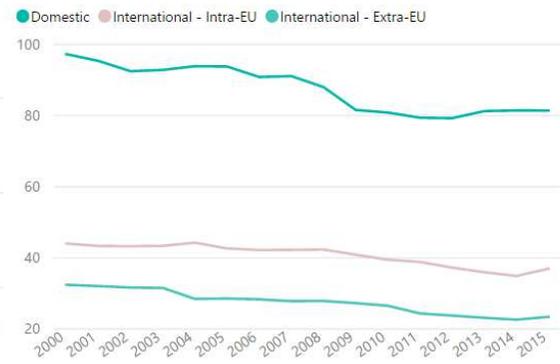
Load factor of flights (passenger or tonne per flight)



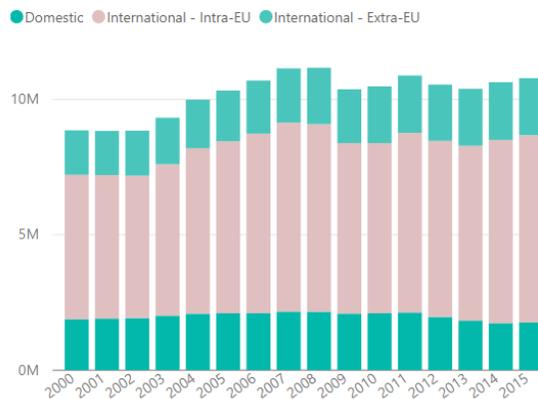
Distance travelled per flight



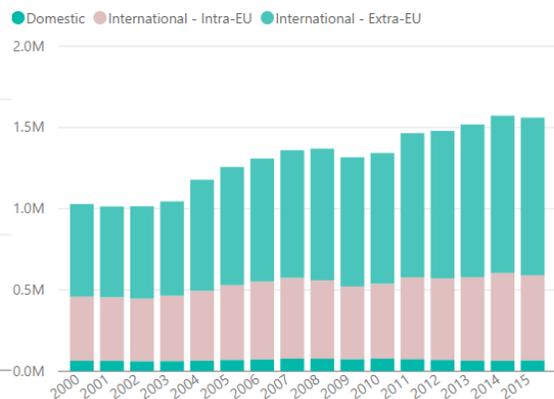
Energy consumption over activity (kgoe per 000 pkm or tkm)



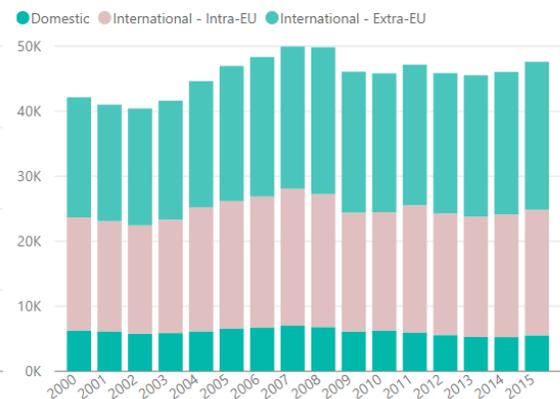
Number of flights



Transport activity (mio pkm or tkm)



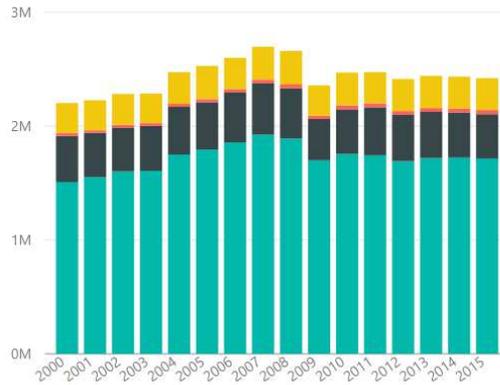
Energy consumption (ktoe)



FREIGHT MOBILITY – MAIN DASHBOARD

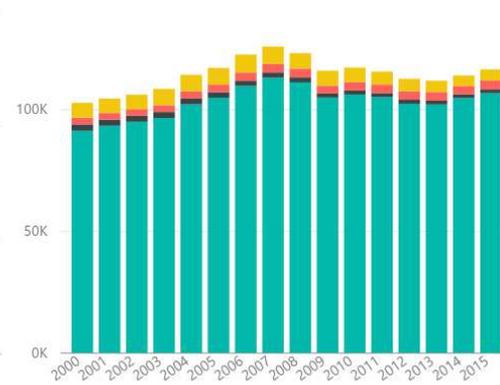
Transport activity

● Road ● Rail ● Aviation ● Navigation



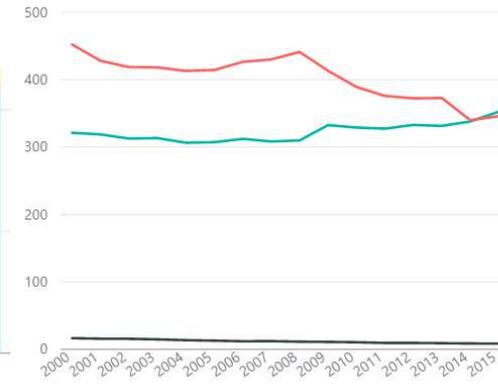
Energy consumption

● Road ● Rail ● Aviation ● Navigation



Energy consumption over activity (kgoe / 00 pkm or tkm)

● Road ● Rail ● Aviation



Category

- Passenger...
- Freight tra...

Mode

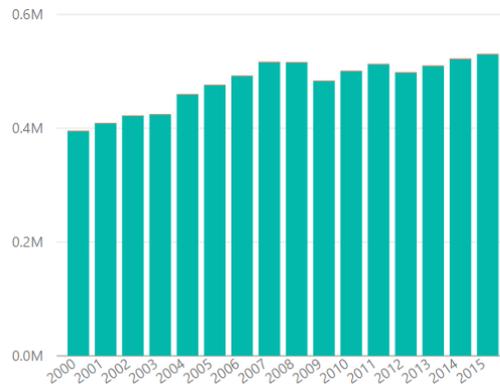
- Road
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country

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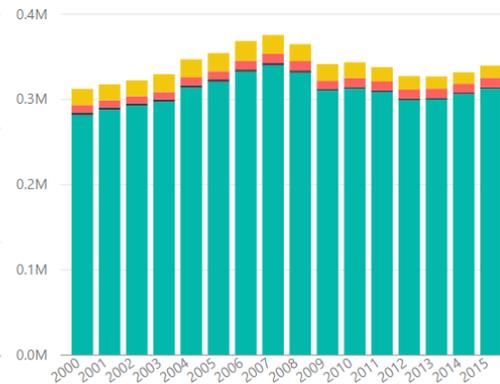
Vehicle-km driven

● Road ● Rail ● Aviation ● Navigation



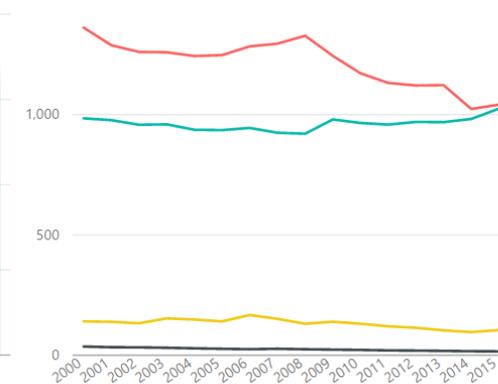
CO2 emissions

● Road ● Rail ● Aviation ● Navigation



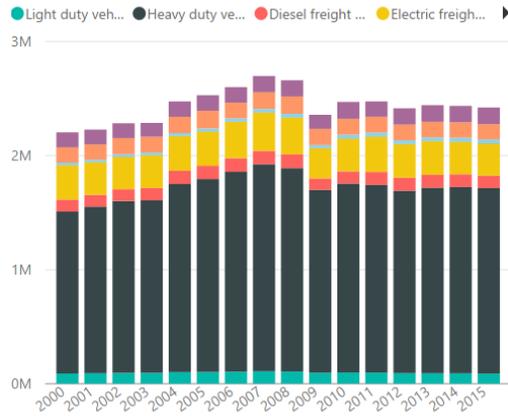
Emission intensity over activity (kg CO2 / 000 pkm or tkm)

● Road ● Rail ● Aviation ● Navigation

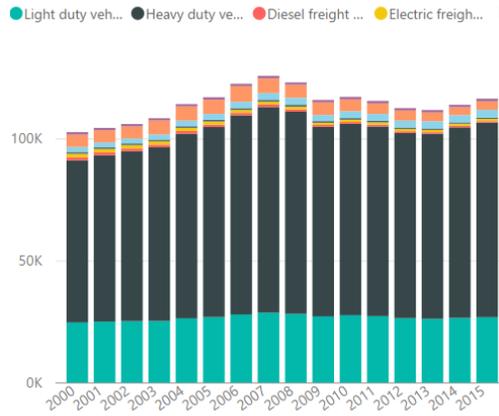


FREIGHT MOBILITY – BY MEANS

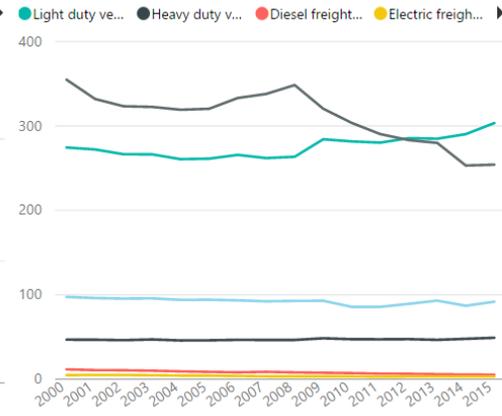
Transport activity



Energy consumption



Energy consumption over activity (kgoe / 00 pkm or tkm)



Category

- Passenger...
- Freight tra...

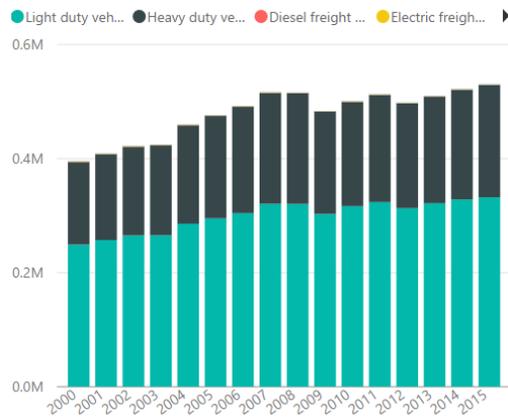
Mode

- Road
- Rail
- Aviation
- Navigation

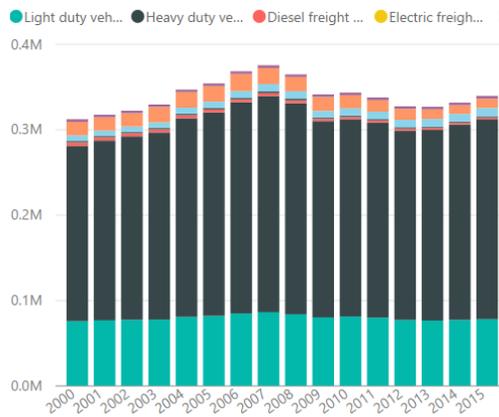
country

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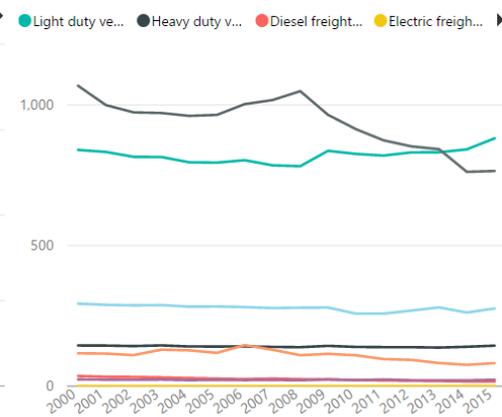
Vehicle-km driven



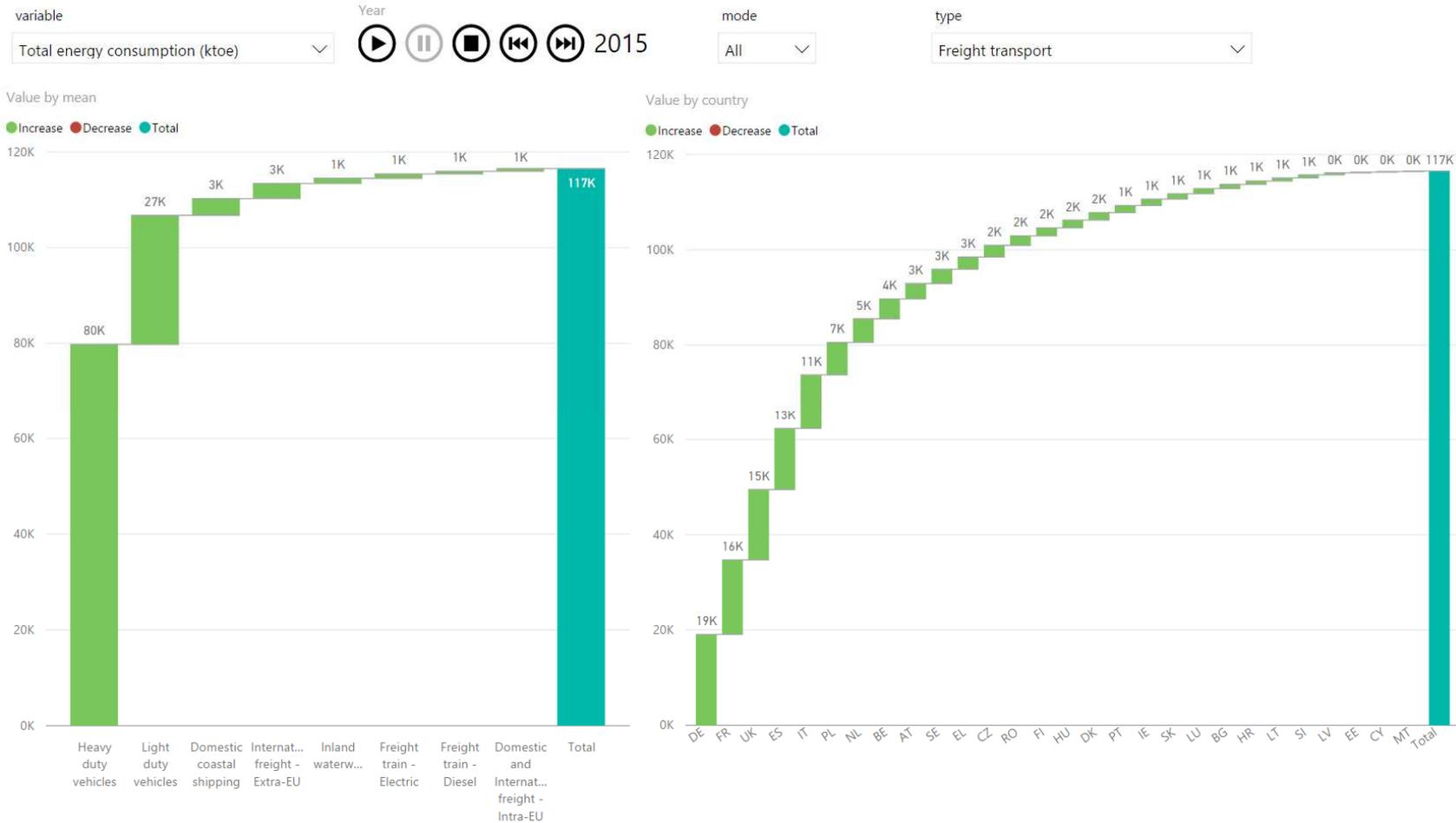
CO2 emissions



Emission intensity over activity (kg CO2 / 000 pkm or tkm)



FREIGHT MOBILITY – HETEROGENEITY WITH LORENTZ-TYPE CURVES

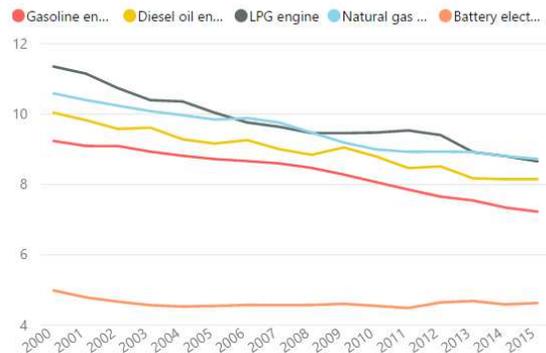


FREIGHT MOBILITY – LDVs

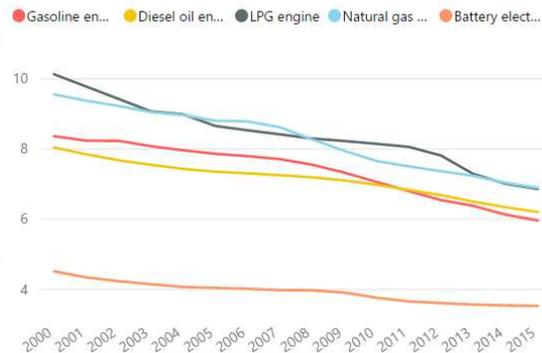
Light duty vehicles

EU28

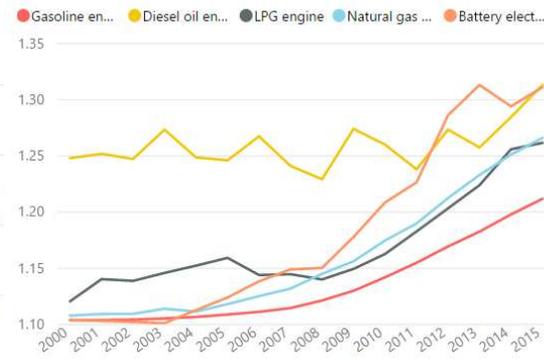
Effective efficiency of total stock (kgoe / 100 km)



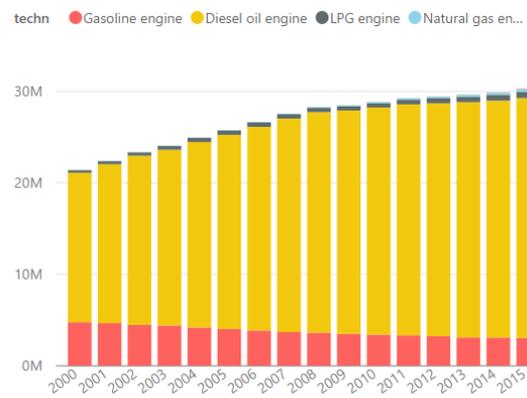
Test cycle efficiency of total stock (kgoe / 100 km)



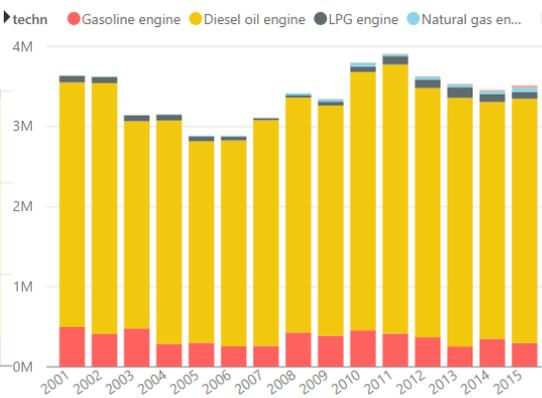
Discrepancy between effective and test cycle efficiencies



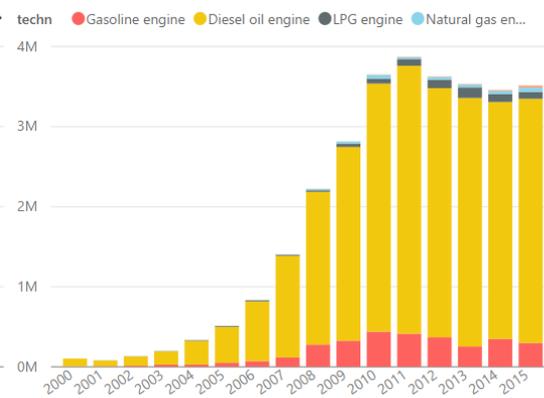
Stock of vehicles



New vehicle registrations



Age structure of 2015 stock

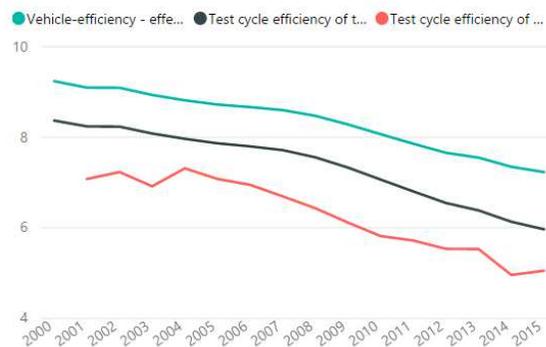


FREIGHT MOBILITY – LDVs INTENSITIES

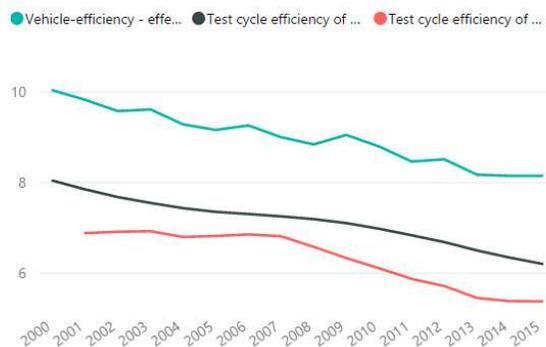
Light duty vehicles

EU28

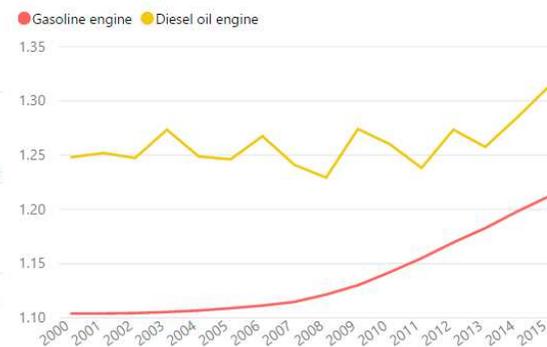
Gasoline engine efficiencies (kgoe / 100 km)



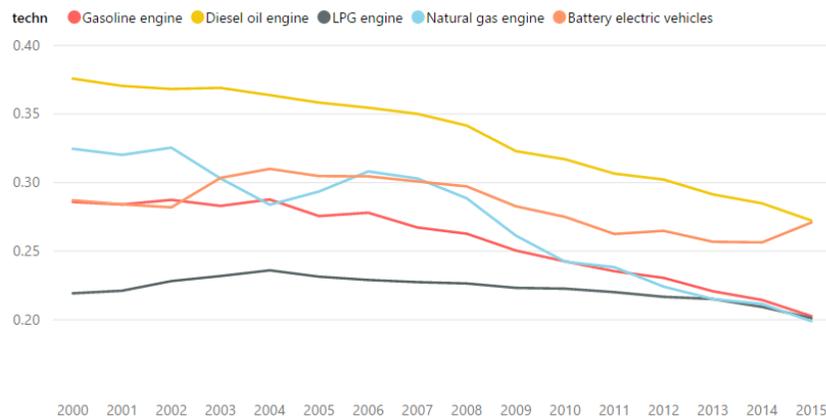
Diesel engine efficiencies (kgoe / 100 km)



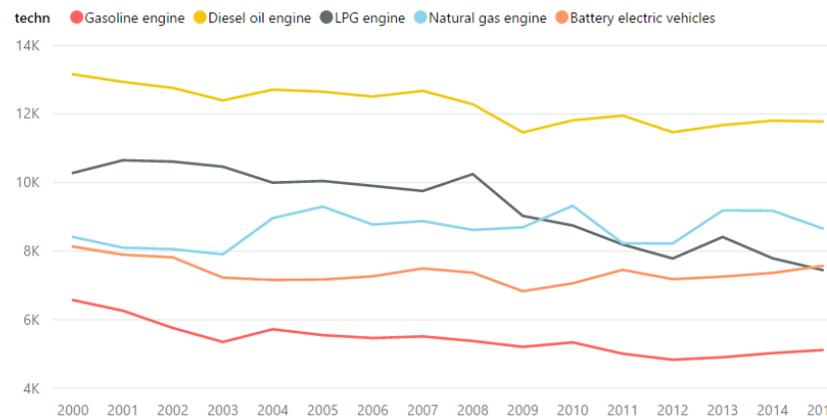
Discrepancy between effective and test cycle efficiencies



Load Factor



Annual mileage driven by technology

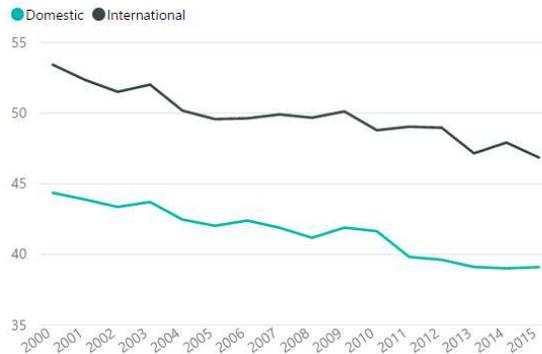


FREIGHT MOBILITY – HDVs

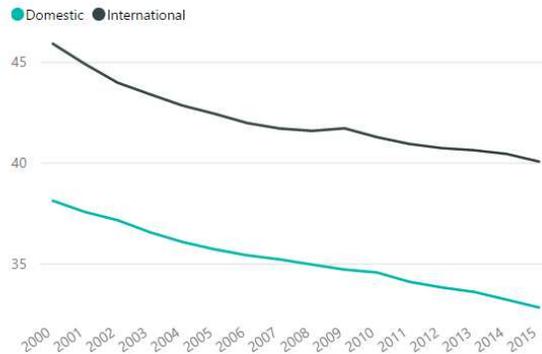
Heavy duty vehicles

EU28

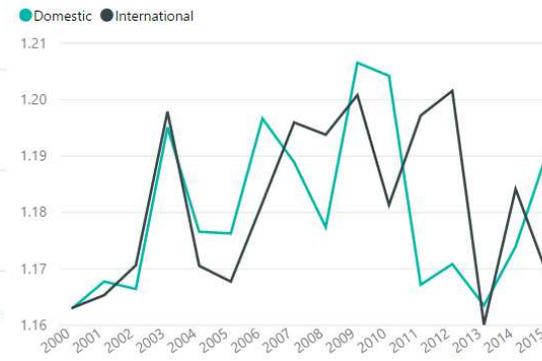
Effective efficiency of total stock (kgoe / 100 km)



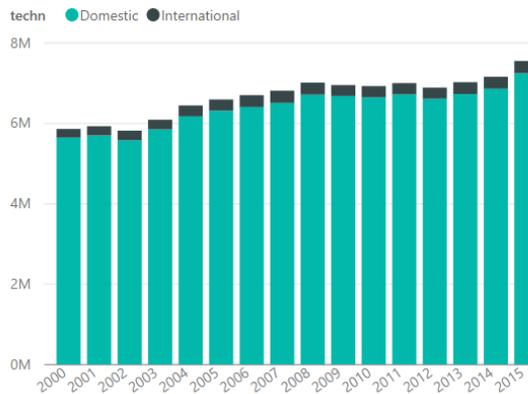
Test cycle efficiency of total stock (kgoe / 100 km)



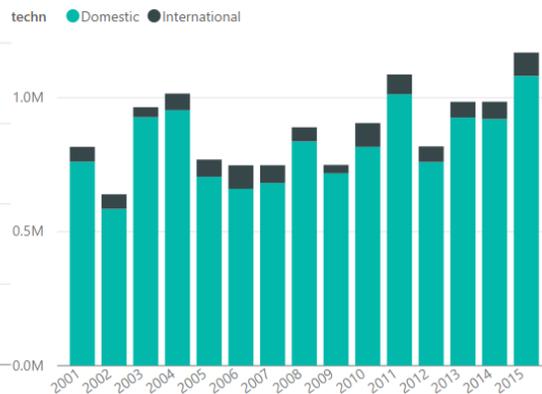
Discrepancy between effective and test cycle efficiencies



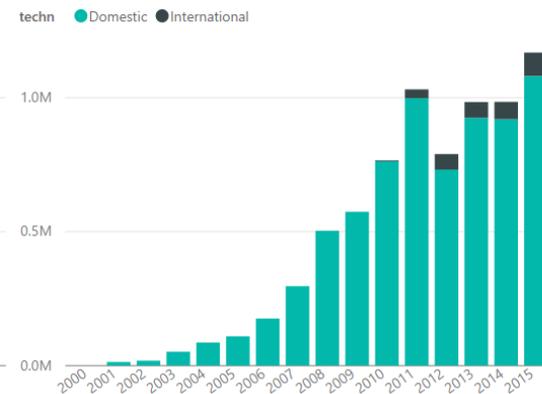
Stock of vehicles



New vehicle registrations

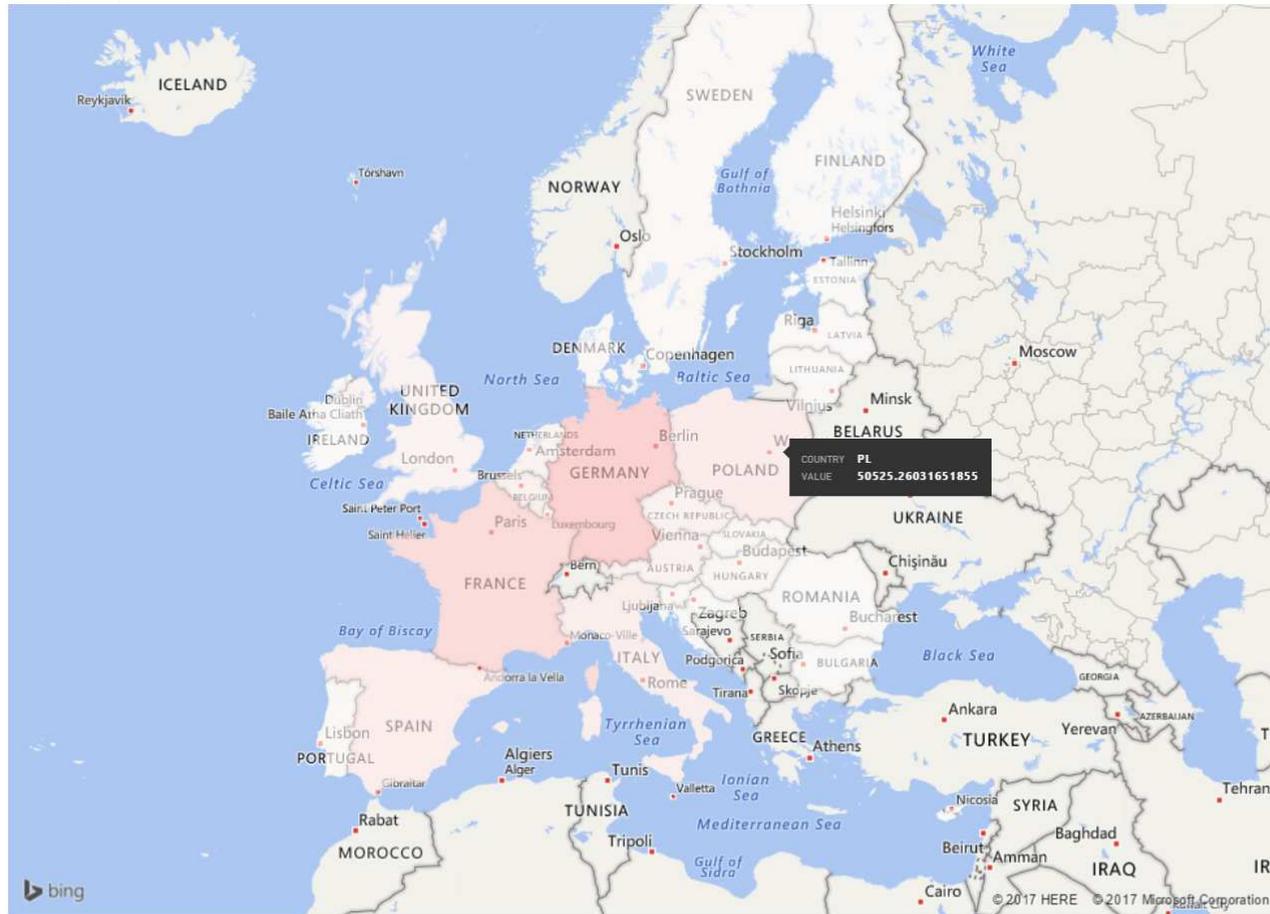


Age structure of 2015 stock



FREIGHT MOBILITY – INTERNATIONAL HAULAGE ON MAP

Value by country



mode

■ Road

mean

■ Heavy duty vehicles

techn

<all>

Domestic

International

variable

Transport activity

Year

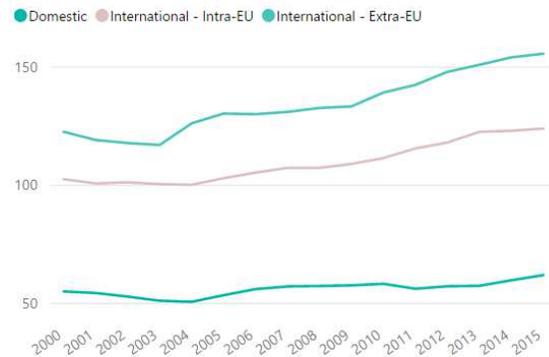
▶ || ◻ ◀ ▶▶ 2015

FREIGHT MOBILITY – AVIATION

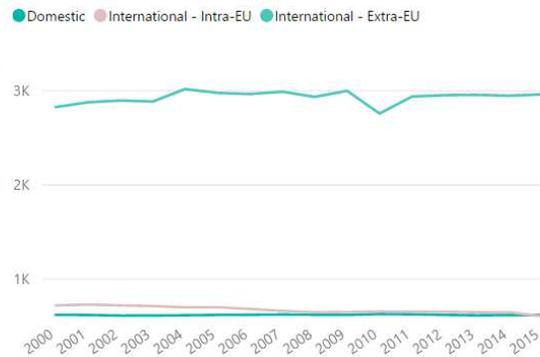
Passenger transport

EU28

Load factor of flights (passenger or tonne per flight)



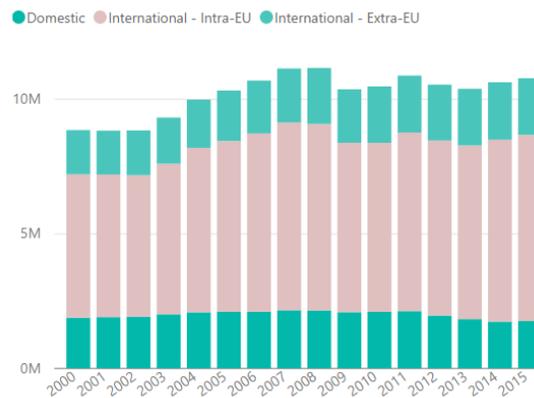
Distance travelled per flight



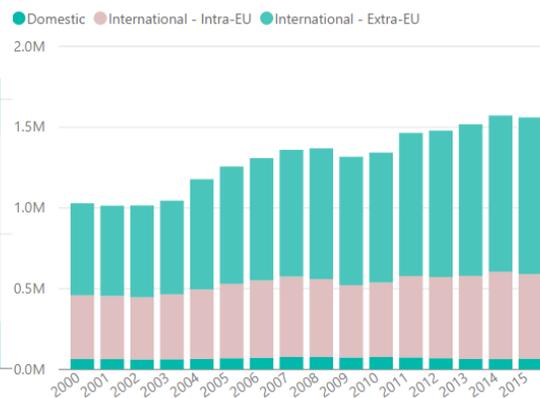
Energy consumption over activity (kgoe per 000 pkm or tkm)



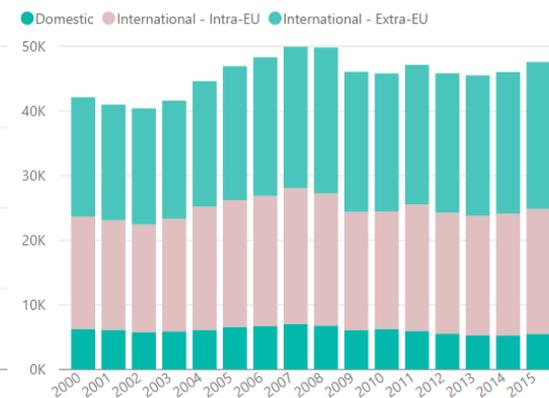
Number of flights



Transport activity (mio pkm or tkm)



Energy consumption (ktoe)





Thank you for your attention



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Contact:

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Additional Material

Brussels, 12 Oct 2017

ROAD TRANSPORT

Carriage	Transport means	Technologies	Variables: quantities	Variables: intensities
Passengers mobility	Two-wheelers	All together (mopeds and motorcycles)	Mobility, total mileage driven, stock, sales, energy consumption, CO ₂ emissions	Possession rates (per inhabitant, household or GDP unit), unit fuel consumption of existing and new equipment, CO ₂ emissions intensity of existing stock and new vehicles, annual mileage per vehicle, load factor
	Passenger cars	Gasoline		
		Diesel LPG CNG PHEV BEV		
Motor coaches, busses and trolley busses	Gasoline			
	Diesel LPG CNG Electric			
Freight mobility	Light Duty Vehicles	Gasoline		
		Diesel LPG CNG Electric		
	Domestic lorries and road tractors	Diesel		
International lorries and road tractors				

RAIL TRANSPORT

Activity Type	Transport means	Technologies	Variables: quantities	Variables: intensities
Passengers mobility	Tram & metro	All together (trams & metros)	Mobility, stock, sales, total mileage driven, energy consumption, CO2 emissions	Unit fuel consumption of existing stock, CO2 emissions intensity of existing stock, annual mileage per vehicle, load factor
	Conventional rail passenger transport	Diesel Electric		
	High-speed mobility	Electric high speed trains		
Freight mobility	Conventional rail goods transport	Diesel Electric		

AVIATION

Activity	Journey type	Technologies	Variables: quantities	Variables: intensities
Passengers mobility	Domestic	Typical aircraft	Mobility, Volumes transported (passengers/tonnes), Distance travelled, aircrafts stock, new aircrafts, energy consumption, CO2 emissions	Fuel consumption (per distance, volume and seat) and carbon intensity, annual mileage per aircraft, aircraft size (seats/plane) and load factor (passengers or tons/plane)
	International – intra-EU	Typical aircraft		
	International – extra-EU	Typical aircraft		
Freight mobility	International – intra-EU	Typical aircraft		
	International – extra-EU	Typical aircraft		

NAVIGATION

Activity	Journey type	Technologies	Variables: quantities	Variables: intensities
Domestic navigation	Domestic sea	Typical transporter	Mileage, activity (tkm), energy consumption, CO2 emissions	Transporters efficiencies (kgoe/100km, kgoe/tkm), load factors
	Inland waterways	Typical transporter		
International navigation	Intra-EU	Typical transporter		
	Extra-EU	Typical transporter		