IOŚ-PIB

Centre for Climate and Energy Analyses

KOBiZE

LIFE Climate CAKE PL

CO_2 Emissions reduction potential in transport sector in Poland and in the EU until 2050

Conference: „Challenges of the economic transformation in the perspective of achieving the climate neutrality by 2050”

Warsaw, 22`nd of November 2019

TR³E MODEL - BRIEF DESCRITPION

TR³E MODEL - TRANSPORT EUROPEAN EMISSION ECONOMIC MODEL

- Methodology: dynamic recursive partial equillibrium model
- Geographical coverage: EU-28 Member States
- Time horizon: 2050 in annual steps
- Subsectors: road, rail, aviation and water transport
- Type of activity: passenger / freight modules
- Passenger module: work /non work trips, urban /non urban trips
- Age structure of stock: up to 30 years old
- Market development: new vehicles and technologies (ex. ZLEV^s)
- Fuels in **TR³E** model: diesel, petrol, CNG, LPG, hybrid and electric

Main assumptions- baseline scenario

- Activity growth is consistent with the EU Reference Scenario 2016
- Vehicles prices are constant up to 2050
- International fuel prices are consistent with WEO 2017 (3-times growth in 2050)
- Dynamics for electricity prices are taken from MEESA energy model, and it is assumed two times growth up to 2050
- Average mileage growth for PL from +0.5% to +2% y/y
- Constant occupancy rates – 1.4 person/vehicle for cars in average in the PL
- Constant load factor (LDV – 180kg, HDV, aviation, rail and coastal)
- Emission intensities decline at the same level as in the EU Reference Scenario

Main assumptions- analitical scenarios

- **Technology progres scenario (Low, Moderate, High):**
  - Electric vehicles prices (cars and LDV^s) and hybrid decline 1% annualy comparing to the baseline scenario;
  - Growth of costs for users in case of aviation (1% annually) and decline of this costs for train transport (0.25% annually) – in purpose of CO2 emissions reductions in aviation and promotion of rail transport;
  - Faster emissivity improvement (by 0.5% annually) comparing to the baseline scenario.
- **Forced electromobility scenario:**
  - Growing share of electric vehicles in new sales is assumed, as well as the ban for new ICE vehicles registration from 2045 (share of hybrids is as the level of 15%);
  - Comparing to technology progres scenario, changes in new vehicles share are due to regulatory constraint and not as an effect of price change;
  - Same growth of costs for users in case of aviation like in the technology progress scenario.

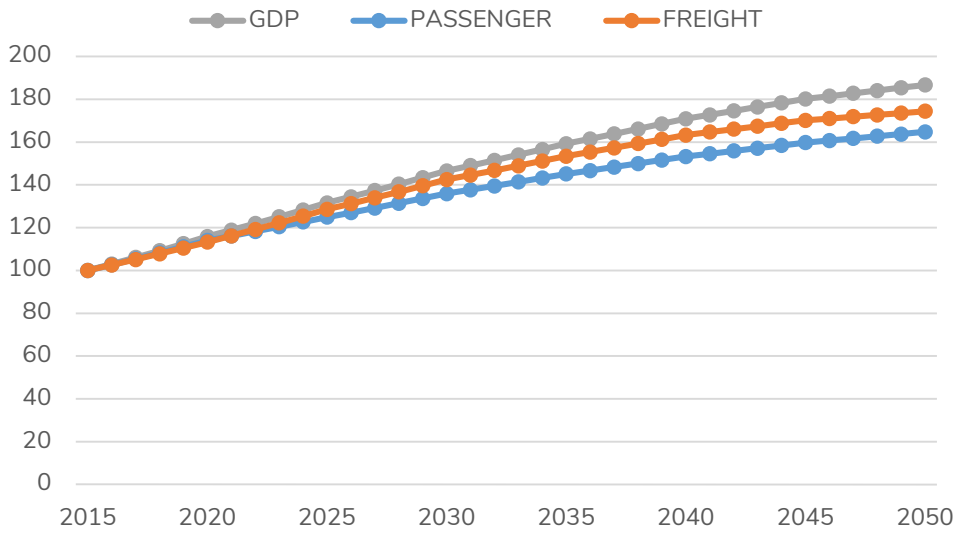
ANALITICAL SCENARIOS– PL

	Baseline	Low	Moderate	High	Forced electromobility
% of electric cars in 2050	24%	39%	47%	57%	80%
% of electric LDV`s in 2050	25%	40%	46%	54%	96%
CO_2 reduction – cars (2050/2015)	-44%	-62%	-68%	-74%	-90%
CO_2 reduction - LDVs (2050/2015)	+35%	-7%	-14%	-24%	-92%
CO_2 reduction - total (2050/2015)	**-4%**	**-36%**	**-40%**	**-45%**	**-66%**
CO_2 emissions in 2050 (Mt)	**47.5**	**30.5**	**28.5**	**26.0**	**16.2**

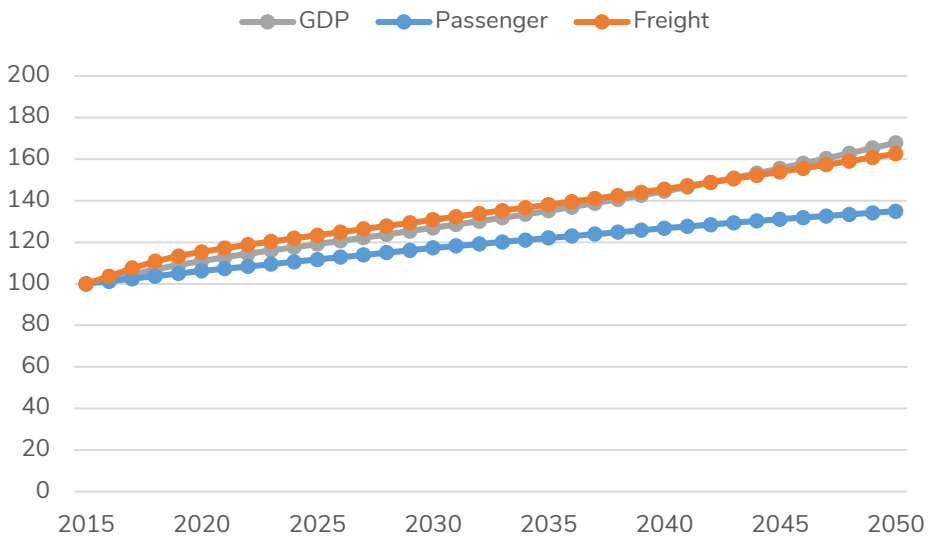
Source: CAKE/KOBiZE own presentation

TRANSPORT ACTIVITY

Poland



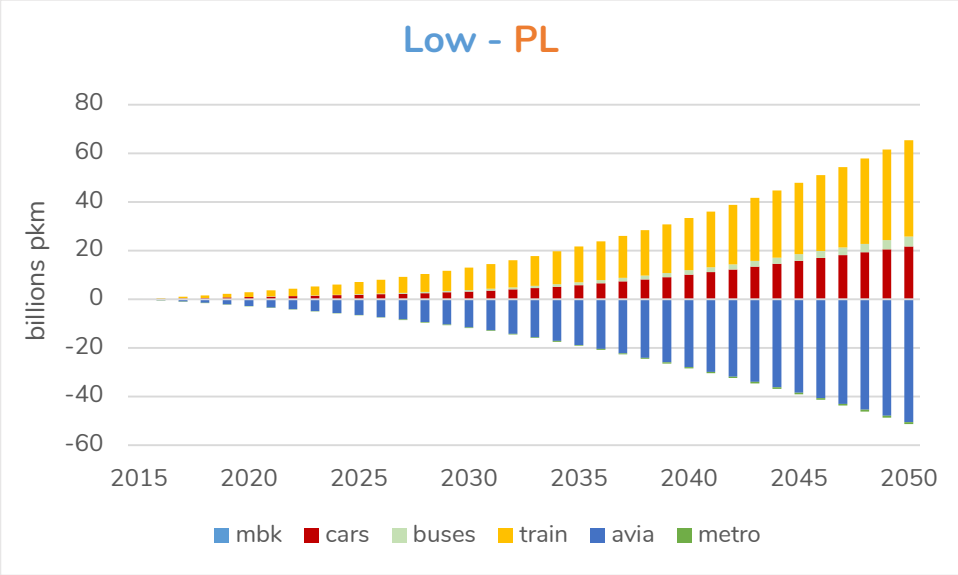
EU

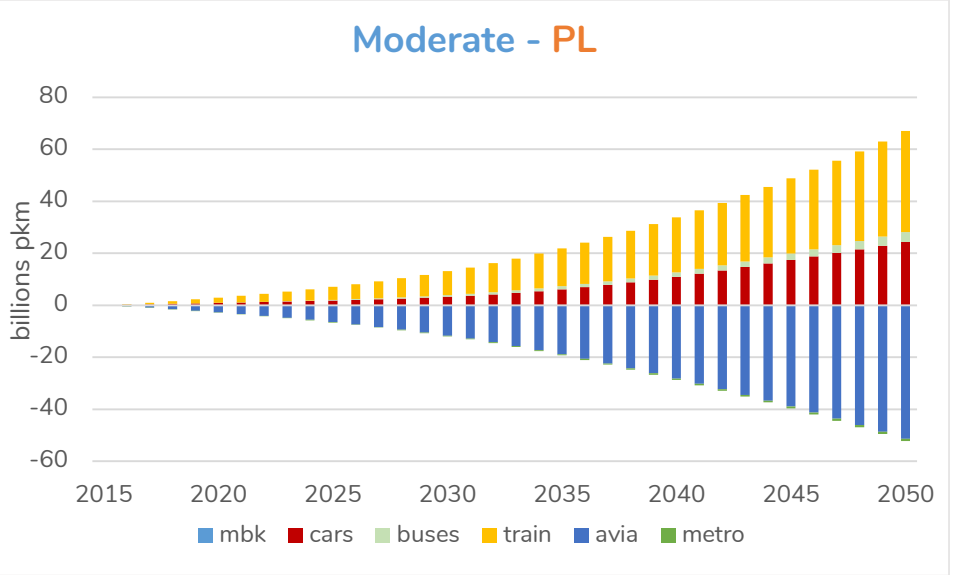


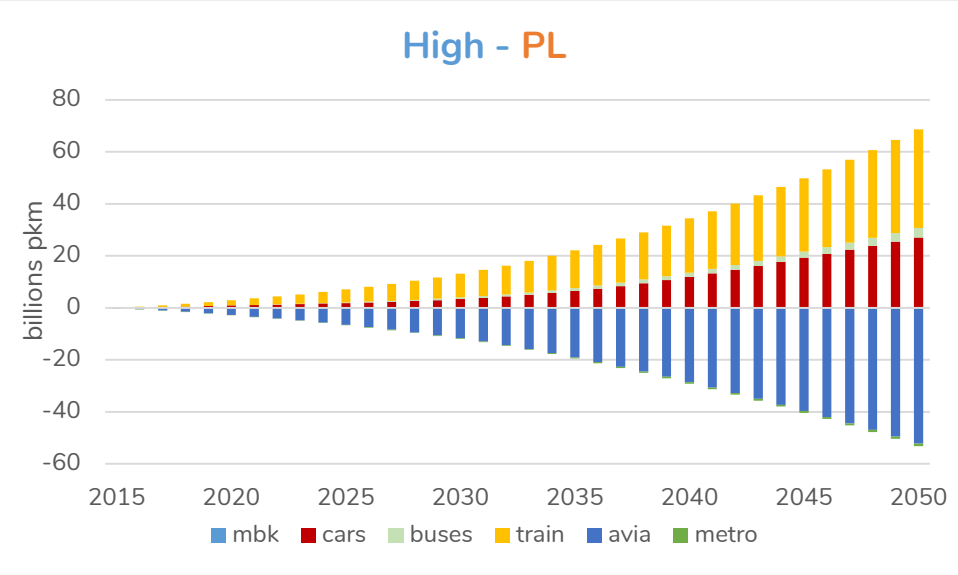
- Activity in passenger transport is growing slower than the GDP; up to 2050 we assume 60% growth in PL (1.4% y/y) and almost 40% in the EU (0.9% y/y);
- In case of the EU, activity in freight transport grows at the same level as GDP (1.4% y/y); In case of PL this growth is at 1.6% y/y;
- Activity growth is consistent with the PRIMES Reference Scenario

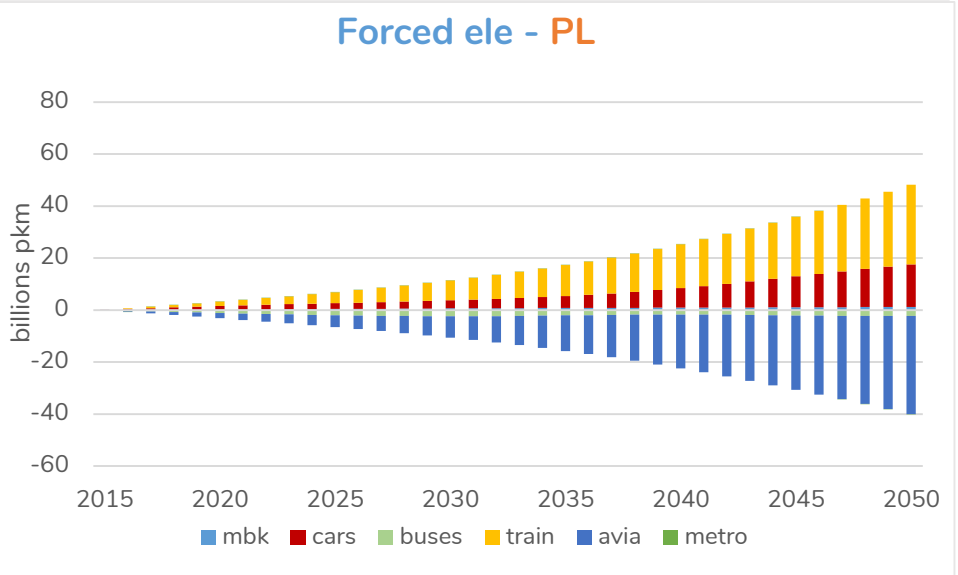
Modeling Results

ACTIVITY CHANGES– PL

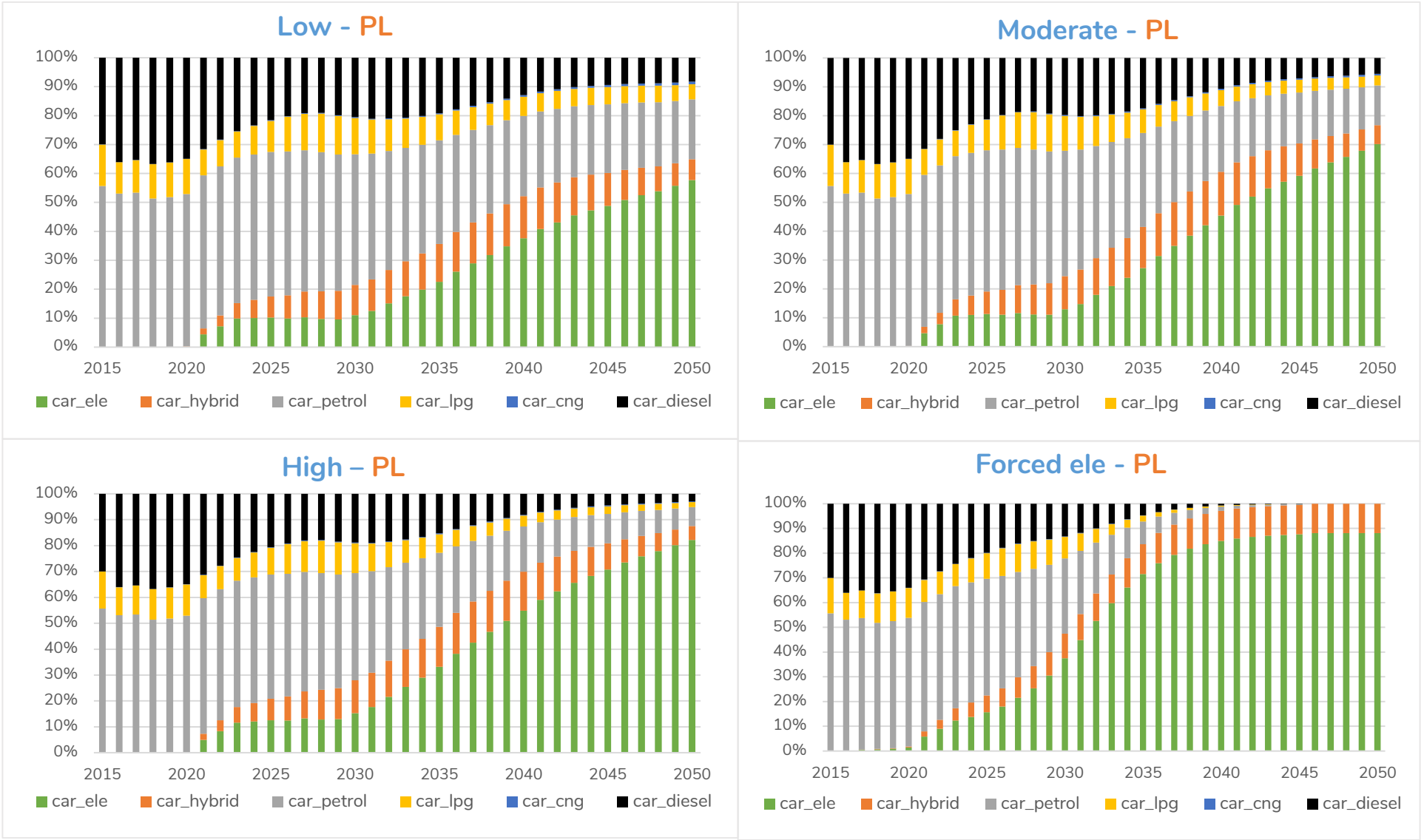




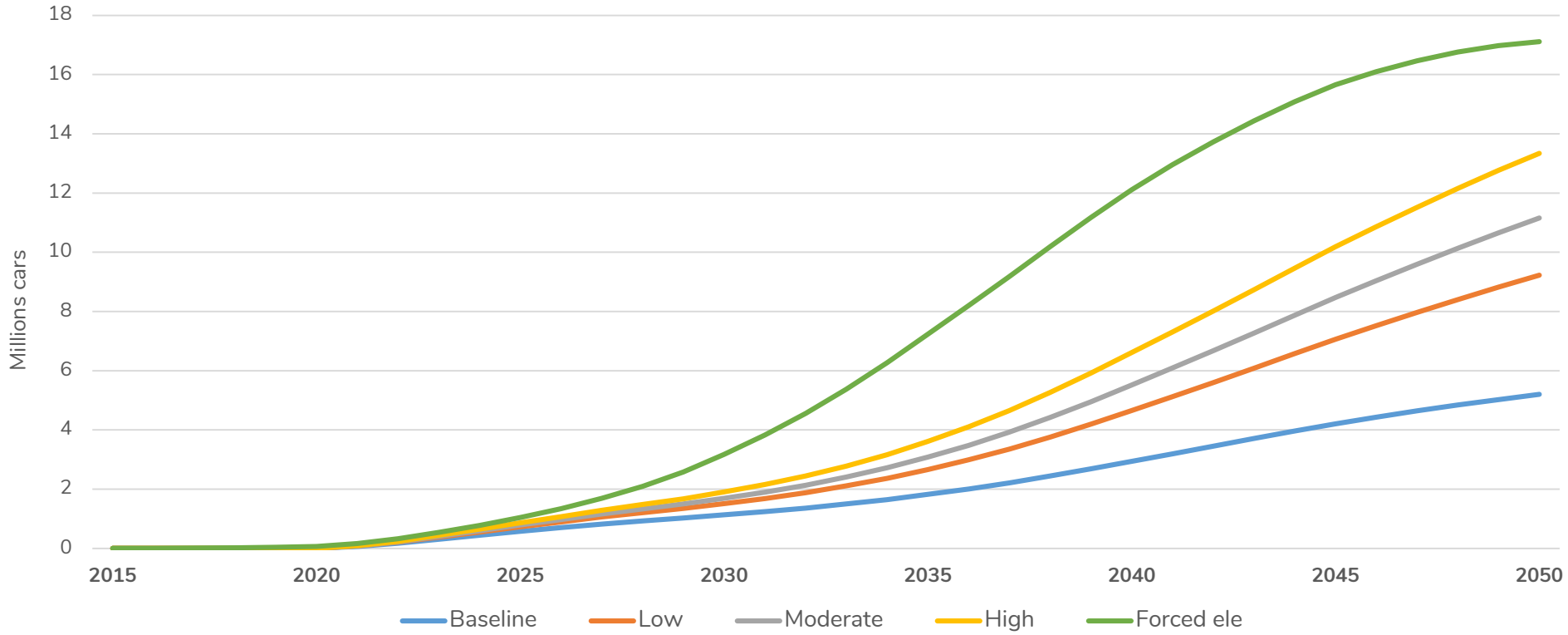




NEW CARS FLEET STRUCTURE- PL

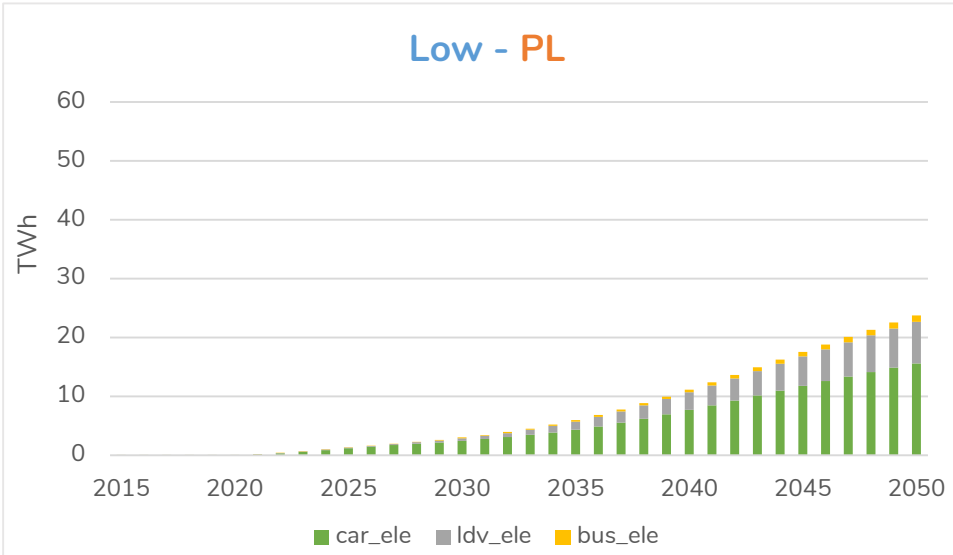


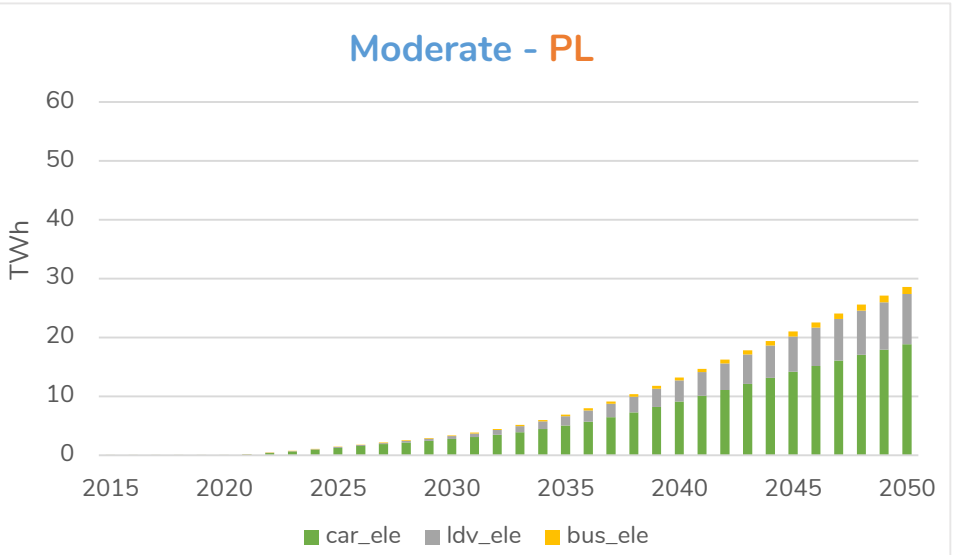
NUMBER OF ELECTRIC PASSENGER CARS - PL

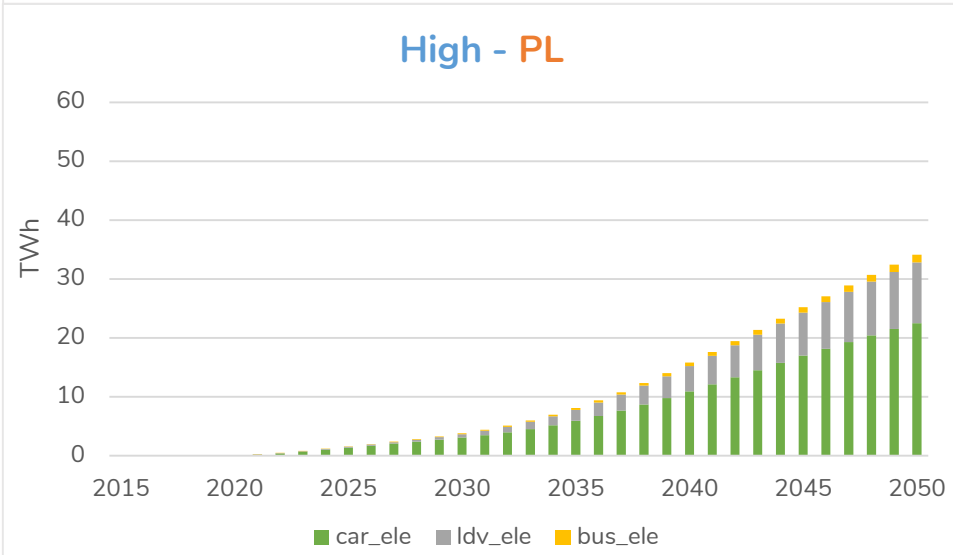


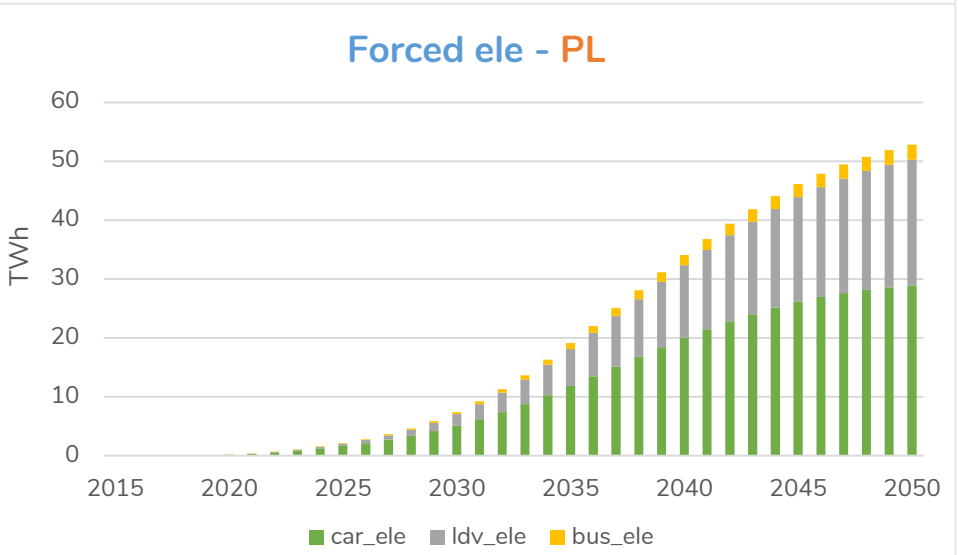
- Even in the baseline, the number of EV in 2030 is higher than 1.5 mln, due to low average mileage, derived from the IDEES database;
- Significant diferreneces between the baseline and analitical scenarios are visible after 2025, when new vehicles price becomes an important factor for growing market sales;
- Fast growth of EV`s is visible only in forced electromobility scenario.

DEMAND ON ELECTRICITY - PL

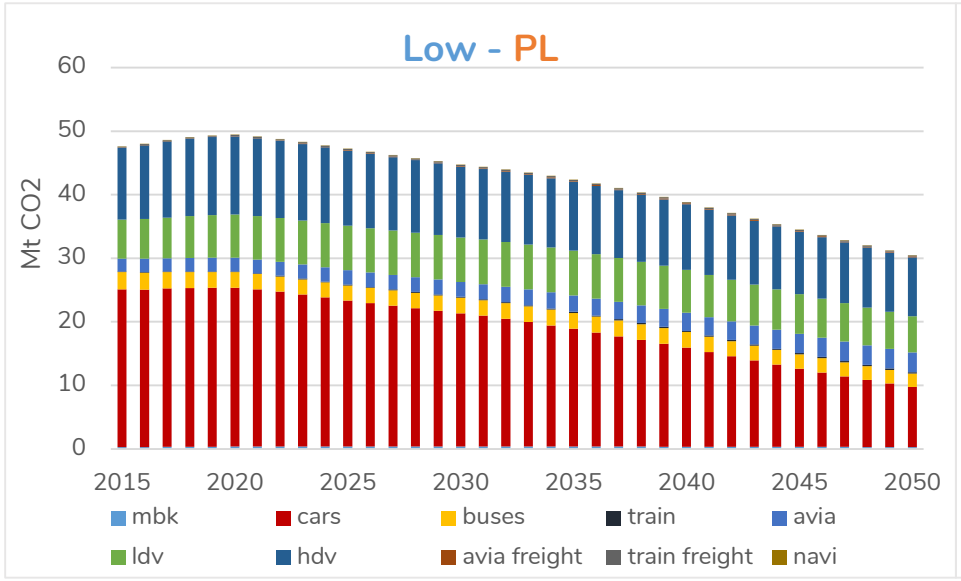


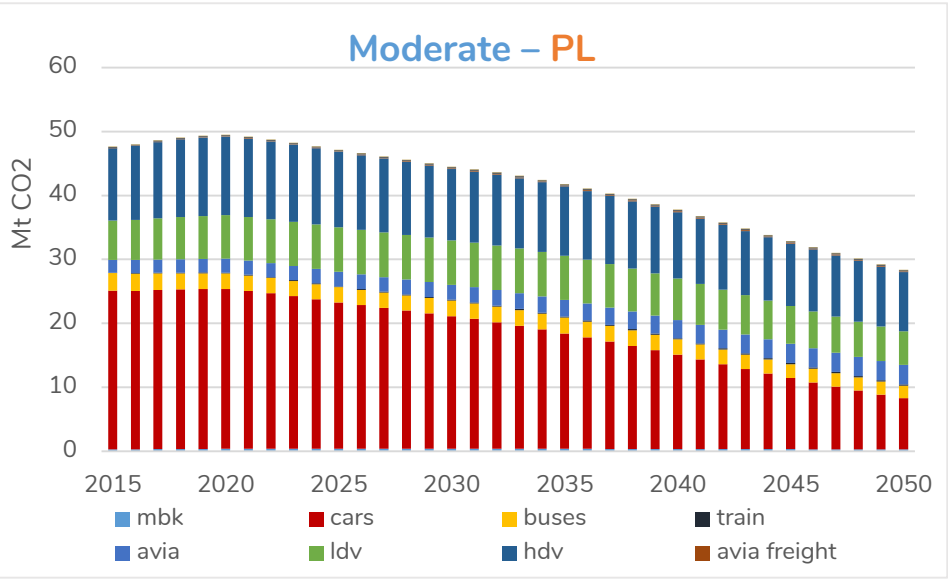


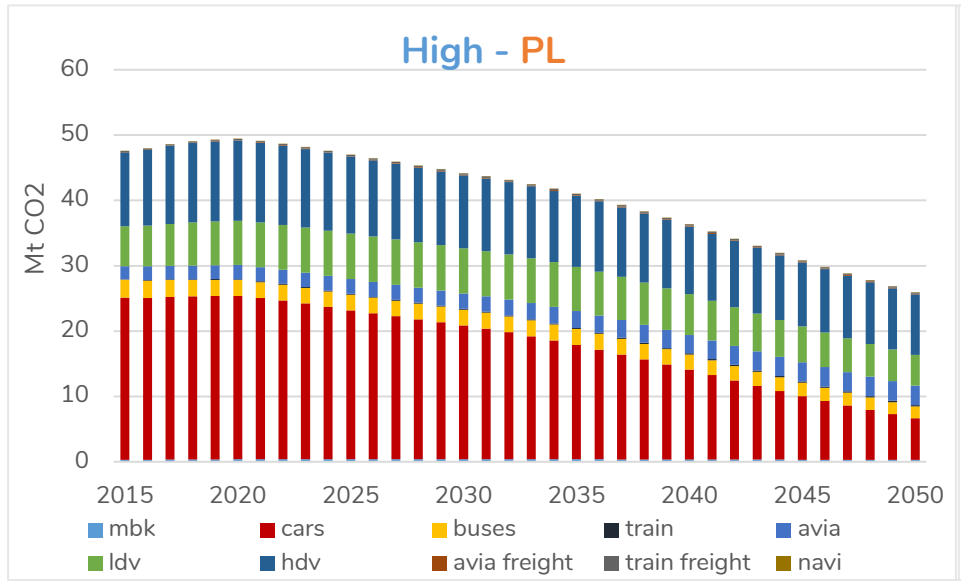


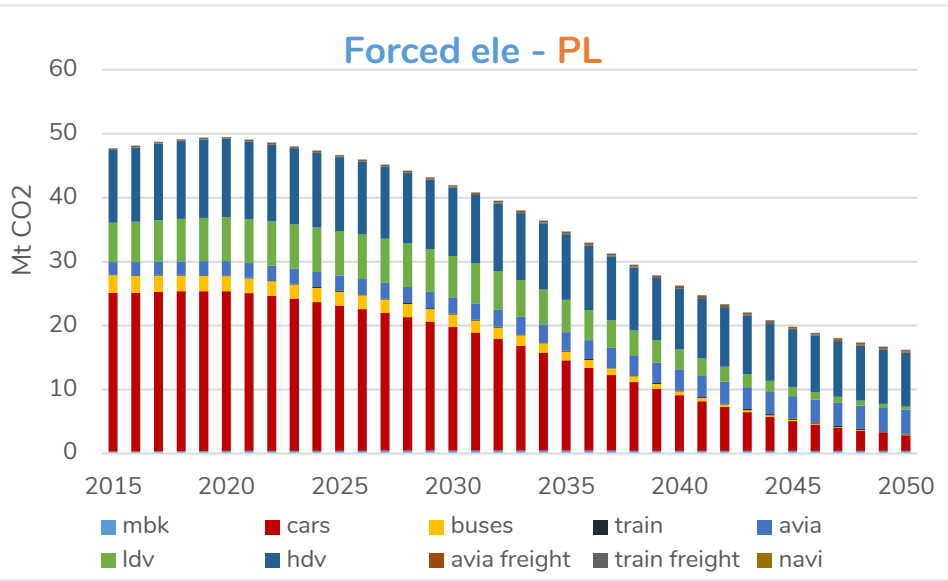


CO_2 EMISSIONS BY MEAN OF TRANSPORT - PL









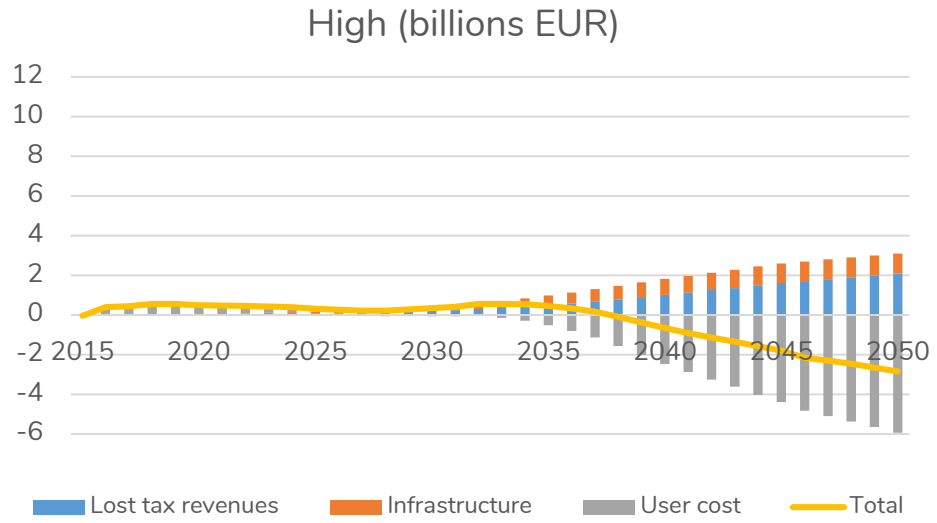
Costs (profits) for the economy and for the users

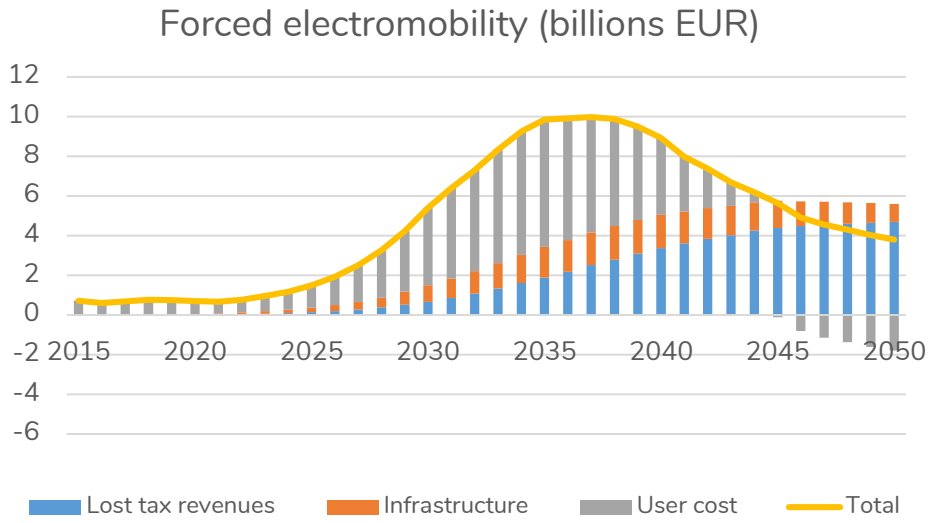
Costs - Summary

	Cumulated costs/profits (2020-2050) (billions EUR)				Average (yearly) (2020-2050) (billions EUR)			
Scenario →	Low	Mod.	High	FE[a)]	Low	Mod.	High	FE[a)]
Consumer Costs(-)/profits (+)	34.8	43.5	52.4	- 70.8	1.2	1.4	1.7	-2.4
Infrastructure Costs	-7.8	-11.6	-16.0	-30.9	-0.3	-0.4	-0.5	-1.0
State budget revenues (+) /loses (-)	-8.9	-15.3	-22.8	-66.0	-0.3	-0.5	-0.8	-2.2
Total	**18.1**	**16.6**	**13.6**	**-167.6**	**0.6**	**0.6**	**0.5**	**-5.6**

Cumulated and average costs/profits overview for Poland for the period 2020-2050 (billions EUR)

[a)] *FE – Forced electromobility scenario*





MAIN CONCLUSIONS

- Deep CO_2 emissions reduction in the transport sector is difficult but possible and need in the same time:
  - Limitation of aviation activity or important emissions intensity improvment
  - Dynamic growth of EV^s sales (including electric HDV^s).
- These targets can be acheived togehter with significant EV price fall and infrastructure development. As well they can be forced by leguratory changes (case of forced electromibility scenario);
- In the scenarios with fast EV prices fall, costs are beard with the vehicle purchase, then they are balanced by fuel gains. In forced electromobility scenario these spendings are higher, and gains occurs relatively later.

Thank you for your attention!

Wojciech Rabiega, Przemysław Sikora, Jan Gąska

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