



Environment Center  
Charles University  
in Prague

# **Impact assessment of transport policies: exploration of TREMOVE model**

Vojtěch Máca

Workshop Modelling and assessment of policies for  
sustainable transport, 16/09/2010

# Outline

- background to (transport) modelling
- TREMOVE model description
- policies for assessment
- model runs
- pros and cons and beyond

# Basics on modelling

- models are used to compare two states of (part of) the economy – before and after implementation of a policy or with and without implementation of a policy (do-nothing vs. do-something)
- net effect of the policy refers to the difference between the two states

## Partial versus general equilibrium

- detailed, technically oriented description of a sector
- analysed sector is taken as isolated island in the economy
- limited feedback and lack of interaction with other parts of the system
- limited ability to predict impacts on the economy, but suitable for the simulation of supply sector
- development of GDP, energy prices and some other key parameters are exogenous variables

# TREMOVE model - intro

- transport and emissions simulation model developed for the European Commission Directorate-General Environment
- currently maintained and developed by Transport & Mobility Leuven (BE)
- developed for assessing both national and European transport policies (current version 2.7b covers 31 countries)
- highly sophisticated (bottom-up approach) and extremely data-hungry model

# TREMOVE model - structure

transport demand module - transport users reactions to changes in generalised prices of transport supply (pkm/tkm)

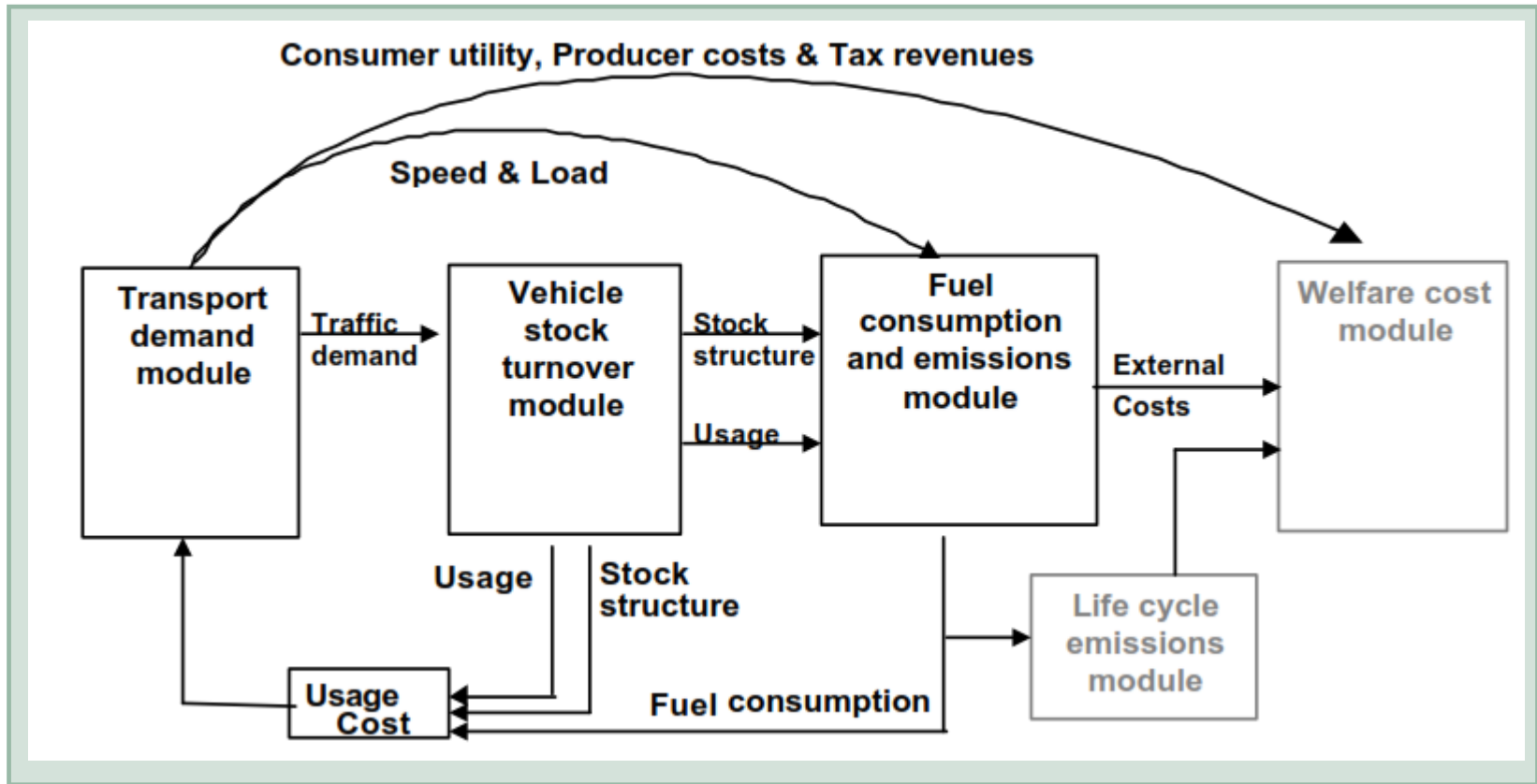
vehicle stock module - estimates sales of new vehicle taking into account natural scrappage, price of new vehicles and transport demand

pollutant emissions module - calculates fuel consumption, pollutant and greenhouse gases emissions (well-to-wheel)

welfare module - calculates changes in consumer and producer surplus, cost of public funding, and environmental benefits (change in external costs)

upstream module - well-to-tank emissions of fuels and electricity

# TREMOVE modular structure



Source: T&M Leuven

# TREMOVE – baseline and inputs

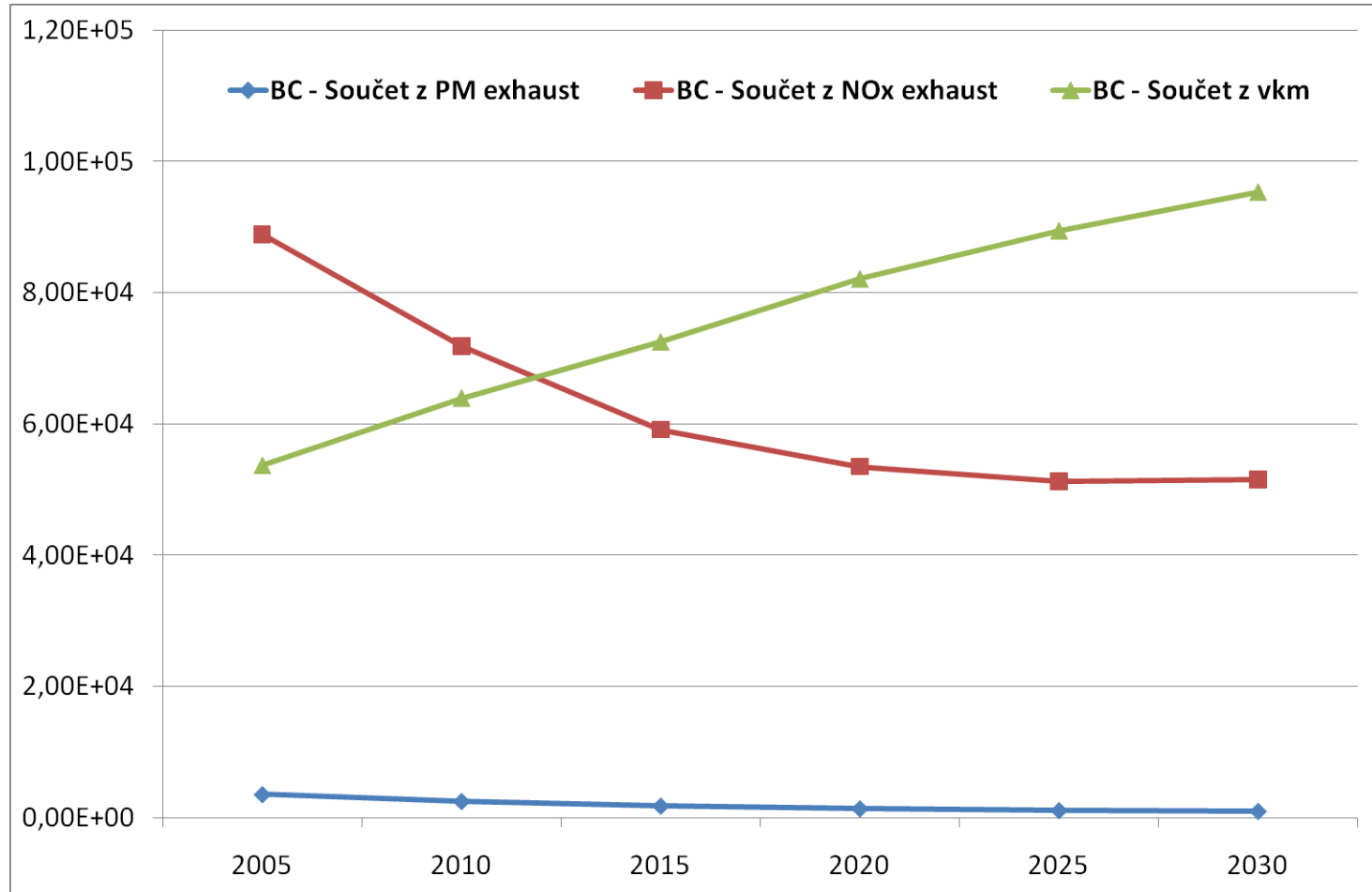
- transport demand baseline is exogenous (i.e. forecast to 2030 is needed, now based on SCENES network model)
- demand modelling is simplified (w/o network disaggregation)
- **inputs needed:**
  - vehicle stock by technology, costs
  - emission inventories
  - demand elasticities of substitution
  - parameters for vehicle choice and stock renewal
  - emission Factors
  - external cost values
  - revenue recycling options

# Impact assessment of transport policies

- exploration of capabilities of TREMOVE model
- allows for simulation of measures in order to predict change in transport demand (including changes in the modal split), impact on fleet renewal, emissions of air pollutants and effects on welfare (revenues from the taxes, change in external costs)
- virtually no such impact modelling in transport domain currently exists in Czech Rep.

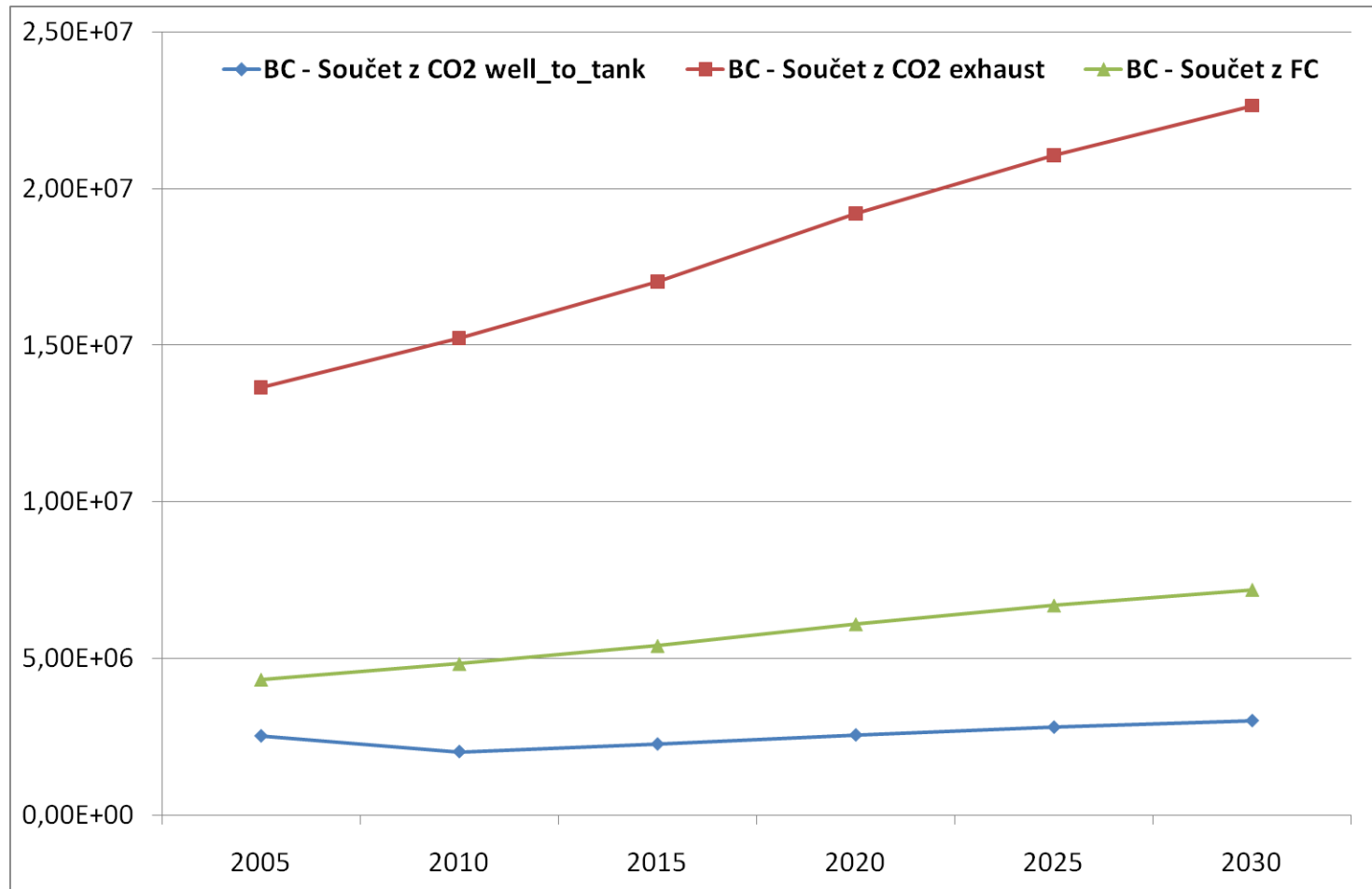


# Basecase scenario – vehicle kms, PM & NOx



units: PM & NOx in tons, mio vkm

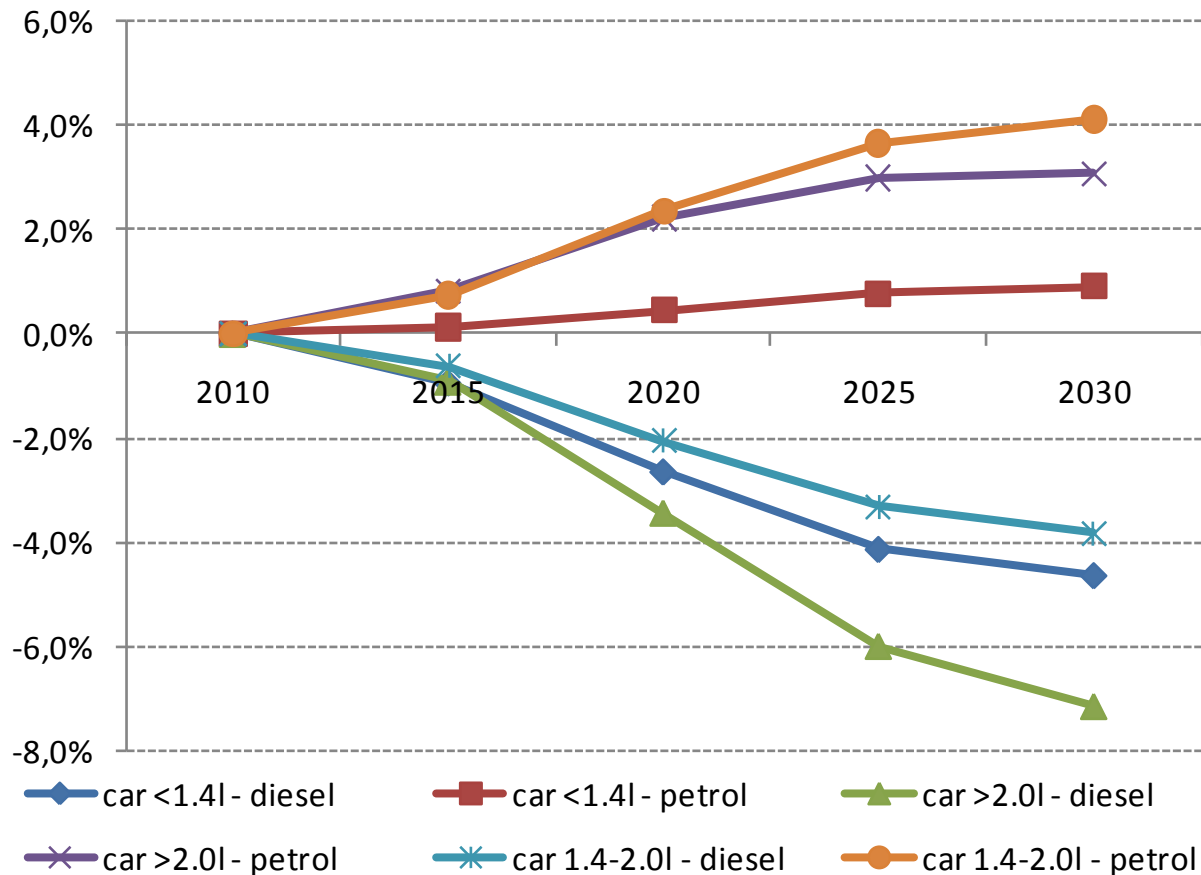
# Basecase scenario – fuel cons., CO<sub>2</sub> TTW & WTT



units: CO<sub>2</sub> in tons, fuel consumption in tons

# Excise tax modification

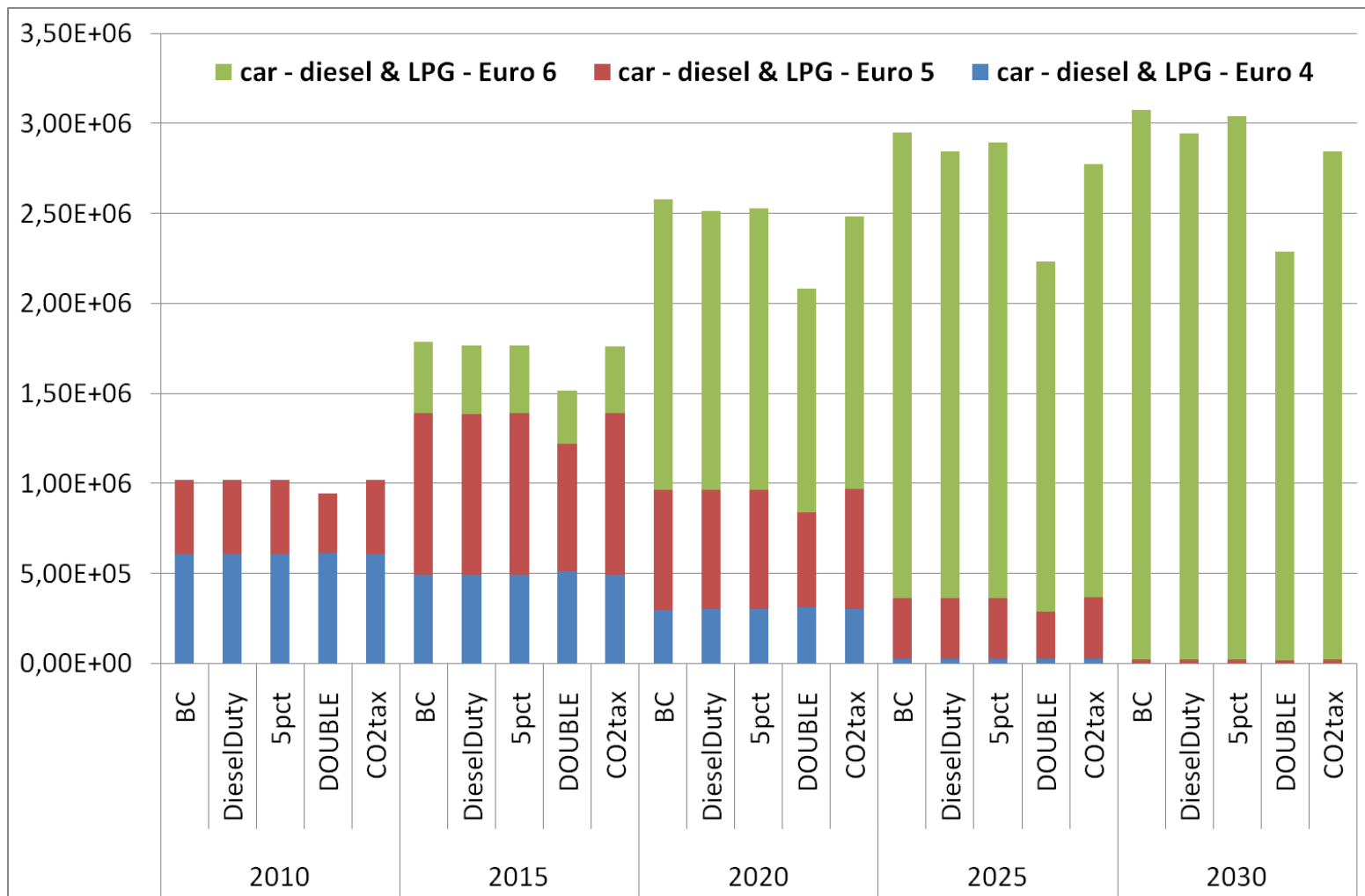
- impact of alignment and annual 3% increase in the rates of excise duty on petrol and diesel (up to 2020) on CO2 emissions (tank-to-wheel)



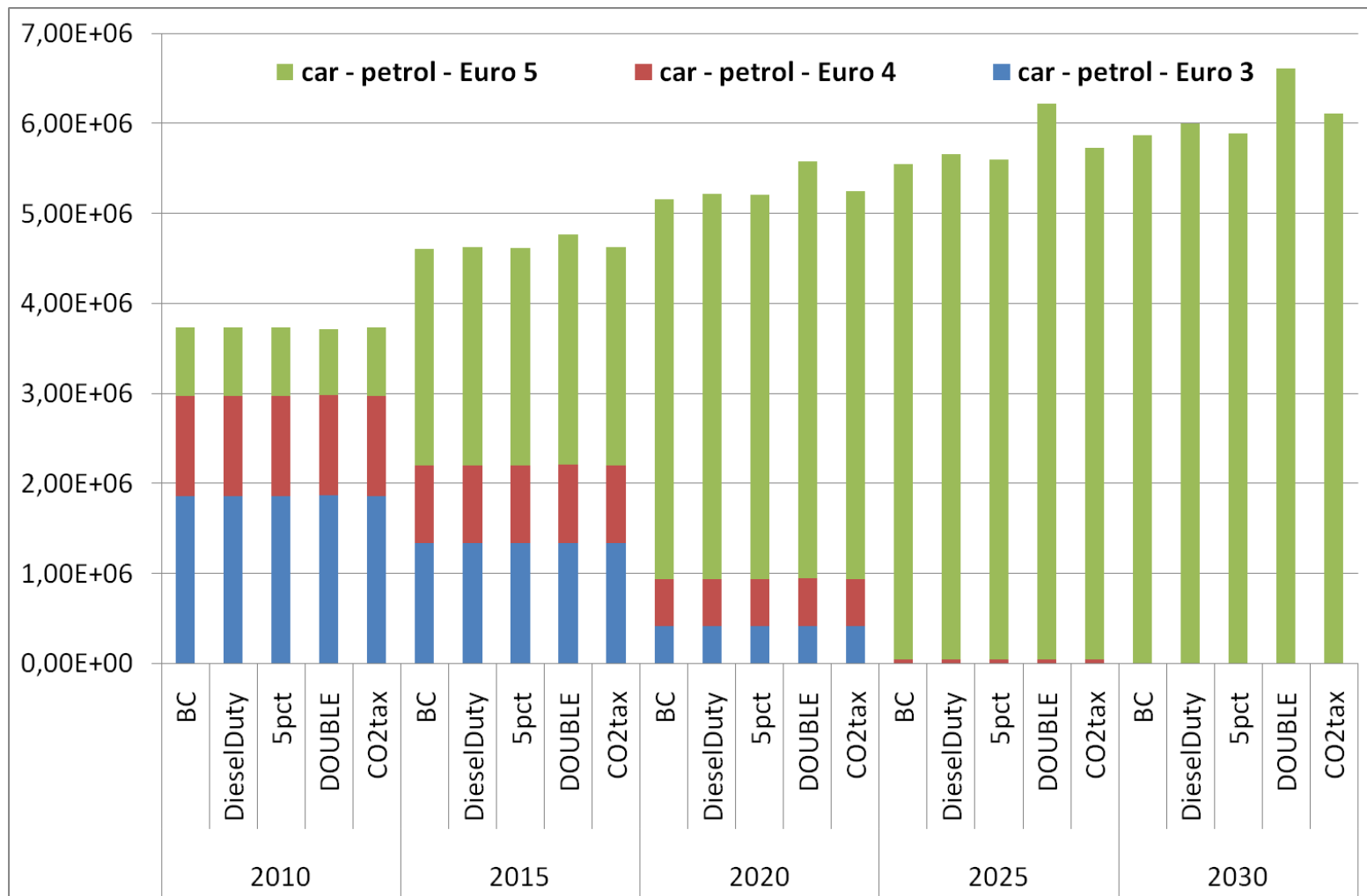
# Scenarios

- basecase (BC) – do-nothing scenario
- DOUBLE – doubling of excise tax rates from 2011
- DieselDuty – alignment of tax rates for petrol and diesel (2016) with 3% increase of rates until 2020
- 5pct - alignment of tax rates for petrol and diesel (2016) with 5% increase of rates until 2030
- CO2 tax – implementation of proposed ETD revision (rates on CO2 and energy contents)
- car scrappage subsidy (šrotovné) – for new small cars purchased in 2009-2010

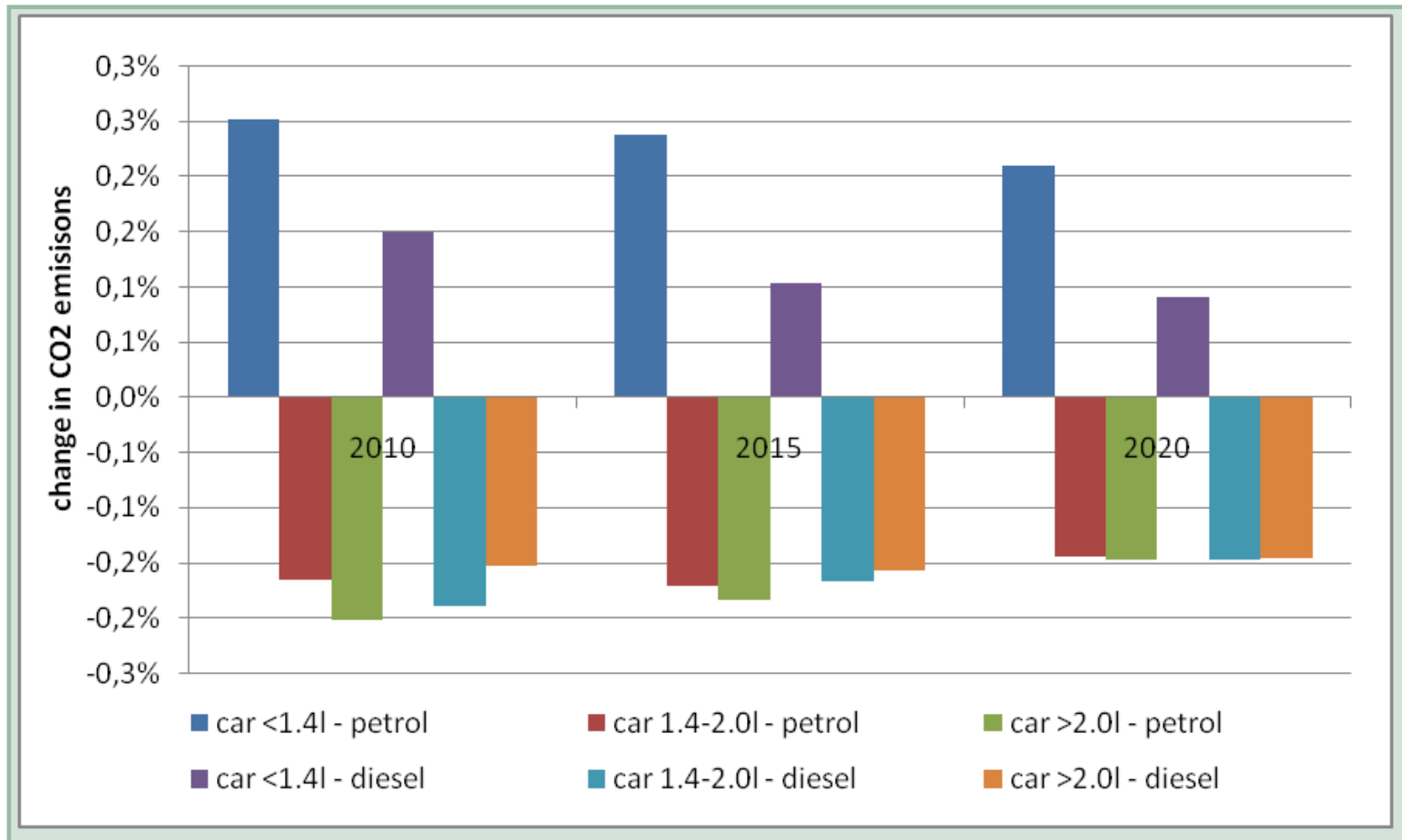
# Impact of excise tax modification on fleet and CO<sub>2</sub> emissions - diesel cars



# Impact of excise tax modification on fleet and CO<sub>2</sub> emissions – petrol cars



# Car scrappage subsidy – change in CO<sub>2</sub> emissions from passenger cars against BaseCase



# External costs in TREMOVE

- **one of 4 components in welfare modul**
  - together with change in utility of households, productions costs and distortion effect of changes in taxes and subsidies
- **environmental costs**
  - upper and lower bound values from CAFE CBA (country specific)
    - urban estimates used for metropolitan and urban areas
  - **CO2 values**
    - lower bound - growing from 2010 to 2020 from 12 to 20 €/ton, and constant after 2020
    - upper bound for CO2 at 80 €/ton



# TREMOVE - pros and cons



- sophisticated model with very detailed structure and wide scope of application
- widely used to evaluate proposals for the EC
- open structure and the availability of the program code
- good support from the model developers



- complete lack of a secondary market for imported used vehicles
- data set for CR are inconsistent and in some cases weird
- modifications of the model are highly data-demanding and time-consuming
- further developing the model would require a specific project
- superseded by TRANS-TOOLS model ??

# Beyond REMOVE?

## TRANS-TOOLS model

- a comprehensive transport modelling bundle developed by TNO and IPTS JRC
- based in ArcGIS, includes CGEurope, emission inventories from REMOVE and other modules
- but low resolution for regional assessments - results at NUTS2 level (but calculates at NUTS3 level)

**AND THAT'S ALL FOR NOW,  
THANK YOU FOR YOUR ATTENTION!**

Questions? Comments?

E-mail: [vojtech.maca@czp.cuni.cz](mailto:vojtech.maca@czp.cuni.cz)