TECHNISCHE UNIVERSITÄT DRESDEN

Faculty of Transport and Traffic Sciences „Friedrich List“

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vip

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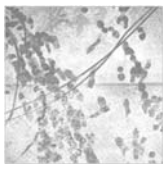
Sensitivity Analysis to Estimate the Potential of Cycling to Reduce Emissions in Road Transport





Perugia, 29 November 2012

DRESDEN concept
Exzellenz aus Wissenschaft und Kultur

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01 Introduction

Topic‘s meaning and classification

- Reduction of greenhouse gas emissions (GHGs) necessary, transport‘s contribution not insignificant
- The extent to which cycling transport can deliver a *substantial* climate contribution (shift potential) not yet fully clarified
- Studies of cycling transport‘s potential mostly qualitative in nature
- Modelling of measures‘ impacts extremely difficult and often not transparent
- Contribution to making the discussion of shift potential through the promotion of cycling more objective

01 Introduction

What is a sensitivity analysis?

= „...the determination of parameters‘ sensitivity in a (model) solution...“
(SCHWARZ (2004): „Sensitivity Analysis and Optimisation in Nonlinear Structural Behaviour“. p. 55)

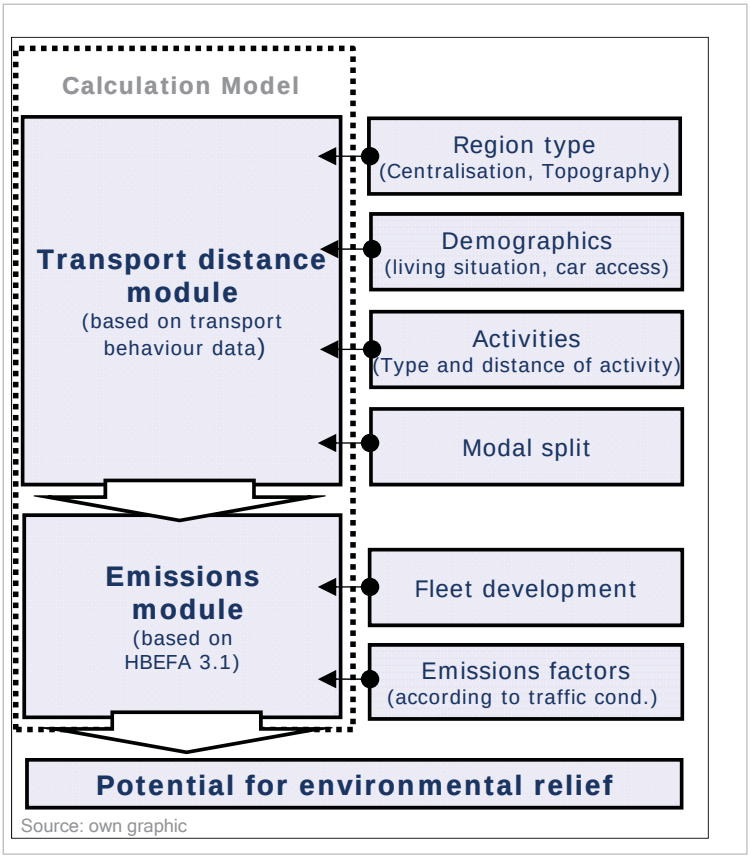
= “... sensitivity analysis studies the relationships between information flowing in and out of the model...”
(SALTELLI (2000): “Sensitivity Analysis”. John Wiley & Sons.)

- Study of the influence of input factors (individually or combined) on certain results under **„ceteris paribus“-conditions**
- Serves to identify relationships between a model‘s input data and desired outcome
- Tool for determining a system‘s responsiveness as a building block for developing **scenarios**

02 Project Idea and Problem Definition

Concept

- Model-based estimate of transport‘s effect on emissions situation
- Premise: coherent model development
- Sensitivity analysis: assumption of hypothetical effects (variations modelling)
- Assessment of results and ability to fully realise potential with the help of experts and scenario building



02 Project Idea and Problem Definition

Data basis

- **MiD, SrV, MOP** (National and local household surveys, cross-section and longitudinal)
- HBEFA V 3.1
- Municipal Statistics, 12th coord. population projection up to 2060

Data sets to be compiled:

- Topography data (sub-project): „Classification of gradient conditions in the German main road network at municipal level“

Basis for transport data

MiD

MOBILITÄT IN DEUTSCHLAND

infas DLR DIW Berlin

Mobilität in SrV Städten

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KIT

MOP

Base data/identification of environmental effects

Image source: http://www.umwelt-bundesamt.at

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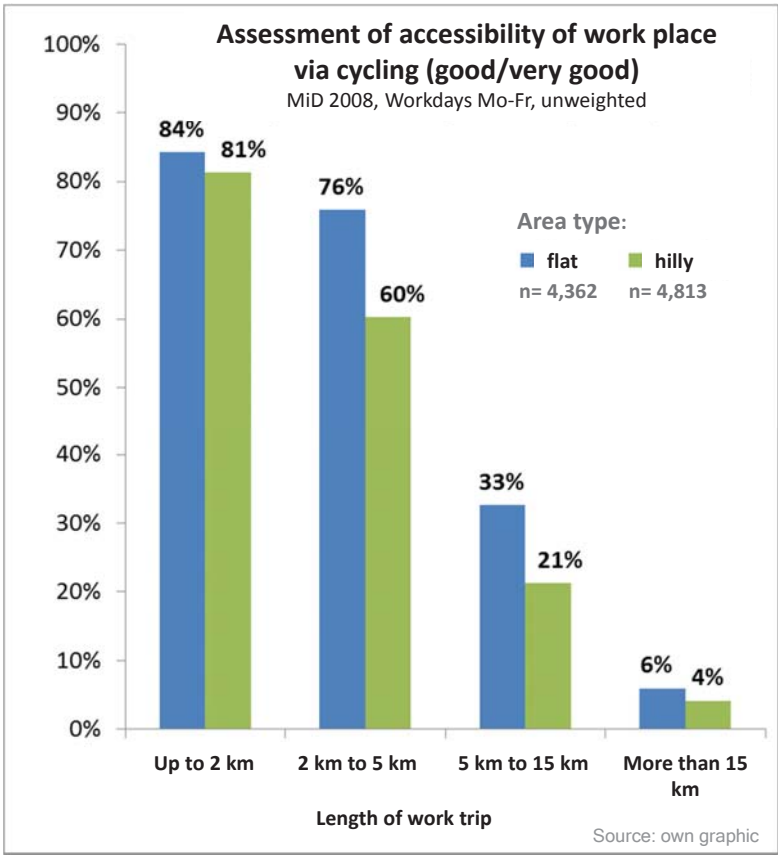
02 Project Idea and Problem Definition

Why use topography data?

Perceived sense of distance

- Topographical influence subjective *(perceived ability to reach destinations by cycling)*
- Differences in subjective rating according to topography clearly smaller than in real behaviour



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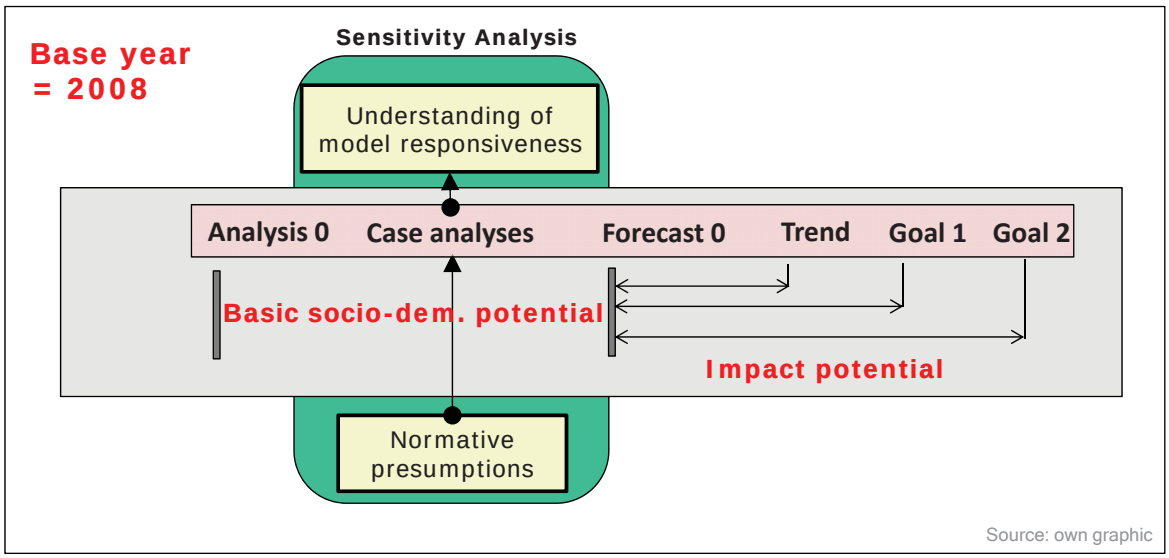
03 Variations Modelling

Classifying the method of calculation



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03 Variations Modelling

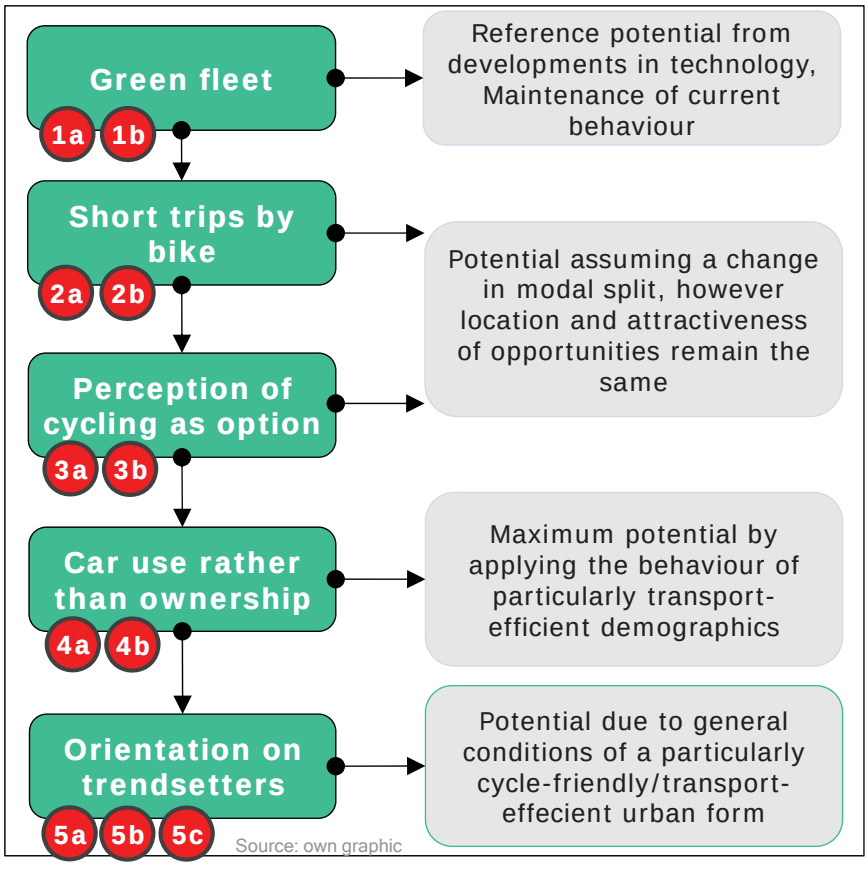
Analytical approaches

Primary effective principle of measures:

(1) Effect of vehicle technology

(2) Effect from
(3) modal shift

(4) Effect of shifting
(5) and avoiding



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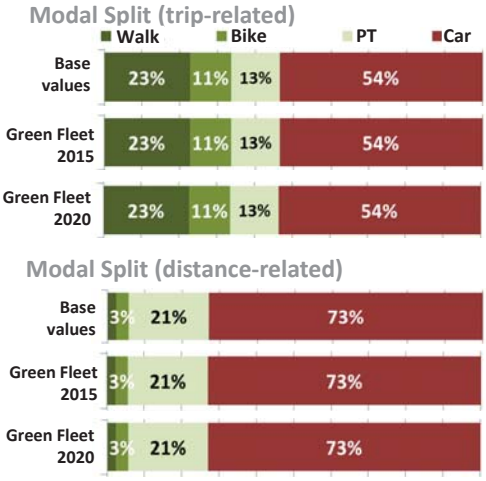
03 Variations Modelling

Green fleet



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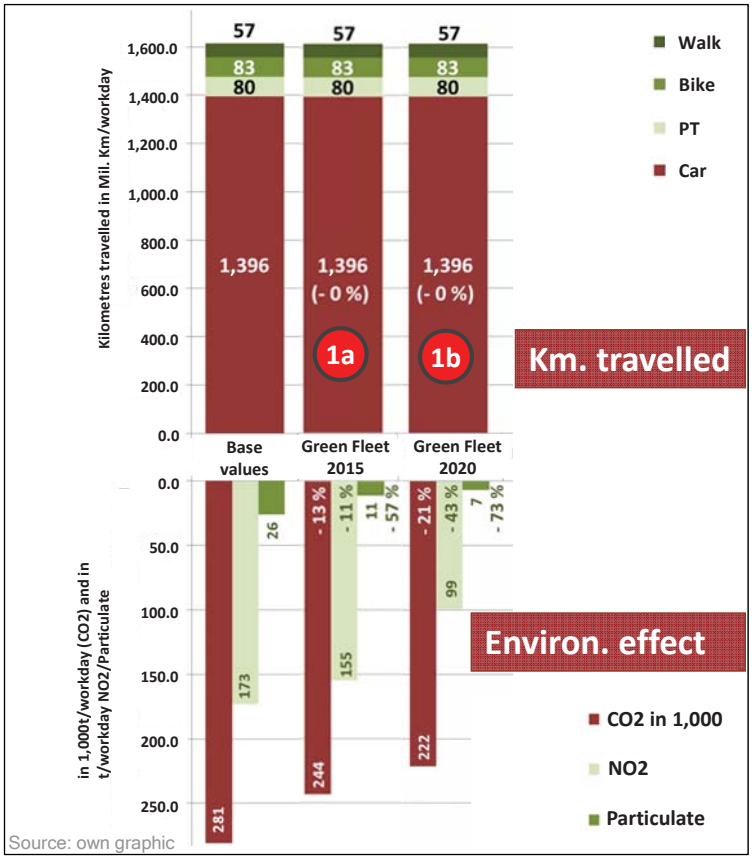
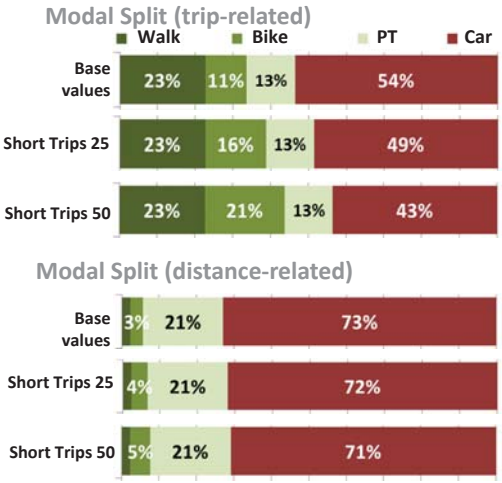


03 Variations Modelling

Short trips by bike

25 % and 50 % of car trips < 5 km to bike



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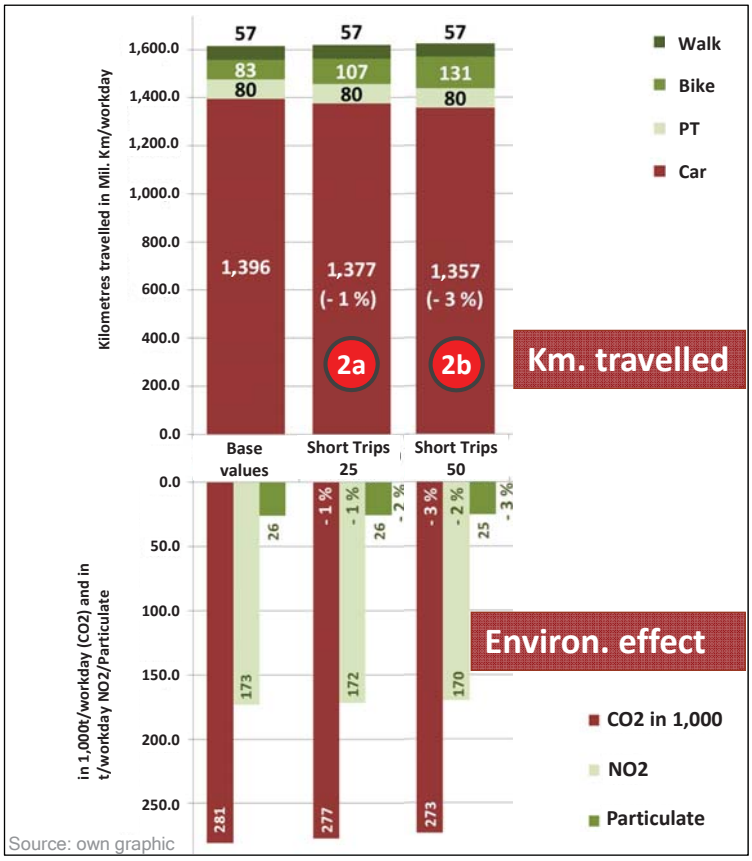
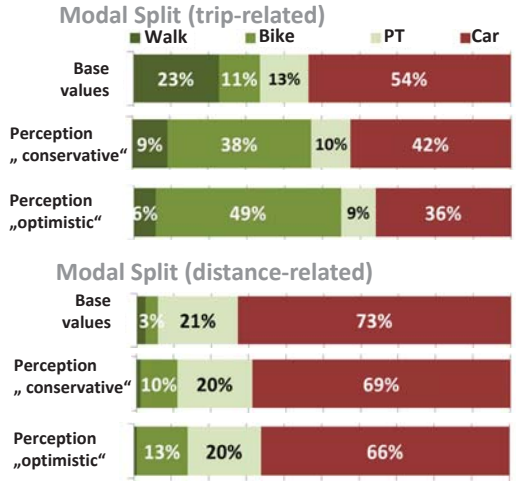


03 Variations Modelling

Perception of cycling as option



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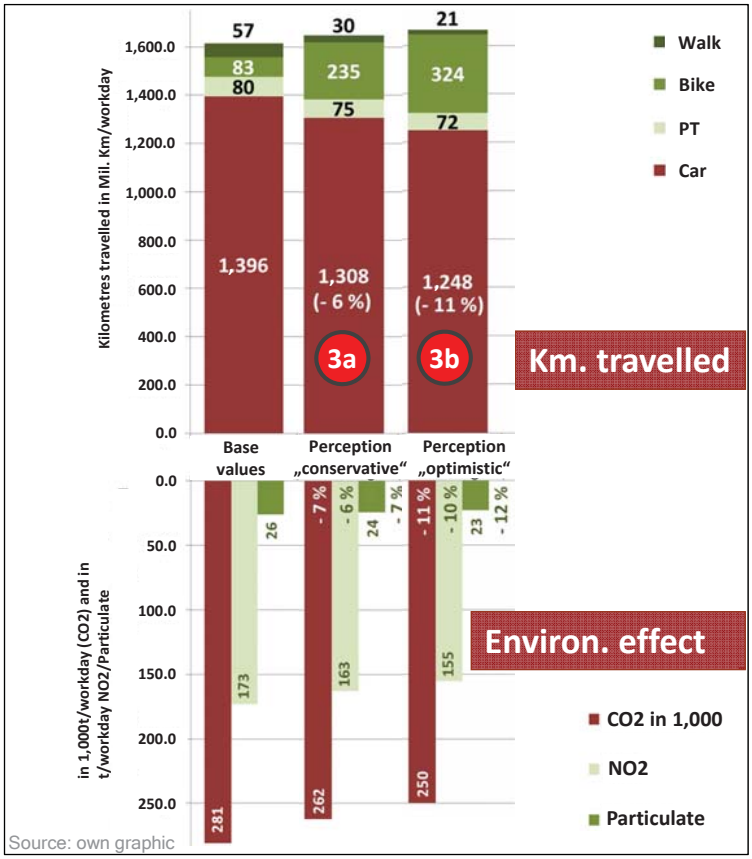
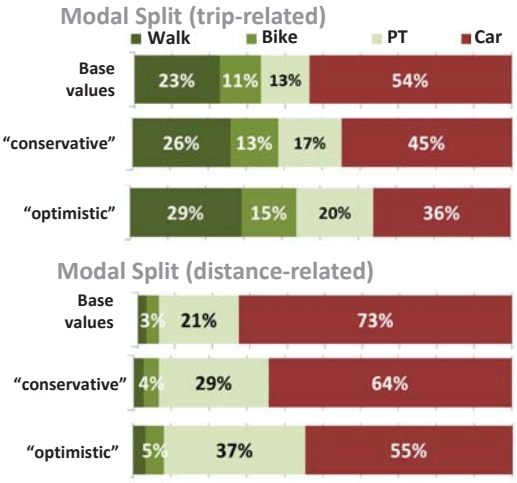


03 Variations Modelling

Car use rather than ownership



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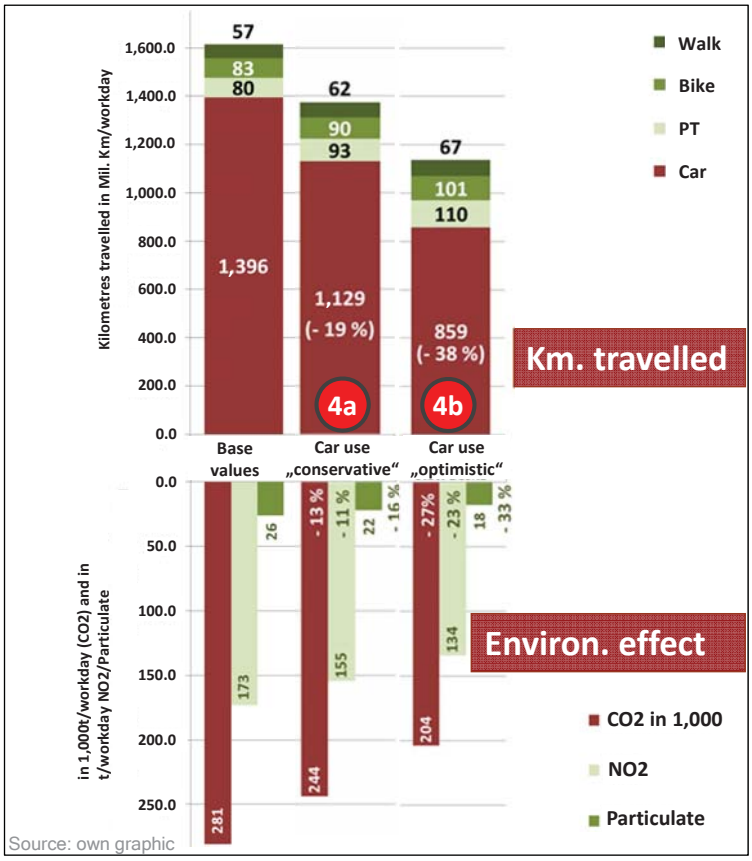

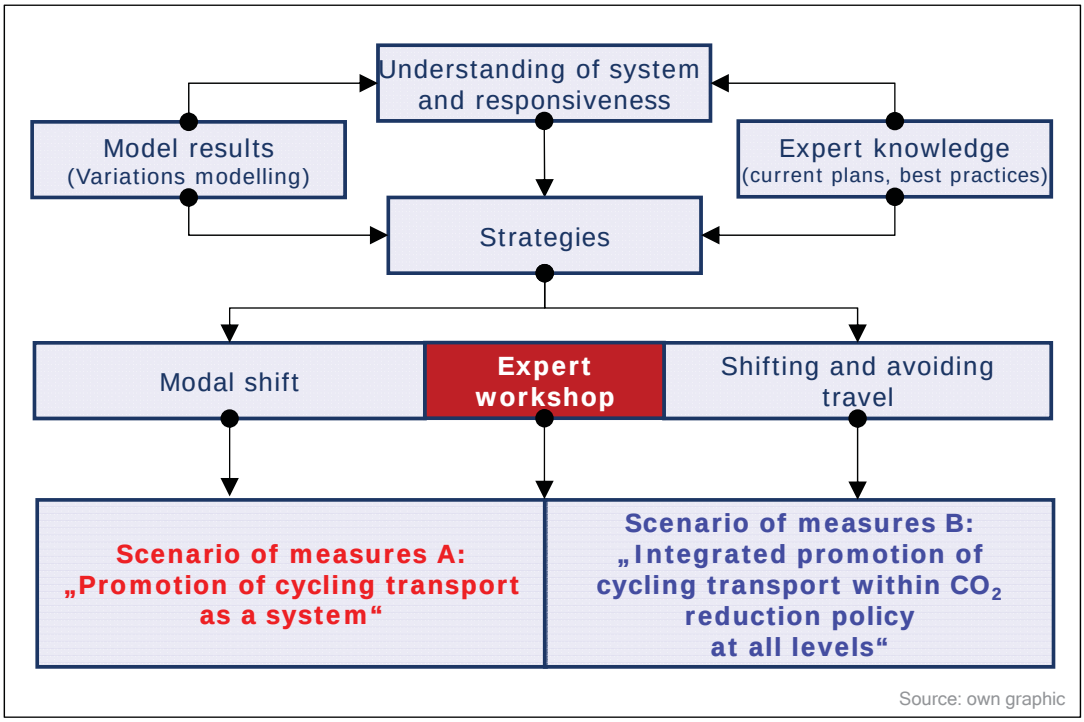

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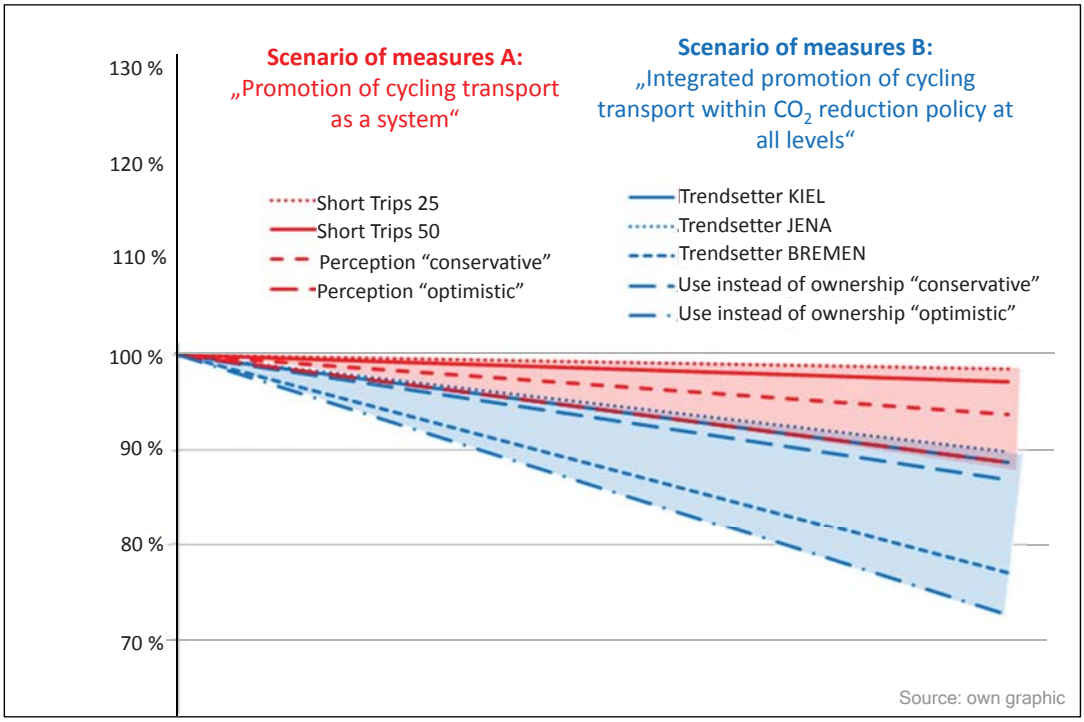
04 Conclusion and Findings

From the sensitivity analysis to scenarios of measures



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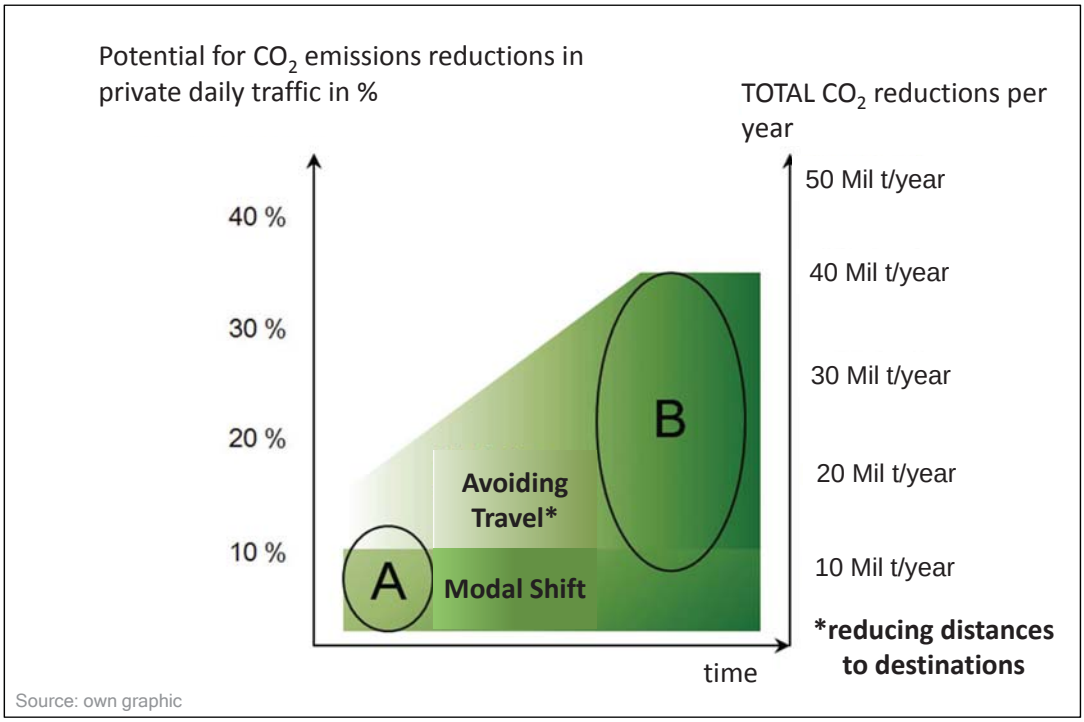
04 Conclusion and Findings

Combining the model results - potential for CO_2 emissions reductions (indexed representation)



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04 Conclusion and Findings

Summary and discussion of the results (Expert workshop, DELPHI-Method)

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»Knowledge creates Fascination«