The drivers of transport emissions in France

Which interactions with ICT?

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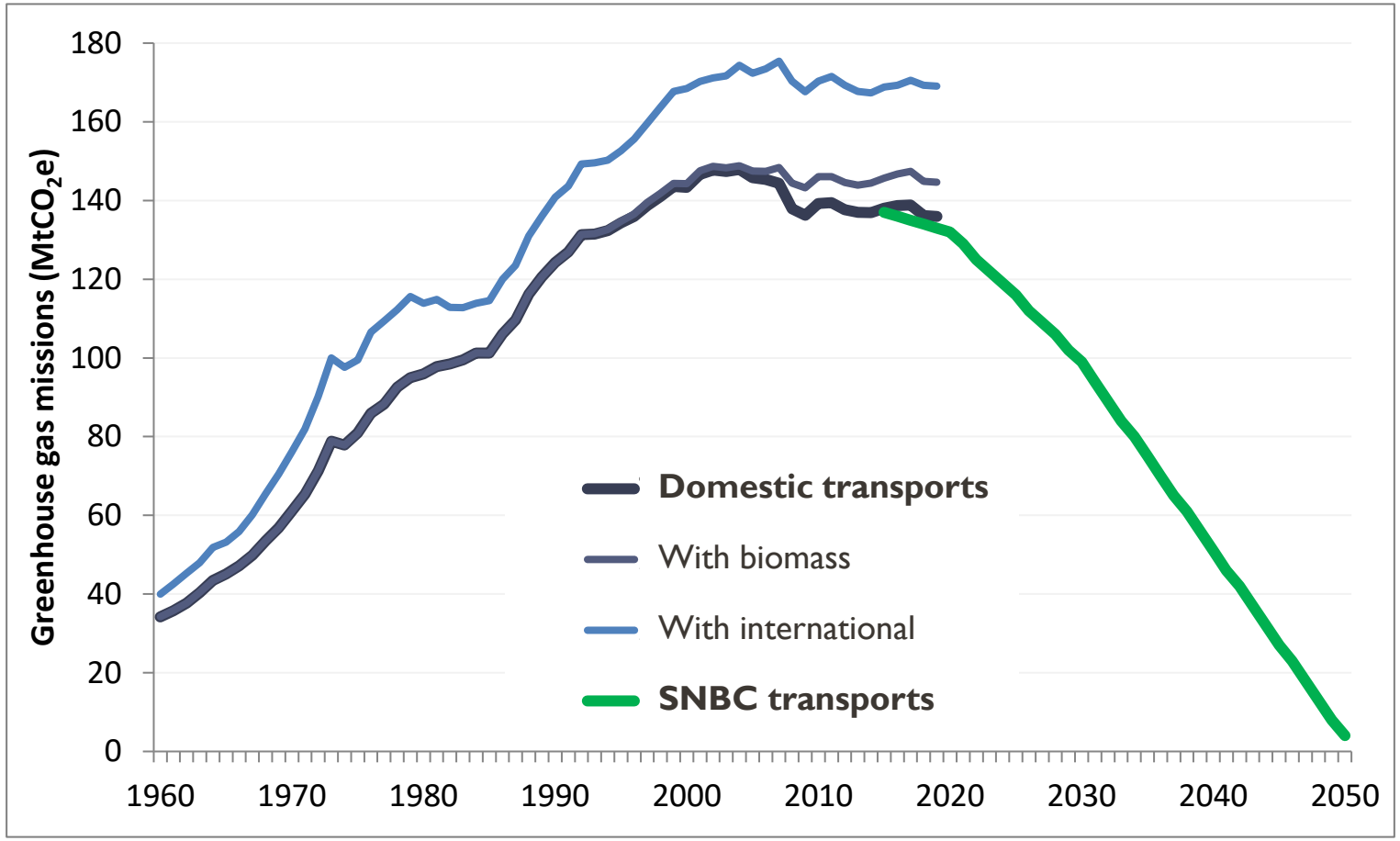
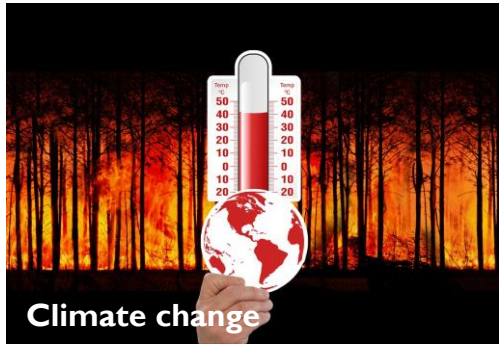
Transport emissions from 1960 to 2050

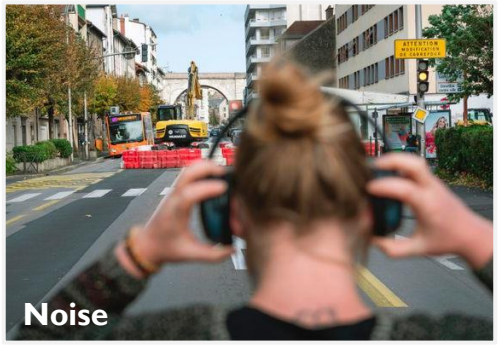


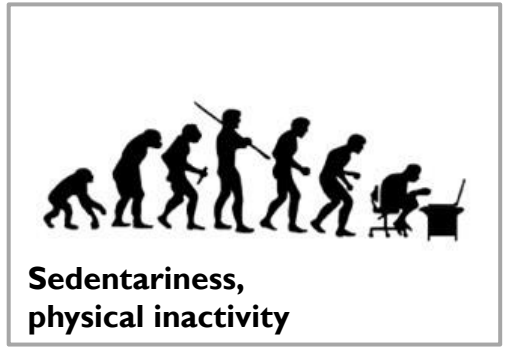
Transport emissions since 1960 and the target by 2050 for the French national low-carbon strategy (SNBC)

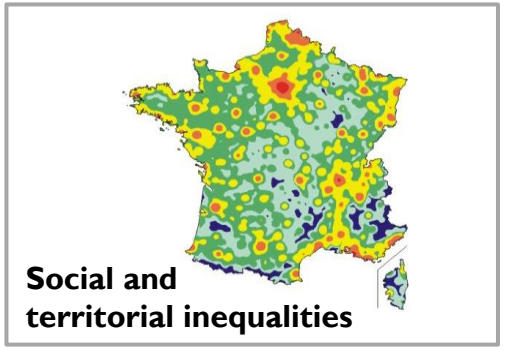
References: from data of CITEPA, MTES

Environmental, social and health impacts of transports









The main externalities of transport

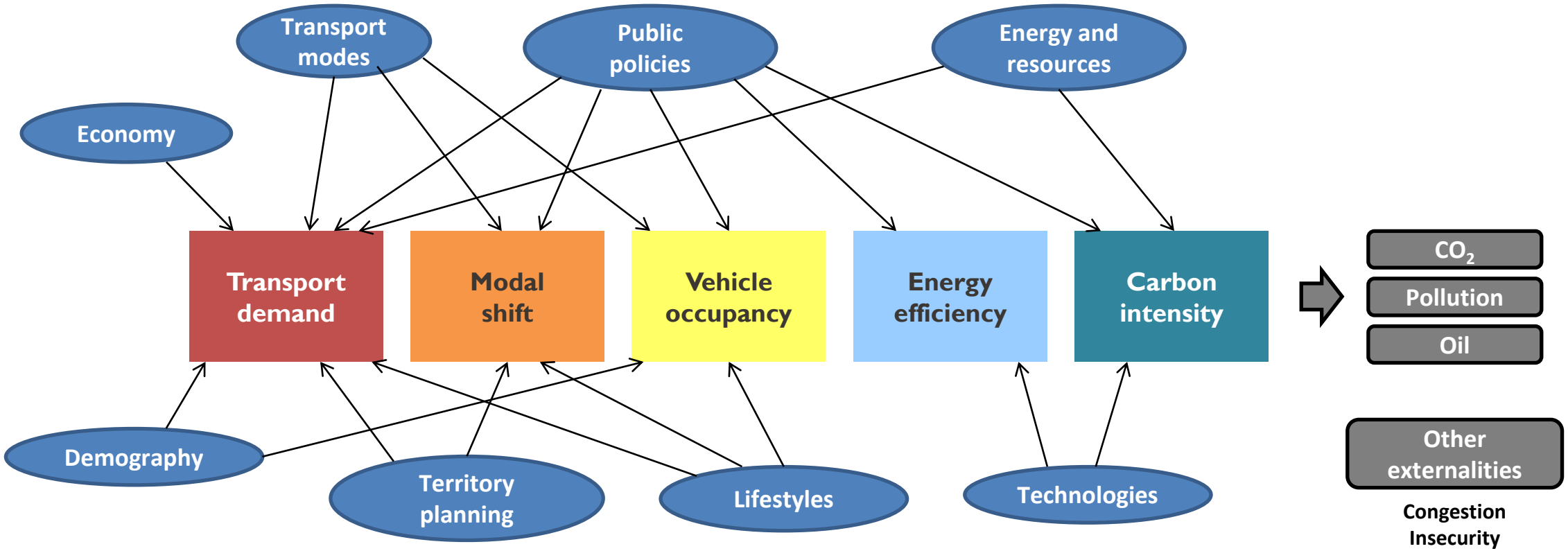
5 drivers of transport emissions

CO_2 = **Transport demand** x **Modal shift** x **Vehicle occupancy** x **Energy efficiency of vehicles** x **Carbon intensity of energy**

SUFFICIENCY, DEMAND-SIDE **TECHNOLOGY**

The 5 levers of the low carbon national strategy (SNBC in French)

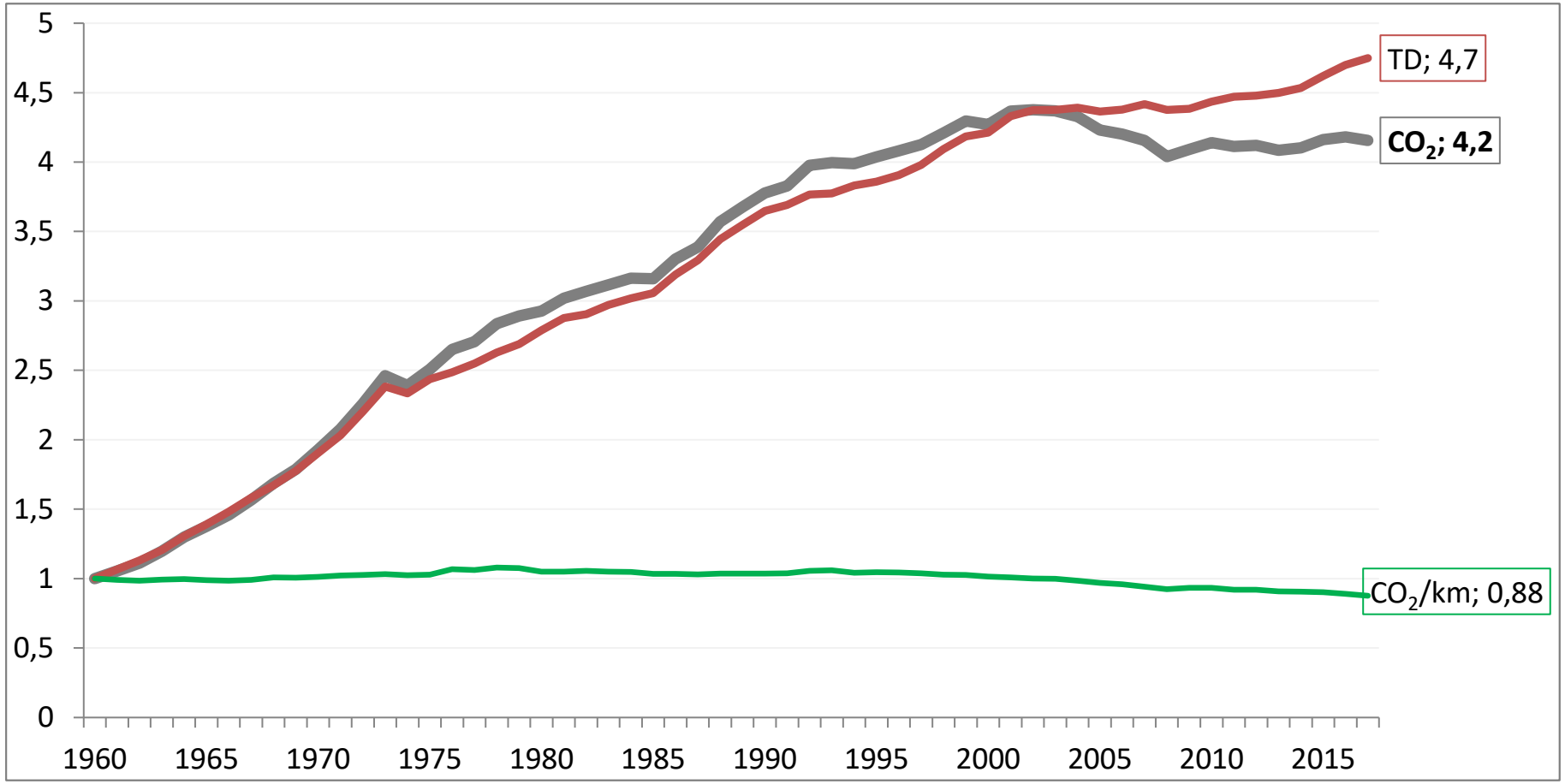
A complex system, multiple possible links for ICT



Key components linked to the energy transition of transports and to the 5 drivers of transport emissions

Passengers 1960-2017

CO_2 = Transport demand x Modal shift x Vehicle occupancy x Energy efficiency of vehicles x Carbon intensity of energy

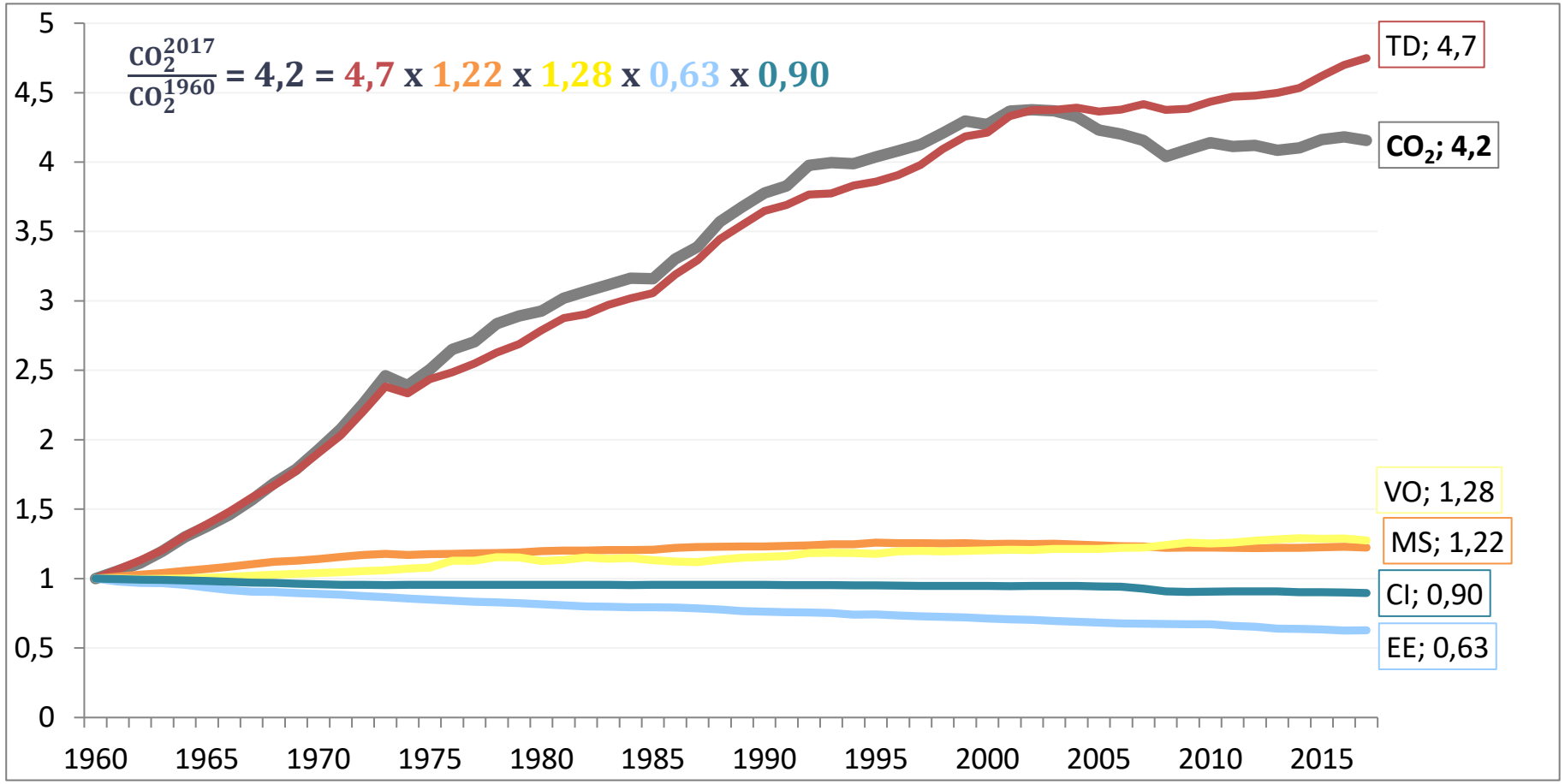


Decomposition of domestic passenger transport CO_2 emissions in France, from 1960 to 2017
(multiplicative form)

Reference: thesis, p47

Passengers 1960-2017

CO_2 = Transport demand x Modal shift x Vehicle occupancy x Energy efficiency of vehicles x Carbon intensity of energy

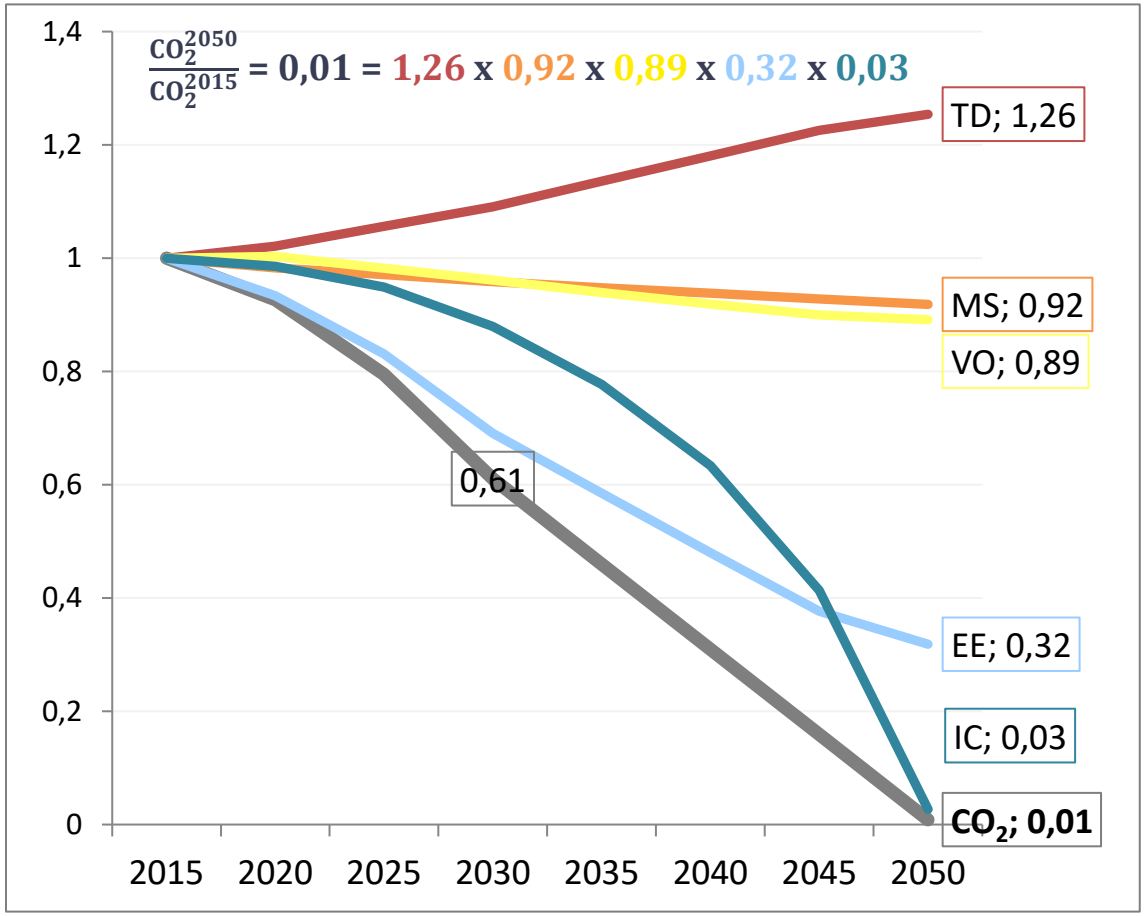


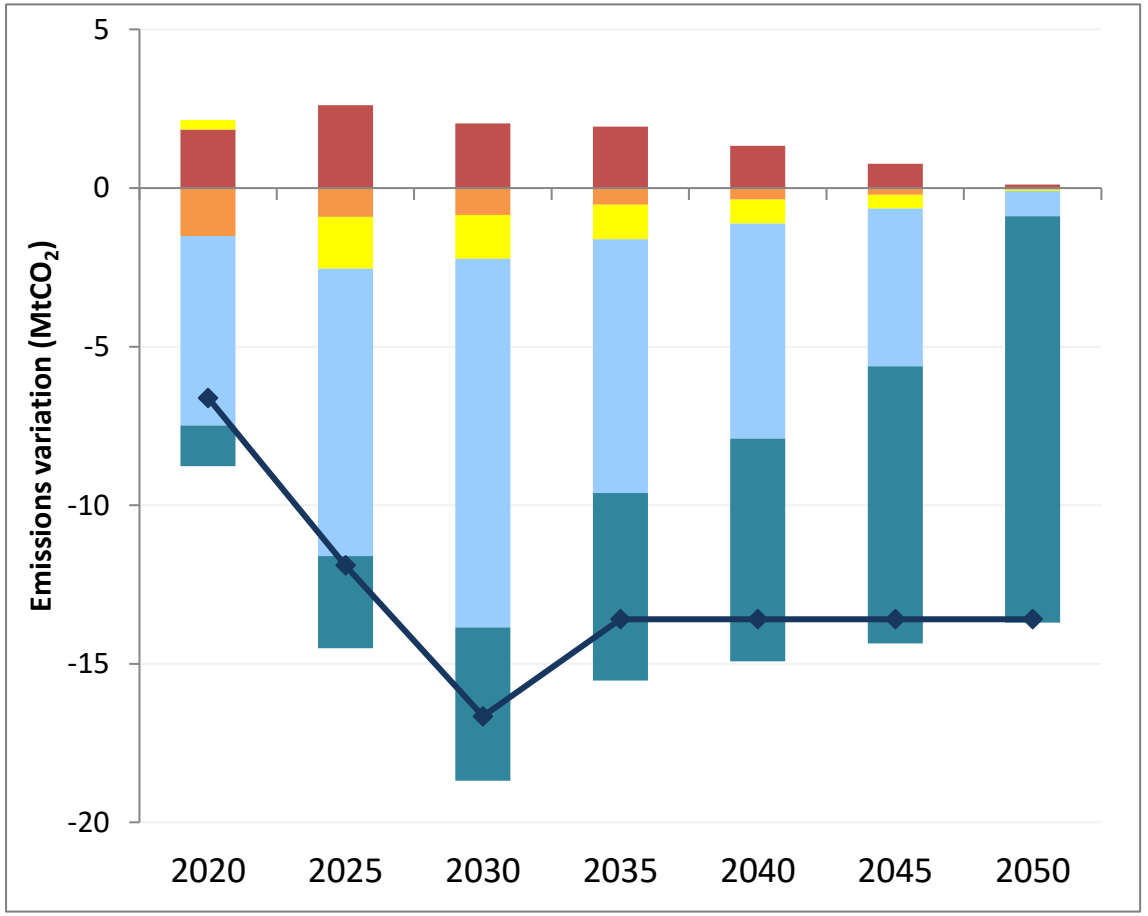
Decomposition of domestic passenger transport CO_2 emissions in France, from 1960 to 2017
(multiplicative form; CO_2 Total with emissions from biofuels)

Reference: thesis, p47

SNBC passengers 2015-2050

CO_2 = Transport demand x Modal shift x Vehicle occupancy x Energy efficiency of vehicles x Carbon intensity of energy



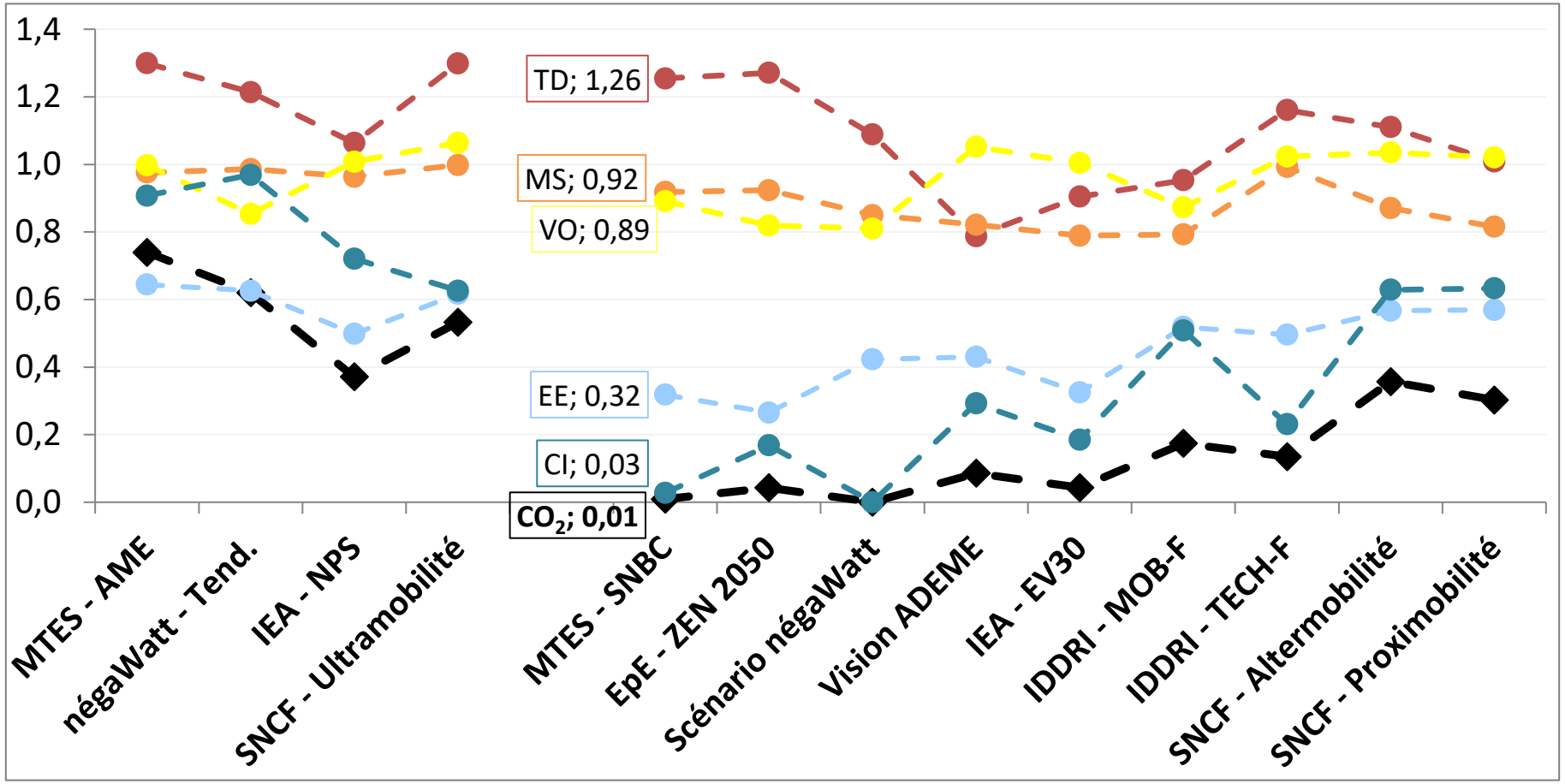


Decomposition of passenger transport CO_2 emissions for the SNBC scenario, between 2015 and 2050
(multiplicative form on the left, additive form on the right)

Reference: thesis, p114

Passengers scenarios

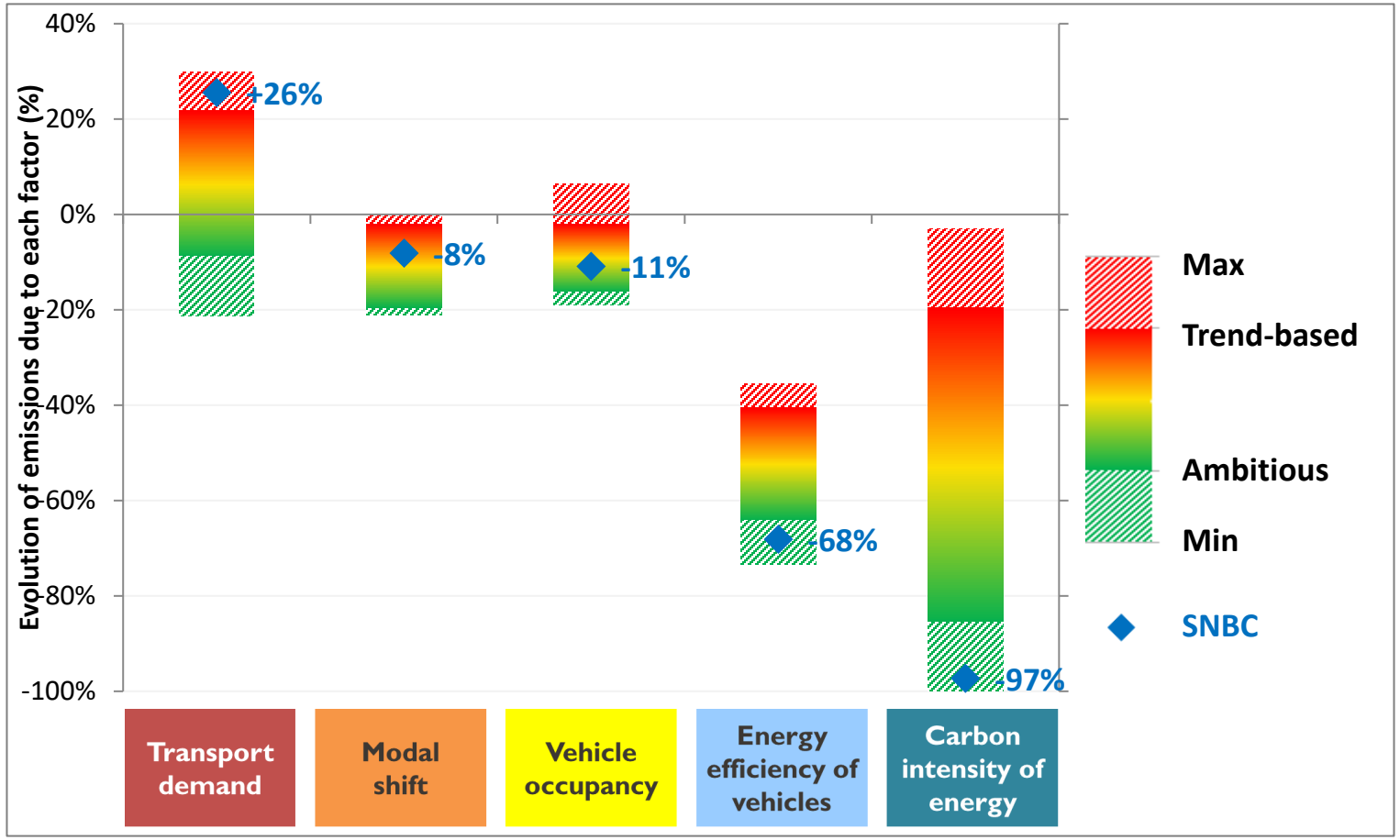
CO_2 = Transport demand x Modal shift x Vehicle occupancy x Energy efficiency of vehicles x Carbon intensity of energy



Multiplicative decomposition of passenger transport emissions between the reference year and 2050, for 13 passenger transport scenarios in France (trend-based scenarios on the left, ambitious scenarios on the right)

Reference: thesis, p115

Passengers: SNBC, trend-based and ambitious scenarios

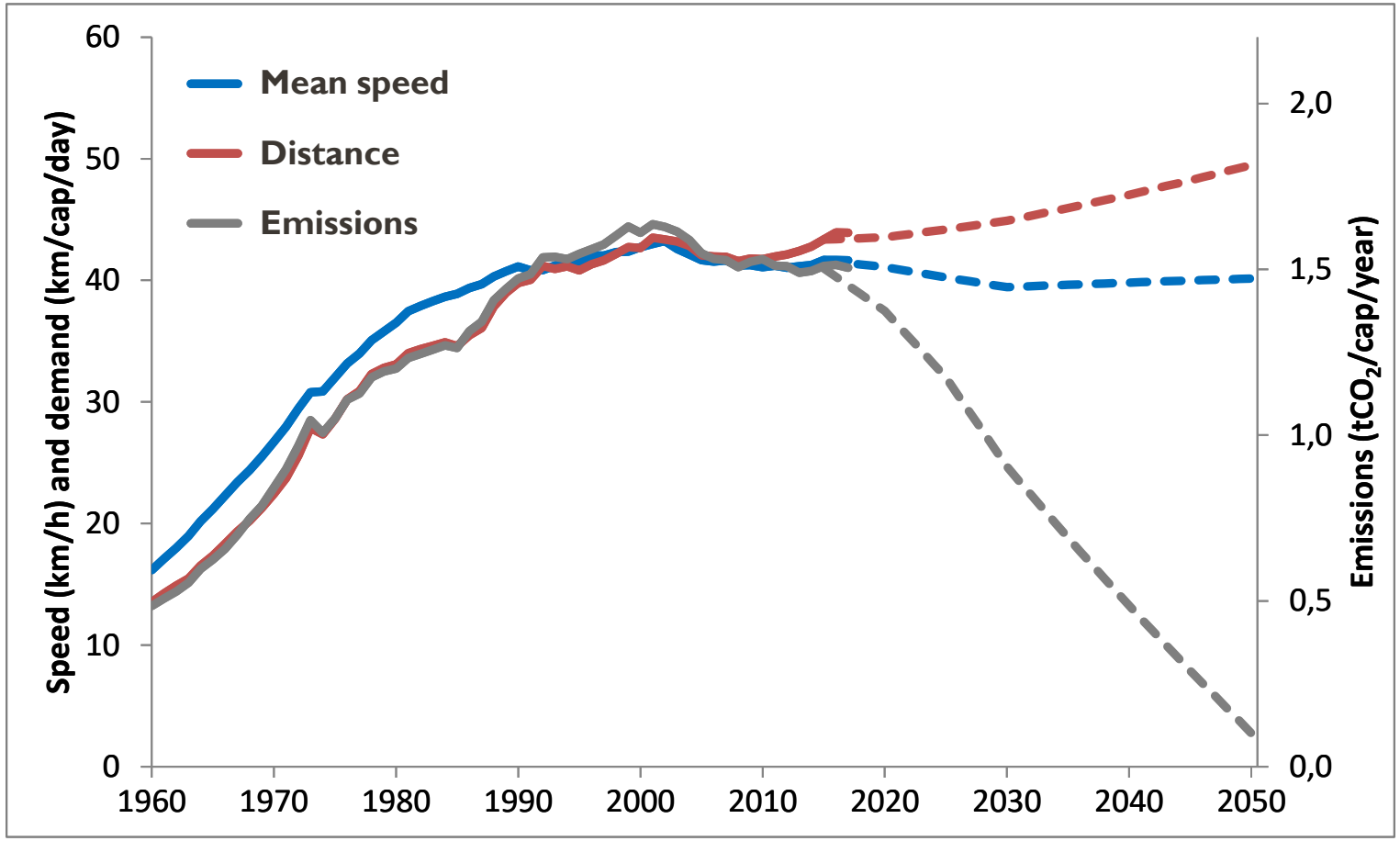


Multiplicative decomposition of passenger transport emissions between the reference year and 2050

(13 scenarios, of which 4 trend-based scenarios in red, the 4 most ambitious scenarios, SNBC in blue, and min-max values)

Reference: thesis, p121

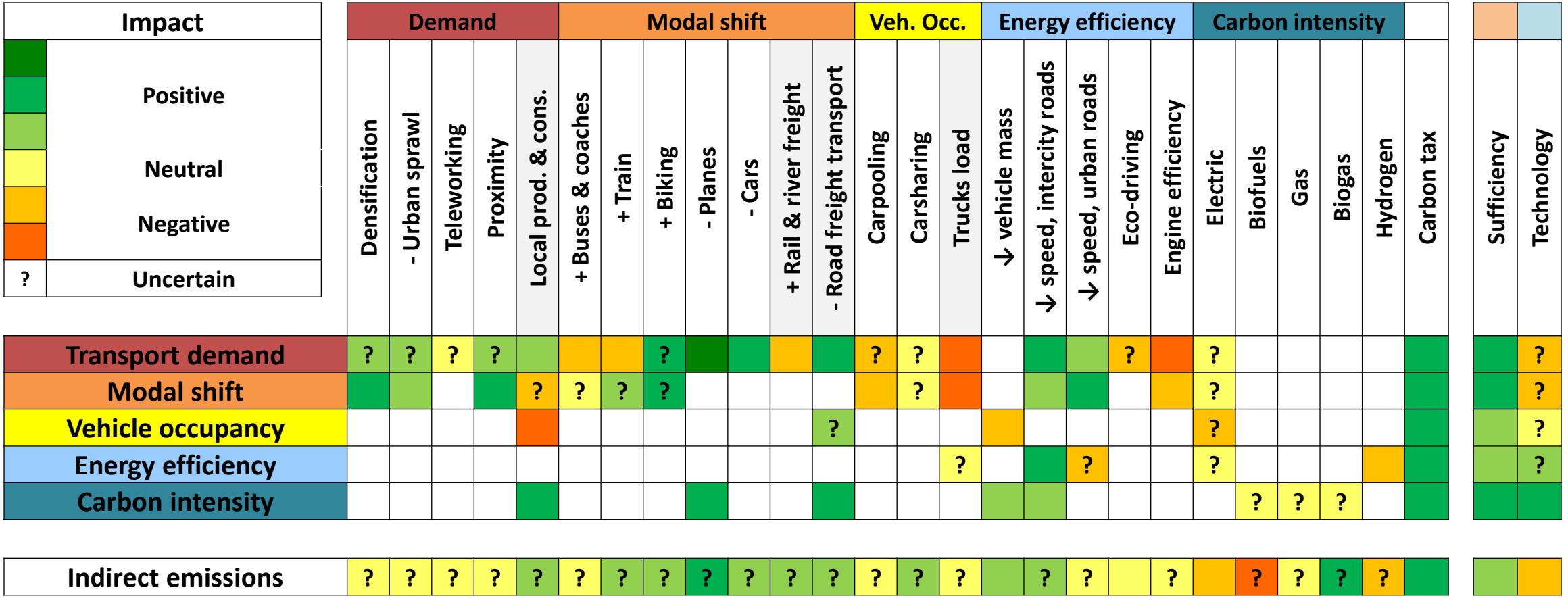
CO_2, demand and speed (past + SNBC)



Evolution of the mean transport speed, distances and emissions per capita, from 1960 to 2050 in France
(Metropolitan transports; CO_2 of biomass included; SNBC for 2015-2050)

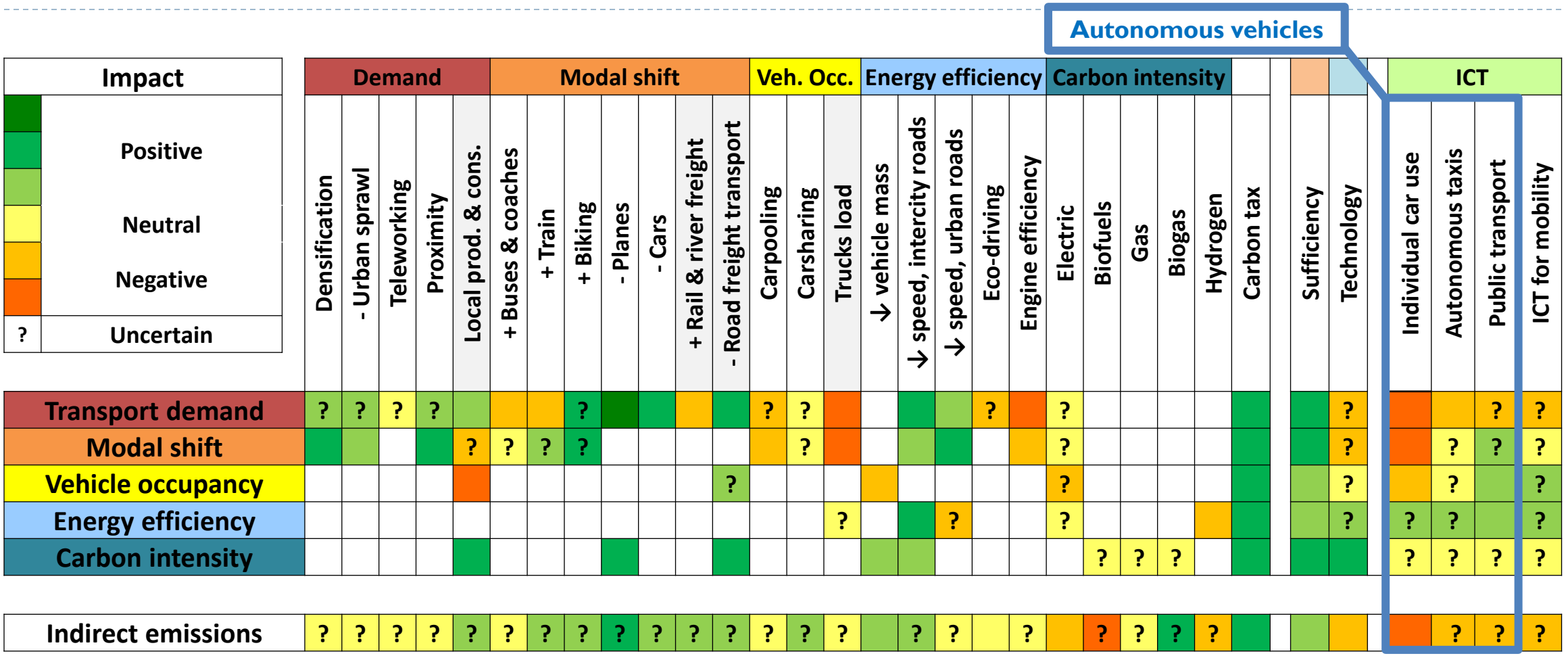
Source : thèse, p223

Positive interactions and rebound effects of ICT



Main suggested drivers of energy transition for transport in the studies scenarios, ans their interactions with the 5 factors

Positive interactions and rebound effects of ICT



Main suggested drivers of energy transition for transport in the studies scenarios, ans their interactions with the 5 factors

(3 scenarios or possible futures for autonomous vehicles, in blue)

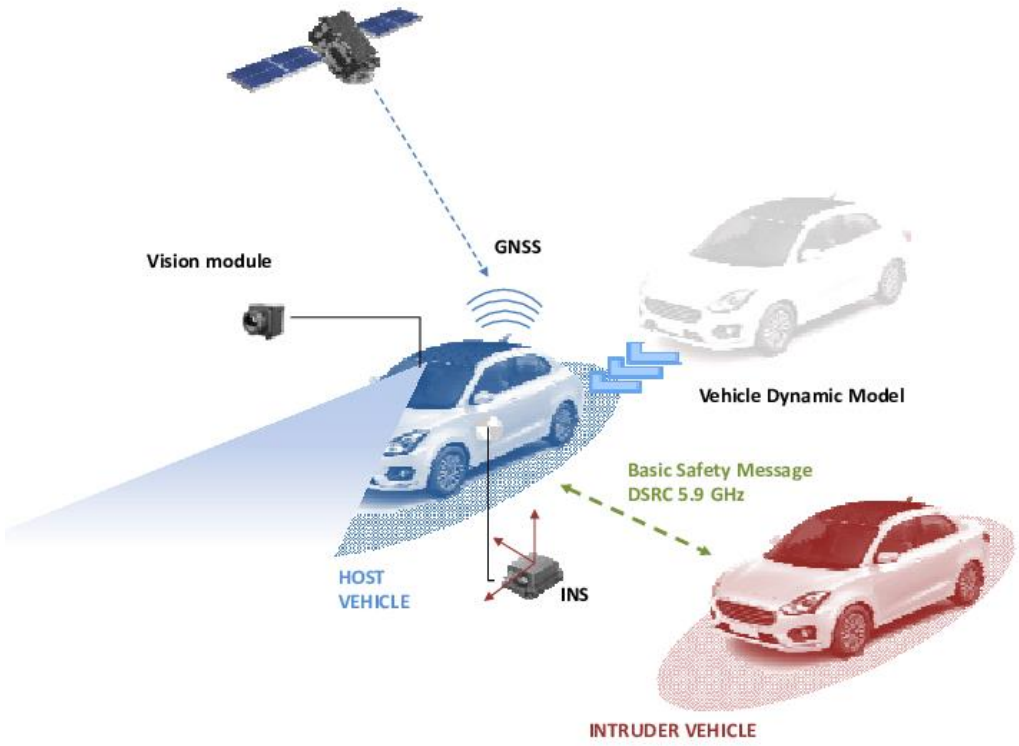
Some interactions between ICT and the 5 drivers

Transport demand	Modal shift	Vehicle occupancy	Energy efficiency	Carbon intensity
Telework Remote services	Public transport: information, mobility as a service Shared biking systems …	Carpooling: apps and real time services	Eco-driving	Electric vehicles charging management
Risk of increased mobility and distances	Reduce road congestion, then shortening and facilitating car trips	Individual autonomous cars	Increased mass, energy and resources consumptions for connected/autonomous vehicules	

Some opportunities (green) and risks (red) of ICT for the 5 drivers of transport emissions

What kind of vehicles for the future?

Technology option : autonomous cars



Sufficiency option : light vehicles

References: Sabatini for autonomous vehicle; article with Frédéric Héran for intermediary vehicles

Key points of the presentation

1) Context

- Target of **carbon neutrality** in France by 2050; need for **-5%/year** globally for staying below 1.5°C
- Various environmental, social and health **externalities** of transports
- Transportation **speed** influences **distances** (and destinations), which influence **CO_2** emissions

2) The 5 drivers of transport CO_2 emissions

- Transport demand, modal shift, vehicle occupancy, energy efficiency, carbon intensity of the energy
- **Technological options** are necessary but not sufficient
- High importance of **demand-side measures** to reduce emissions, especially in the short-term

3) The role of ICT, both opportunities and risks

- One of the numerous **drivers** influencing travel behaviors and emissions
- Main **opportunities** by improving the efficiency of the transport system
- Main **risks** on transport demand, the main factor driving up emissions
- Improving the efficiency of the most emitting modes may lead to **rebound effects**

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Link to the thesis