

Young Researchers Seminar 2013

Lyon, France , June 5-7 2013



Laboratoire d'Economie
des Transports

Unité Mixte de Recherche du CNRS n° 5593
Université Lumière Lyon 2 - ENTPE

How to include climate change in urban mobility planning?

Cases study of Lille and Stockholm

Claire Papaix

PhD student (2nd year)/IFSTTAR-DEST





Outlines

Introduction

I. *Context* – Considering CO2 in urban transport projects appraisal:
a two-fold challenge

II. *Methodology* – Travel choices, system of externalities
and the right mix of policy-tools

Conclusions and branch out



Introduction

Most of CO2 emissions from transport* are not covered by economic instruments

- CO2 emissions from transport are increasing
- European and national binding objectives set for mitigating CO2 emissions from transport activities
- Carbon taxation on fuels heterogeneously implemented in the EU (cf. an overview of road transport instruments existing in Europe and in France in Appendix 1)

Urban mobility ** is the main source of CO2 emissions from passengers transport

- Need for implementing local policy-tools

➔ Interest of focusing on local policy-instruments

- Impact simultaneously several externalities from urban mobility (not only CO2)
- Raises the issue of global challenge vs. bottom-up policy action

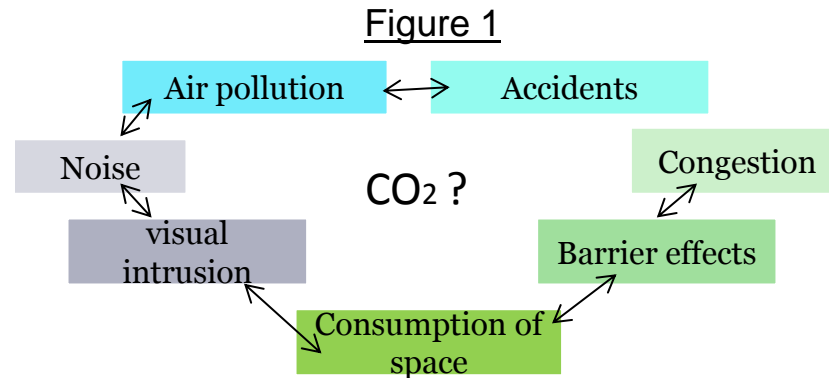
* *The transport sector is the largest source of CO2 emissions in France accounting for 33.7% of the total in 2010. Source: MEDDE 2011*

* * *Urban mobility in France in 2005 : 53% of passengers transport's CO2 emissions (35% for freight and 47% overall). Source: TEC no198 – avril - juin 2008*



I. Considering CO2 in urban transport projects appraisal : a three-fold challenge

(1) Multiple transport (negative) externalities in interaction:



Source: Héran (2011)

→ Ex. CO2 and local pollution; CO2 vs. safety

- (2) adding CO2 emissions in the socioeconomic calculation (CBA) is not straightforward, since they:
- do not directly affect the local population
 - are therefore difficult to quantify and monetize (cf. lowest ranking in the table 1)



I. Considering CO2 in urban transport projects appraisal : a two-fold challenge

Table 1

	Dense urban area	Sprawling urban area	Rural area
COSTS (external)			
Environnement	2,24	1,17	0,74
CO2	0,45	0,45	0,29
Local air pollution	1,15	0,62	0,44
noise	0,64	0,1	0,01
Unsafety	4,75	1,83	1,14
Congestion	16,6	2	1,19
Infrastructure use	0,57	0,57	0,37
<i>total</i>	24,2	5,6	3,4
REVENUES (internal)			
Domestic Tax on Petroleum Products (TICPE in French)	3,51	3,51	2,27
Highways tolls	0,42	0,67	0,76
Other taxes	0,67	0,67	0,43
<i>total</i>	4,6	4,85	3,46

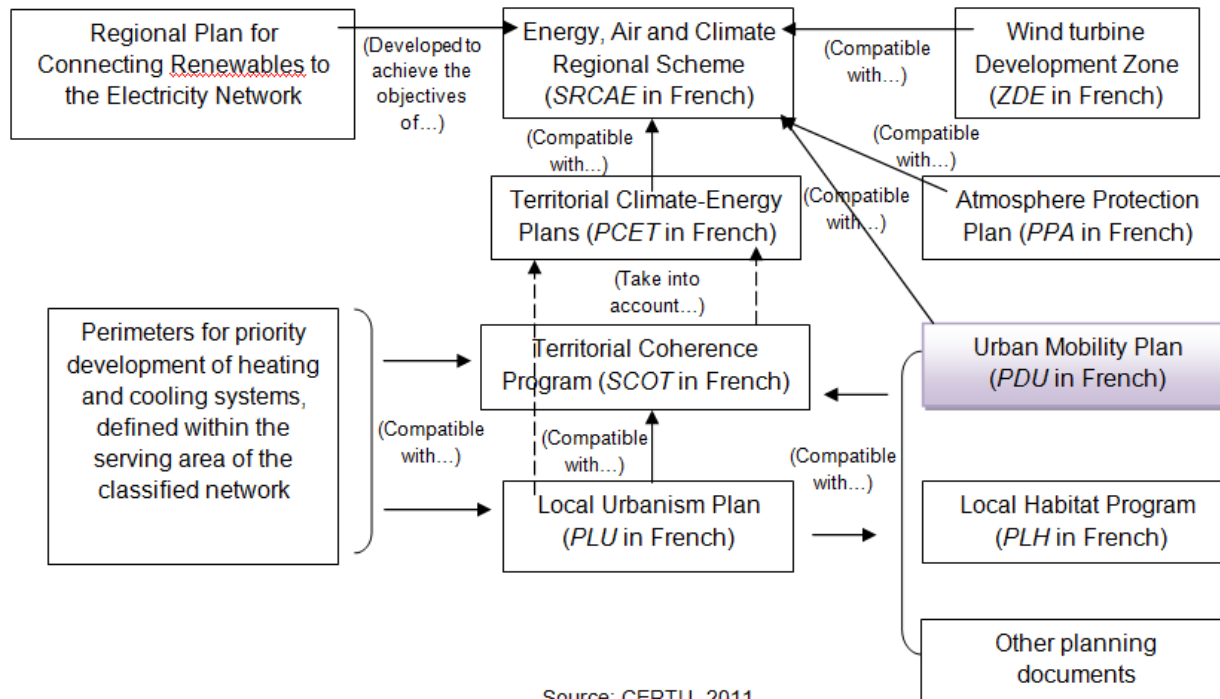
Source: CGDD/SEEIDD/MA, 2012



I. Considering CO2 in urban transport projects appraisal : a two-fold challenge

(3) (Sustainable) urban mobility planning: an increasing complexity

Table 2



Source: CERTU. 2011



II. Travel choices, system of externalities and the right mix of policy-tools

Theoretical framework

1. A complete system of externalities (explained variables, Y_{ti}) simultaneously influenced by: policy-tools (explanatory variables, X_{tj}) and error terms u_{ti} .

- Model of simultaneous equations (Koopmans, 1950)

$$\sum_{i=1}^g \Gamma_{il} Y_{ti} = \sum_{j=1}^k B_{jl} X_{tj} + u_{tl}.$$

2. Which mix of economic instruments to reduce externalities? And how to appraise their effect?

- Mobility patterns determinants (demographic, geographic, related to service quality/transport options and economic): which effects of policy-tools?
- Impact on travel behavior → Disaggregated mode choice analysis

- weight of each alternative specific components and individual characteristics in modes utilities (discrete choice modeling) : *form of policy-tools*

cf. modal split and the 'ASIF' equation in Appendix 2

- Reveals the shadow value of CO2 (bottom-up pricing cf. Guesnerie , 2008)
strong insight for policymaking and social acceptability of the measures : *territorialisation of price-signals*



II. Travel choices, system of externalities and the right mix of policy-tools

Theoretical framework

3. Shortcomings of economic signals : efficiency and equity

➤ Efficiency

relevance of qualitative measures to change travel behavior (Bamberg et al. 2011; Xenias and Whitmarsh, 2013)

➤ Equity

Mileage elasticities differ according to individuals' revenue and residential location (ex. in France: from -0,25 for poor-rural to -0.35 for rich-urban (Kemel, Collet & Hivert 2010))

⇒ not the same responsiveness to pricing instruments + ways of recycling revenues can be unequal



II. Travel choices, system of externalities and the right mix of policy-tools

Data

Two cases study

- Urban Community of Lille Métropole: use of a nested logit model (walking/biking, public transportation or driving (drive alone or share ride) and evaluation of the urban mobility plan of 2000-2010
- Stockholm region: test of the carbon tax, urban toll and biofuel policy on travel choices



Conclusion

- **Synthesis**

Adopting a bottom-up approach for including CO2 in urban mobility planning allows:

- 1- to investigate the challenge of global issue vs. local action
- 2- to reveal a shadow-value of CO2, corroborating current trends in public policymaking

- **Branch out**

Long term growth opportunities for local communities

Mitigation vs. adaptation



Thank you for your attention

Claire PAPAIX

IFSTTAR – DEST (AME)

Marne-la-Vallée

14-20 Boulevard Newton

Cité Descartes, Champs sur Marne

F-77447 Marne la Vallée Cedex 2

+33(0)1 81 66 86 56

+33(0)6 27 04 02 53

www.ifsttar.fr

claire.papaix@ifsttar.fr



Appendix 1:

Overview of the policy toolbox for EVs in EU

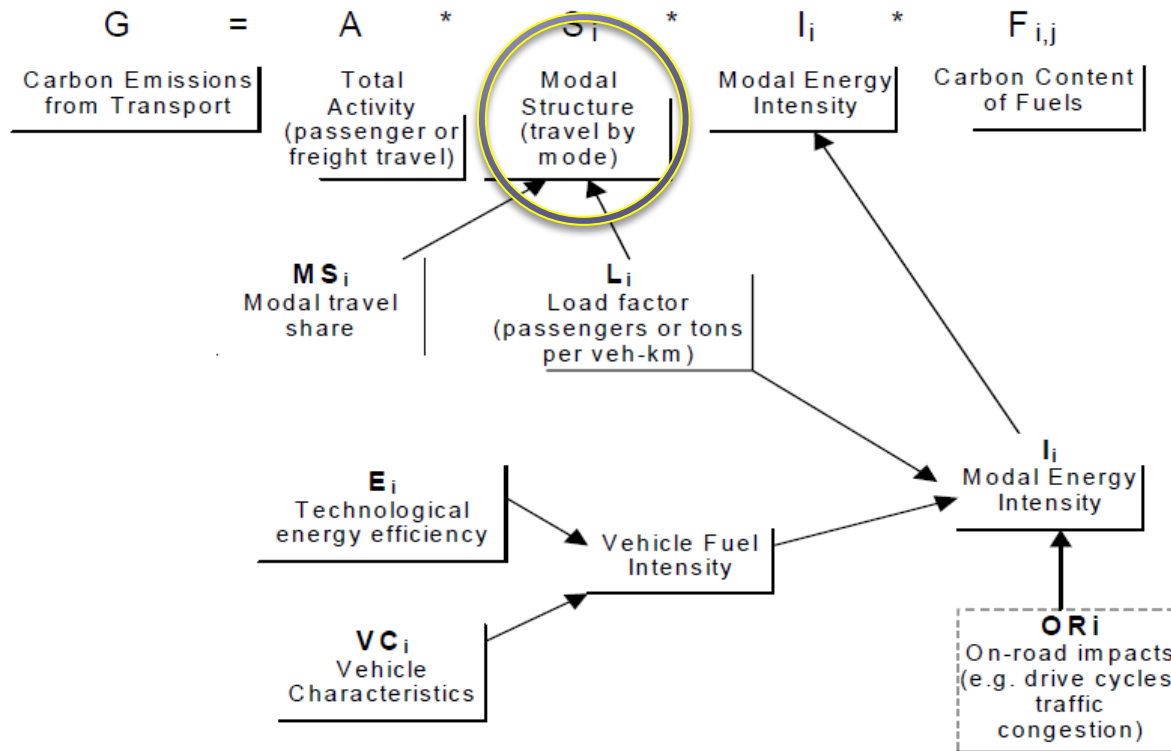
1. Command and control	Supply-side	<ul style="list-style-type: none"> -Quality standards - Safety standards -Emissions standards* -Licensing procedures (building, etc.)
	Demand-side	<ul style="list-style-type: none"> -Purchase mandates -Preferential access rights (parking, driving)
2. Economic instruments	Supply-side	<ul style="list-style-type: none"> -Investment in infrastructures -Investment in R&D
	Demand-side	<ul style="list-style-type: none"> -Vehicle purchase subs./feebates -Preferential taxes on sales prices - registration taxes - ownership taxes - energy taxes - parking fees/congestion charges -Home infrastructure install.& equipment subsidies -Scrapping schemes
3. Public procurement	Demand-side	<ul style="list-style-type: none"> -Mandatory green procurement -Purchase consortia
4. Collaborative initiatives	Supply-side	<ul style="list-style-type: none"> -PPPs -Coordinative/managerial activities
5. Communication and diffusion	Supply-side	<ul style="list-style-type: none"> - Education/training of sales /mechanics persons - Lobbying - Support to demonstration projects
	Demand-side	<ul style="list-style-type: none"> - Labelling /certifications -Marketing activities -buyers guides -Information and awareness campaigns

Source: author from Leurent, F, Windisch, E., 2012



Appendix 2:

Modal split and the 'ASIF' equation



Schipper et al. (2000)