ITS and ethical design in terms of ecological and social sustainability: the new transport systems

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Chair of Behavioural process Transport Research Board Committee

cambiaMO | changing MObility

ERAdiate

Enhancing Research and innovAtion dimensions of the University of Zilina in intelligent transport systems

Content

- Where we are and where we are going to?
- Digital platforms: bahaviours and social consequences
- Digital and real networks contradictions (congestion by Uber).
- Ethical design: personal data protection Regulation
- Eliciting assessment tools
- Value of Time and social and environmental constraints

Future scenarios: a re-elaboration

- **The Driving Ahead, for capital intensive people**
- **Live Local, for strong environmental scenario (people awareness+ strong regulation(?))**
- **Digital Divide scenarios (slow growth for people without digital resources)**

Universal Access: about 450 million people in Africa— or more than 70% of its total rural population—are estimated to have been left unconnected to transport.

Efficiency: transporting a container of avocados from Kenya to the Netherlands requires 200 interactions and more than 20 documents, at a cost equal to that of shipping. Efficient supply chains can increase farmer income 10-100%.

Safety: almost 1.3 million people die on the world's roads every year and tens of millions are seriously injured. Traffic crashes are the leading cause of death among young people aged 15-29.

Green mobility: transport emits 23% of all energy-related greenhouse gases; its CO2 emissions could grow by 40% by 2040.

"**The world is off track to achieving sustainable mobility**. The growing demand for moving people and goods is increasingly met at the expense of future generations," said José Luis Irigoyen, Senior Director of the Transport & ICT Global Practice at the World Bank.

And what about the current generation?

We first identified 6 technologies that could impact travel demand, network capacity or traveller productivity

Autonomous vehicles

Internet of Things

Next Generation ICT connectivity / telecommuting / telehealth

Advanced manufacturing / 3D printing

User apps / Big Data / intelligent processing

Novel materials and embedded sensors in infrastructure

Dr. Barbara Jensen (Gautrain): "the smart phone is the most important public transport invention"

Shared economy: Where we are?

Who is paying for UBER efficiency?

- Consumer
- Capital
- Workforce

The gains for an Uber driver in Paris off peak

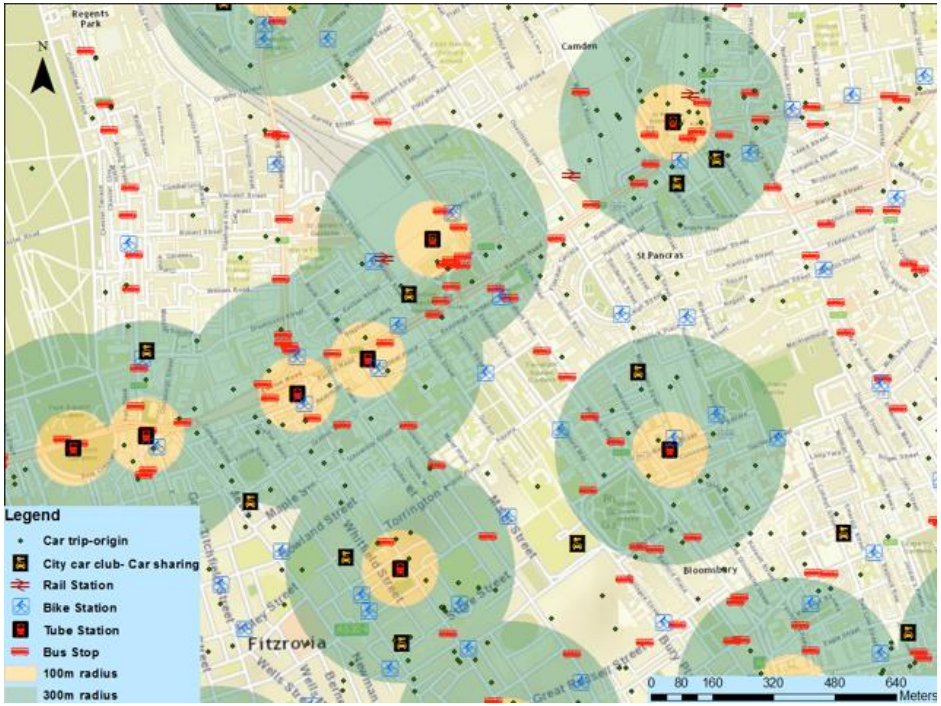
Benefits	Costs	Gains
10 €	1,9 - 25% to pay to Uber	
	2,5 Social security piad by the worker	
	3,1 cars costs	
		2,5€

Deliveroo, Glovo…

- Current situation in Madrid:
- 700 delivers, y 200 riders

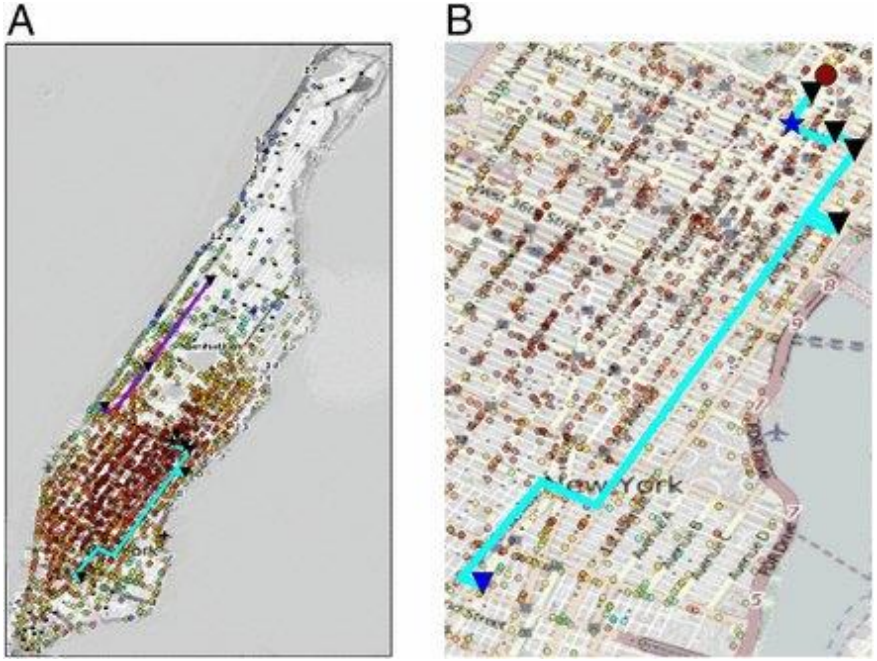
Benefits	Costs	Gains
4,25 € for delivering	2€ each 15 days	
	1,6: Social security	
	Assurance	
		2,,60€

Transport Spots vs Networks



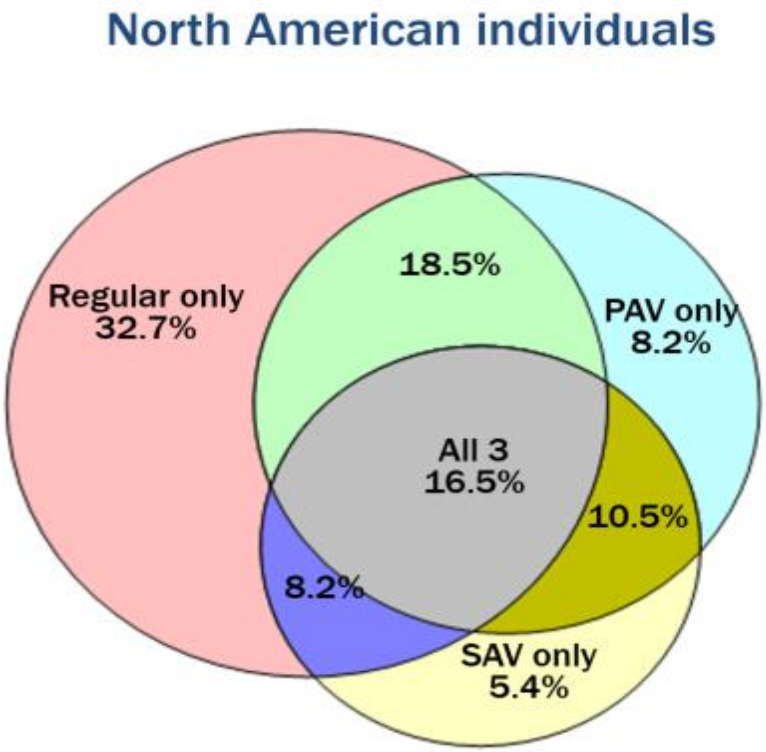
Source: Feasibility Study for “Mobility as a Service” concept in London FS--MaaS , Dr. Maria Kamargianni et al. , UCL Energy Institute

Transport ITS platforms vs Real effects: some contradictions

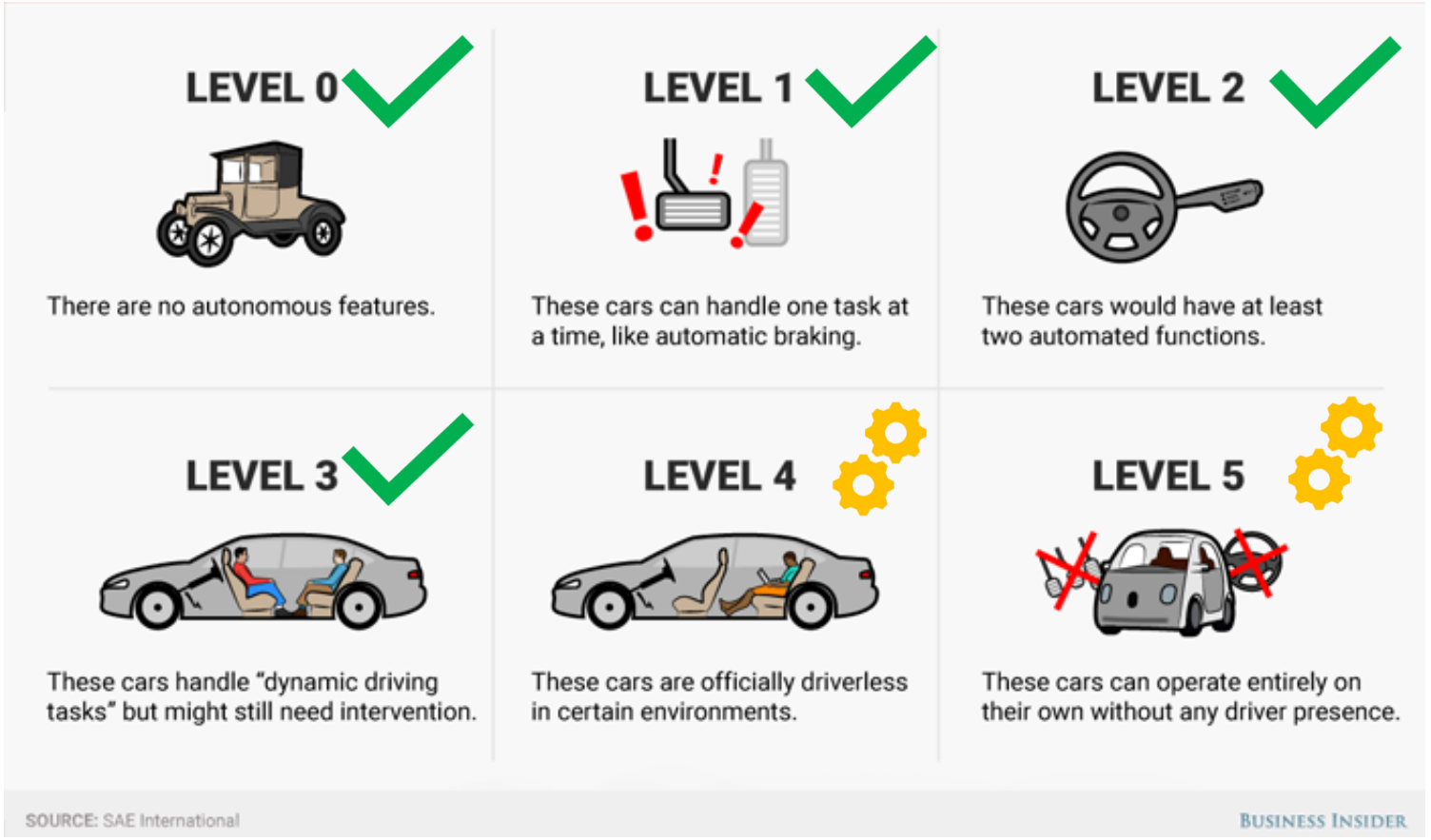


Autonomous vehicles

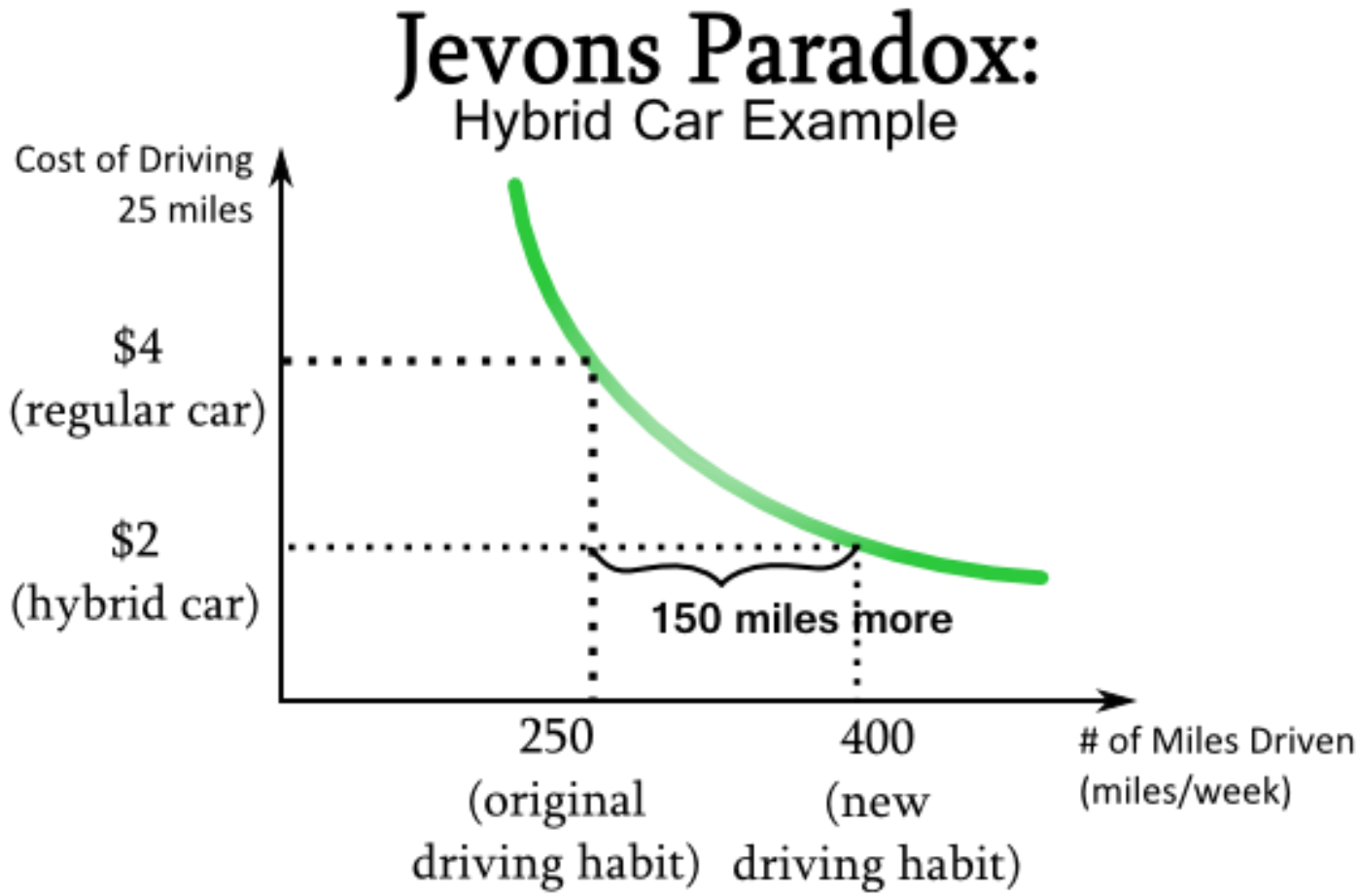
New services?

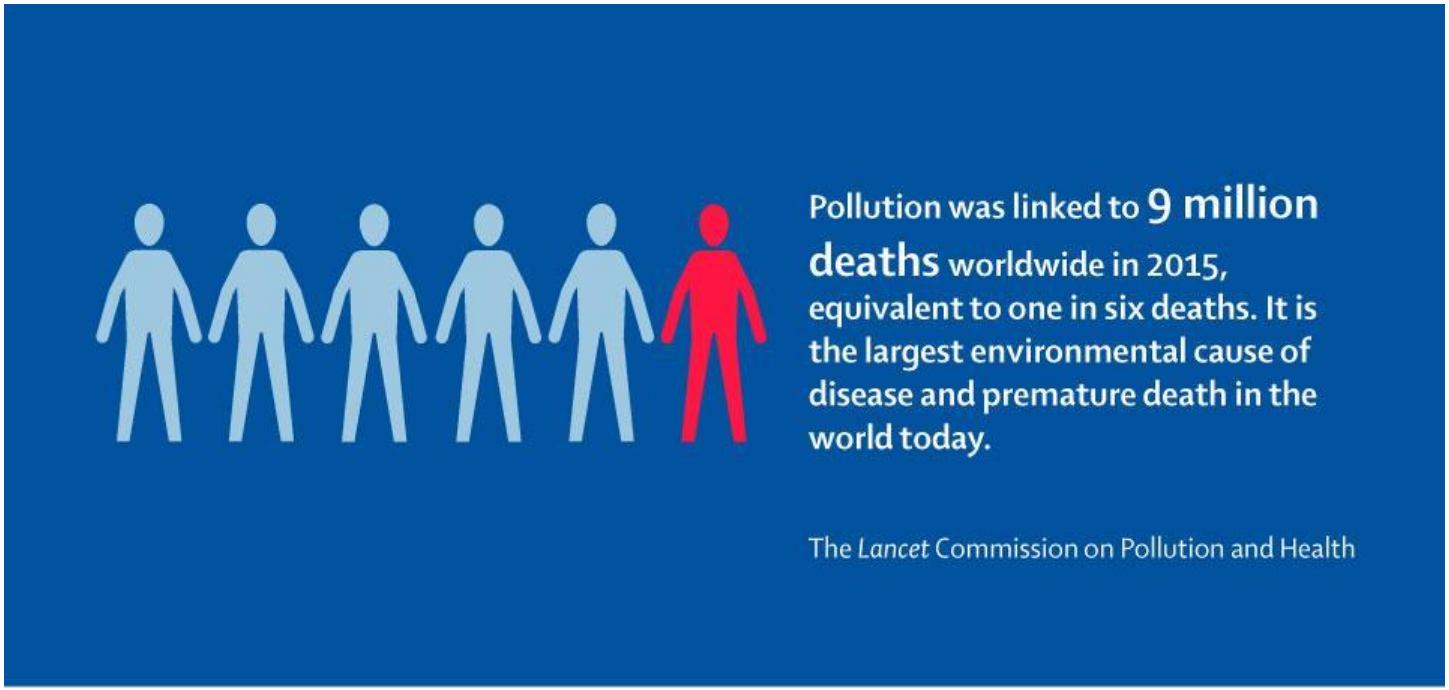


By **"User preferences regarding autonomous vehicles": motivations for choosing to own and use autonomous vehicles**, Habouchaa C. J., R.Ishaqa, and Y. Shiftan, forthcoming.


LEVEL 0
There are no autonomous features.
LEVEL 1
These cars can handle one task at a time, like automatic braking.
LEVEL 2
These cars would have at least two automated functions.
LEVEL 3
These cars handle "dynamic driving tasks" but might still need intervention.
LEVEL 4
These cars are officially driverless in certain environments.
LEVEL 5
These cars can operate entirely on their own without any driver presence.
SOURCE: SAE International
BUSINESS INSIDER


RPA
The Road to AVs in the Region
PHASE 1 2017
PHASE 2 2022
PHASE 3 2027
PHASE 4 2040
A Prospective Timeline in Four Phases
1 2017-2022
Automated features continue to improve and become less expensive, while car ownership declines.
2 2023-2027
Fully autonomous vehicles are on the market, but AV and legacy vehicle mix results in uneven traffic improvements.
3 2027-2040
Autonomous conversion of light-duty vehicle fleets increases from 15 percent in 2030 to 75 percent in 2040.
4 2040 and beyond
Land use planning is permanently altered to make way for pedestrians, cyclists, and public spaces, in both urban and suburban streets.

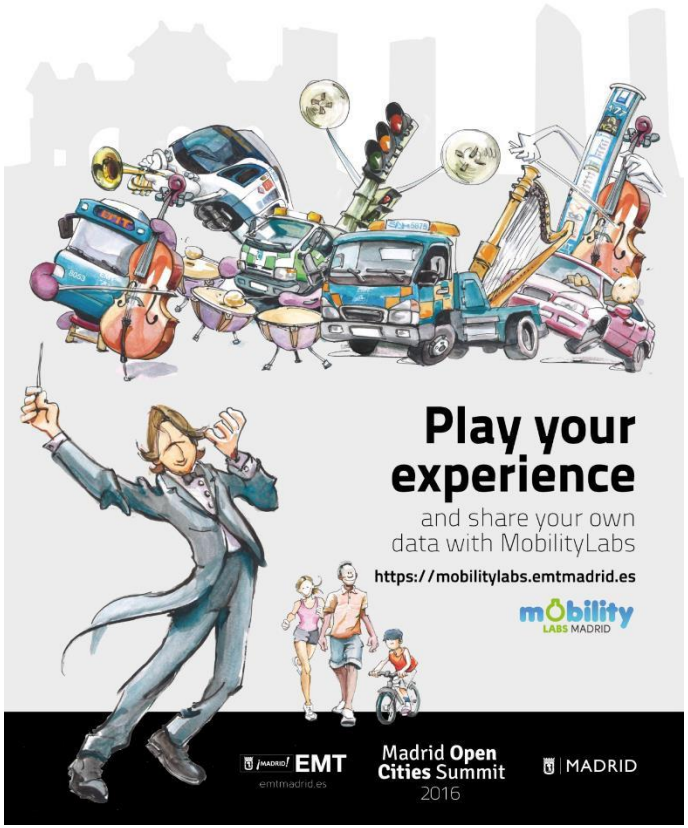

Jevons Paradox:
Hybrid Car Example
Cost of Driving
25 miles
$4
(regular car)
$2
(hybrid car)
150 miles more
250
(original
driving habit)
400
(new
driving habit)
# of Miles Driven
(miles/week)


Pollution was linked to 9 million deaths worldwide in 2015, equivalent to one in six deaths. It is the largest environmental cause of disease and premature death in the world today.
The *Lancet* Commission on Pollution and Health
THE LANCET
The best science for better lives

MAAS _Madrid Open Data

Portal MobilityLabs

#OPEN DATA 2.0



http://mobilitylab.emtmadrid.es

http://rbmobility.emtmadrid.es:4444

Regulation 2016/679/EU: **G**eneral (personal) **D**ata **P**rotection **R**egulation

WHEN

Application: 25 May 2018 - at which time those organizations in non-compliance may face heavy fines

TO WHOM IT APPLIES

- To organizations established in the EU
- To organizations (especially the ones with internet-based business models) outside the EU, if they either:

(a)offers goods or services to EU data subjects; or

(b) monitors the behaviour of EU data subjects.

GDPR: A BALANCE OF PRINCIPLES AND FUNDAMENTAL RIGHTS

Charter of Fundamental Rights of the European Union

- respect for private and family life, home and communications
- protection of personal data
- freedom of thought, conscience and religion
- freedom of expression and information
- freedom to conduct a business
- right to an effective remedy and to a fair trial
- respect of cultural, religious and linguistic diversity

How are we analyzing the GDPR?

1. Types of personal data

2. Key players

3. Key actions

NB: in yellow the changes made by the GDPR

1) Definition of personal data and the different types

Personal data = any information relating to an identified or identifiable natural person ('data subject')

Identifiable natural person = one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier* or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person.

PROCESSOR:

natural or legal person, public authority, agency or other body which processes personal data on behalf of the controller.

DATA PROTECTION OFFICER (DPO)

DPOs must be appointed in the case of:

(a) public authorities

(b) organizations that engage in large scale systematic monitoring

(c) organizations that engage in large scale processing of sensitive personal data

If your organization doesn't fall into one of these categories, then you do not need to appoint a DPO.

3) The key actions

CONSENT:

any freely given, specific, informed and unambiguous indication of the data subject's wishes by which he or she, by a statement or by a clear affirmative action*, signifies agreement to the processing of personal data relating to him or her.

*therefore...silence, pre-ticked boxes or inactivity should not therefore constitute consent

OBLIGATIONS OF CONTROLLERS (News)

- burden of proof of having obtained a valid consent
- compliance with EU data protection law
- respect of the principles of data protection by design and by default (important in the relation employer – employee)
- full liability of joint controllers
- appointment of representatives by controllers not established in the EU
- appointment of processors by controllers: it is permitted, but the GDPR imposes significant new requirements that must be included in all data processing agreements

Benefits for users and local authorities

Travel time saving criteria: three key criticisms technologically and socially speaking

1. Tremendous transport investments related to travel time saving don't lower the average travel time

2. Travel time saving: mobility vs accessibility: right to the city services, mobility needs and higher accessibility

3. Several studies show a zero or positive coefficient of travel time

Motivation for changing assessment tools

- Value-of-time (VOT) at the heart of transport decisions:
  - the forecasting travel demand
  - the transport projects assessment

- Determinants of the change of value of time:
  - Change of travel time perception
  - ICT's and new mobility services
  - Increasing social segmentation of population (i.e. migration status, gender, type of location)

Problem and background

- Travel behavior analysis is a continuously changing field regarding the qualitative and quantitative methods used, to estimate the VOT (Ortuzar, 1999).

- The increased diversity of society, the decreasing importance of traditional social structures, and the disruptive technological changes have resulted in more fluid and complex lifestyles (Monrency & Muñizaga, 2015) with an indirect yet strong impact on value of time.

Methodological framework

- **Travel demand forecasting**:
  - 4 steps model
  - Utility-based approach
  - arbor-three classification
  - Learning machines: participative techniques and democratically vote

- **Assessment:**
  - CBA
  - Multicriteria
  - Needs-based approach

Operational travel demand model: what we need?

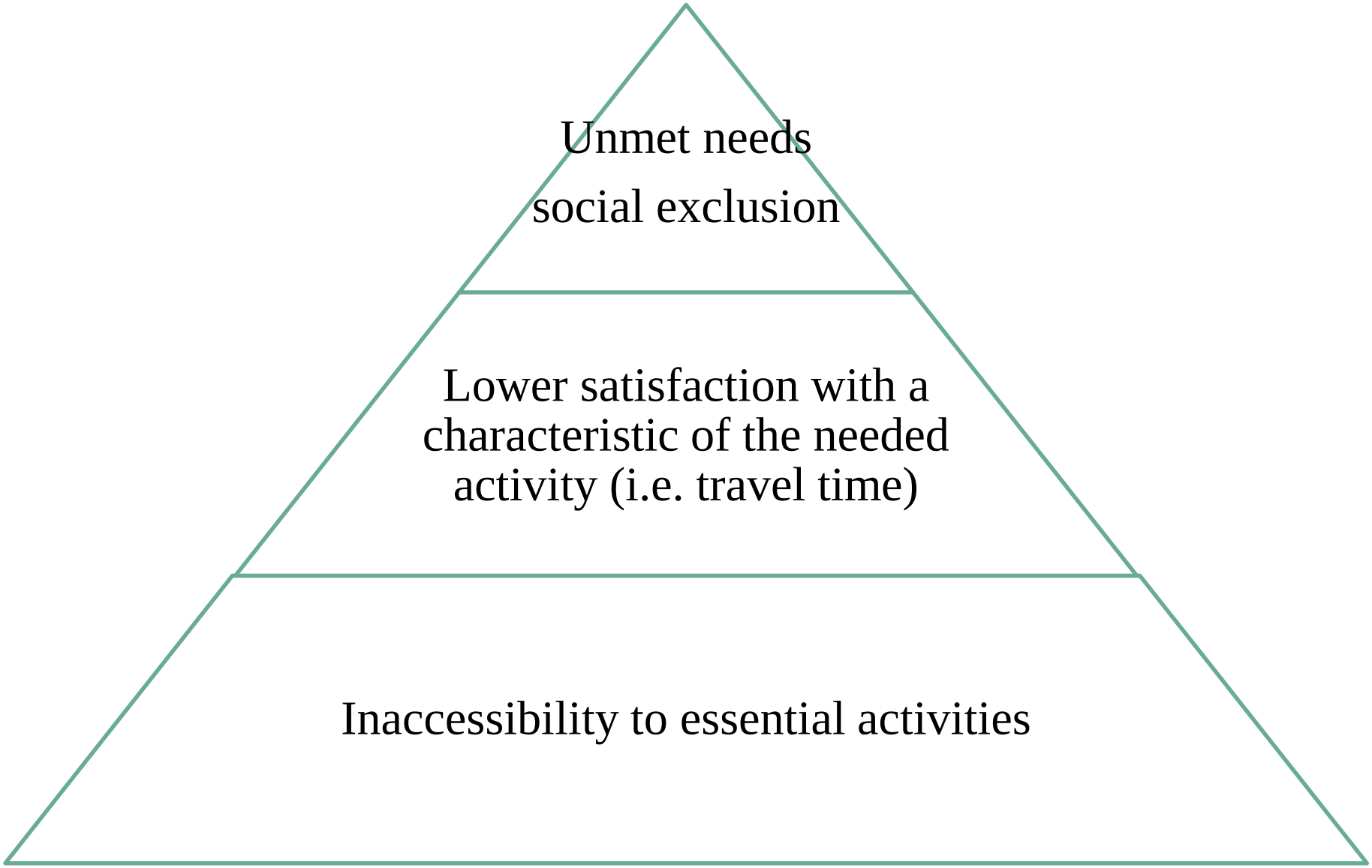
- **new data elements** as well as a data collection method to operationalize the proposed framework for VOT estimation
- **collection method** based on a case studies typology, which enabled estimating the associated models for deriving value-of-time distributions across population groups.
- **cross-case studies variations** as well as differences among different population groups (such as by immigrant status, by gender, or by type of geographic area)

VOT: new framework

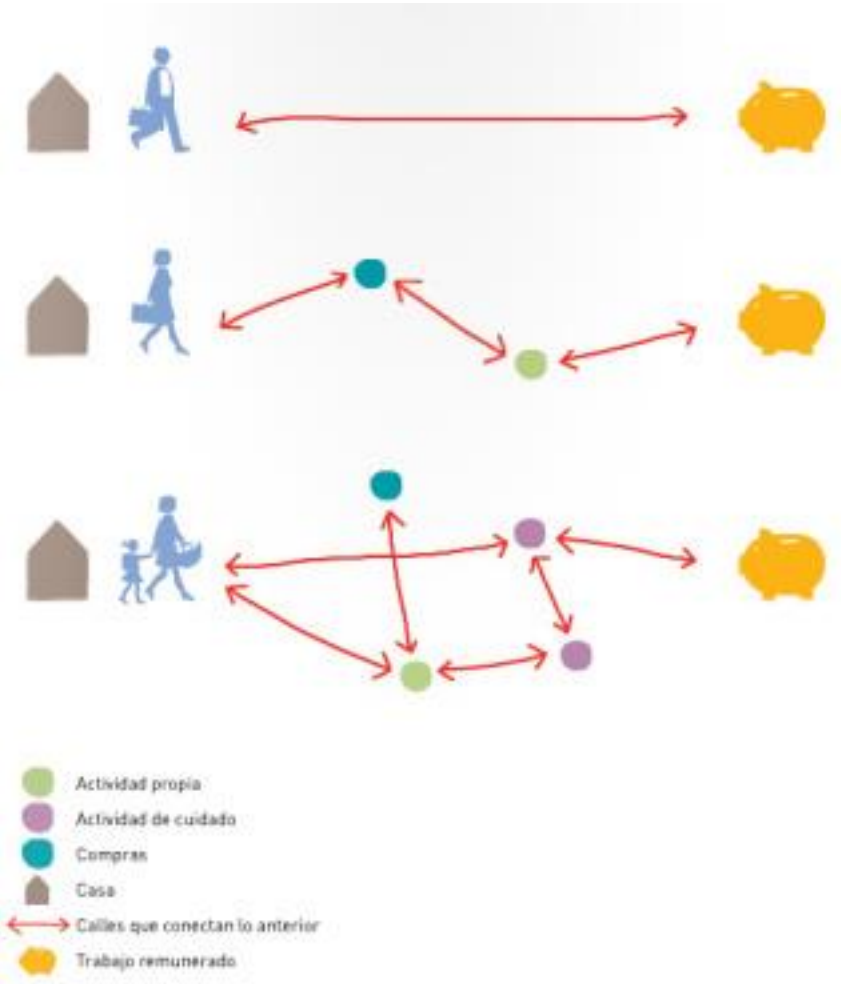
- Starting a new framework for estimating VOT will facilitate a better travel demand forecasting process and an improved CBA assessment.

- The new methodological framework will act on both sides of the story: travel demand and transport project assessment.

Identification of needs in transport



Patterns of Mobility



Vía @miguelalvarez, @**CollectiuPunt6**

Methodology

Time thresholds

Use of mobility survey, where people were asked to evaluate from 0 to 10 their satisfaction of travel time with respect to their last trip, and to indicate the duration of her/his trip.

The ranges of users' level of satisfaction is:

- High satisfaction for likert points between 10-8
- Medium satisfaction for likert points between 7-4
- Low satisfaction for likert points between 3-0

Satisfaction level between 8 and 10 means that the user is satisfied with her/his travel time.

Methodology

- Time thresholds defined for each trip typology

inaccessibility index IA :

$$IA_{o,d}^{m,p,l} = 1 - \frac{\sum_{d=1}^{n} TT_{o,d}^{m,p,l} * \sum_{i=1}^{j} NU_{o,d}^{m,p,l}}{\sum_{i=1}^{j} NU_{o,d}^{m,p,l}}$$

(1)

where:

m represents the transport mode; p the trip purpose; l the length; o the trip origin and d the trip destination.

TT is the time threshold defined for a given trip typology; it is equal to 1 if the travel time is less or equal than the time threshold, 0 otherwise.

NU is the number of users making a given trip.

n is the number of considered typology, while j defines the number of users that need to make a given trip for reaching a given activity.

Multi-criteria analysis with and without time saving

Port Badalona	(versió anterior) SENS Sortida de la inaccessibilitat							
C1	Costos de construcció			15,4				
C2	Costos addicionals de manteniment i operació			0,5				
								TIR
	Estalvi de temps			0,9				1,47%
	Interns vehicle privat			0,0				VAN (r=0,03)
	Externs			-0,1				-3,85
	Ambientals			-0,1				

Port Badalona	AMB Sortida de la inaccessibilitat (que substitueix estalvis de temps, estalvis vàlids només per als in							
C1	Costos de construcció			15,4				
C2	Costos addicionals de manteniment i operació			0,5				
								TIR
	Estalvi de temps			0,0				-5,27%
	Interns vehicle privat			0,0				VAN (r=0,03)
	Externs			-0,1				-17,25
	Ambientals			-0,1				
	Sortida de la inaccessibilitat			0,36				

Conclusion

- ITS: how much Mess for the current ethical design?

- Environmental, social, and health consequences
- More or less regulation for saving our rights (the GDPR)?
- The value of time: difficult to trust in when its heterogeneity is so big…
- Travel time seems to become less relevant when patterns mobility are more complexe (the inaccessibility index?)
- A tentative to substitute the time saving by the inaccessibility index value.

Related publications

Floridea Di Ciommo is chair of Behavioral processes Committee of Transportation Research Board. She leaded research activities related to the social impacts of ITS on travel behavior patterns

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- Martens, K., & Di Ciommo, F. (2017). Travel time savings, accessibility gains and equity effects in cost–benefit analysis. Transport Reviews, 1-18.
- Di Ciommo, F. Comendador, J. López-Lambas, M.E., Cherchi, E. and Ortúzar, J.dD. 2014. Exploring the role of social influence variables on travel behavior, Transportation Research Part A: Policy and Practice, 68, 46-55