ANALYSIS OF MOBILITY IN THE VALENCIA METROPOLITAN AREA THROUGH DISCRETE CHOICE MODELS. PROPOSAL TO IMPROVE THE METROPOLITAN PUBLIC TRANSPORT NETWORK.

ESCUELA TÉCNICA SUPERIOR DE INGENIERÍA DE CAMINOS, CANALES Y PUERTOS

UNIVERSITAT POLITÈCNICA DE VALÈNCIA

MÁSTER EN INGENIERÍA DE CAMINOS, CANALES Y PUERTOS. MASTER'S DEGREE FINAL PROJECT. YEAR 2018/2019. MARCH 2019.

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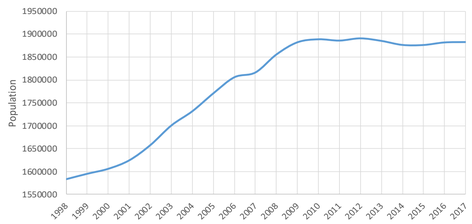
1. BACKGROUND

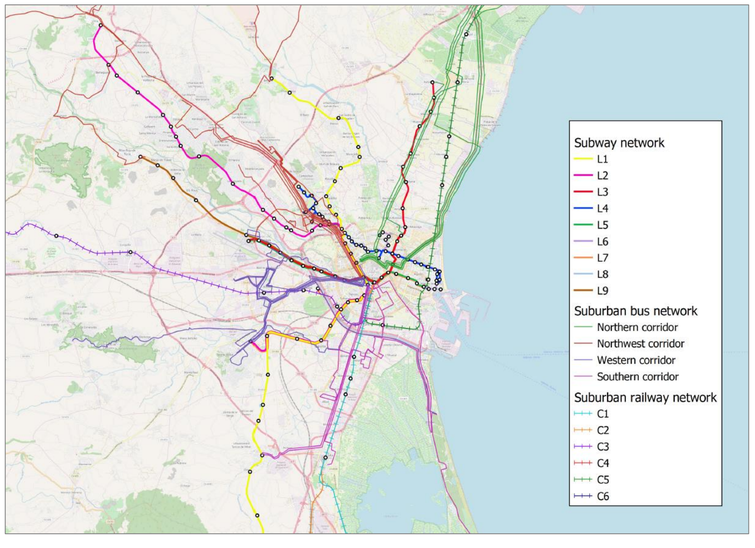
The growth of the population in Valencia over the last decades has led to the **overcrowd of the urban nucleus** of the city and to the **expansion of the Metropolitan Region**. However, the public transport network does not expand at the same rate as the city does: **connections between metropolitan municipalities are scarce** and the use of the private vehicle is often necessary.

EVOLUTION OF THE POPULATION IN VALENCIA FROM 1998 TO 2017 (INE)



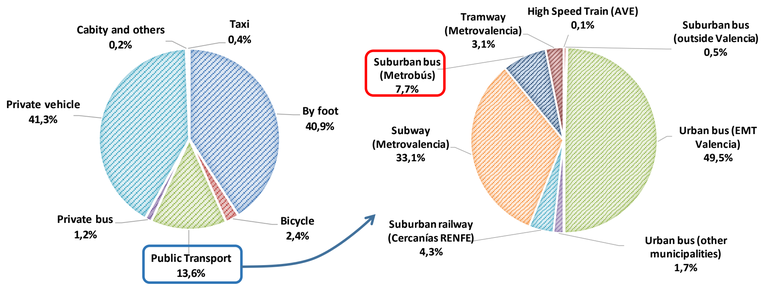
2. PUBLIC TRANSPORT NETWORK

Starting from the centre of the city, the public transport network in Valencia runs through radial corridors which are not linked one another; thus, municipalities located at different corridors are left with almost no connections between them. Nowadays, the best option for solving this mobility problem lays on the **implementation of new suburban bus (Metrobús) lines linking metropolitan nucleuses** with substantial mobility flows.



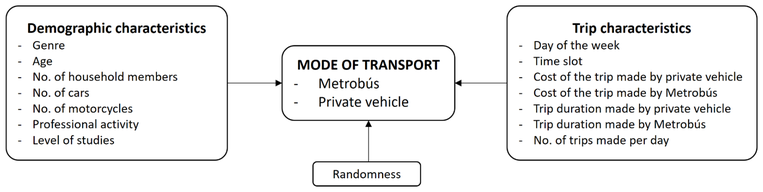
3. PUBLIC TRANSPORT DEMAND

The majority of trips in Valencia and is Metropolitan Region are made by private vehicle (41,3%) and by foot (40,9%), followed by public transport (13,4%). Only 7,7% of the 13,4% public transport share corresponds to the suburban bus, so **the modal split of Metrobús in relation to all modes of transport is 1,05%**. Its low percentage of use suggest that the service is not attractive enough. For this reason, before implementing any new Metrobús line, the **variables that determine the choice of transport should be analysed**.



4. ANALYSIS OF ROUTES ONLY CONNECTED BY METROBÚS

It has been made an analysis of the routes with no public transport connections other than Metrobús with the aim of understanding how the different **characteristics of population** and how **the nature of the trips** being made have an **influence in the decision** of choosing to travel with the private vehicle or with Metrobús.



5. MODEL SPECIFICATION: THE LOGIT MODEL

For transforming the observed attributes (x) into a **statistical expression**, a discrete choice Logit model has been developed using Mplus in order to **obtain the probability of a person of choosing to travel by Metrobús.**

$$P(Metrobús) = \frac{1}{1 + e^{-(V_{Metrobús})}} \qquad V_{Metrobús} = \beta_0 + \sum_k \beta_k \; x_k$$

6. ESTIMATION OF THE DISCRETE CHOICE LOGIT MODEL

After various iterations with Mplus, **relevant variables have been identified** (P-value<0,1). Our final objective is to come up with a tool that a transport company could use to make technical decisions for implementing new bus lines. Thus, we select the variable that shows a pure technical nature: the relative price that an individual would have to pay for using the private vehicle against the alternative of travelling by Metrobús (DIFCOST).

MODEL RESULTS (final iteration)

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
MODE#1 ON				
WOMAN	-0.802	0.304	-2.641	0.008
DIFCOST	0.574	0.223	2.576	0.010
AFTERN	0.780	0.375	2.078	0.038
STUDENT	-1.966	0.396	-4.965	0.000
LOOKING	-1.255	0.415	-3.027	0.002
PRIMARY	-0.816	0.345	-2.265	0.018
OTHERSTU	-2.232	0.998	-2.238	0.025
ESTDK	-2.394	0.397	-6.027	0.000
Intercepts				
MODE#1	4.397	0.355	12.371	0.000

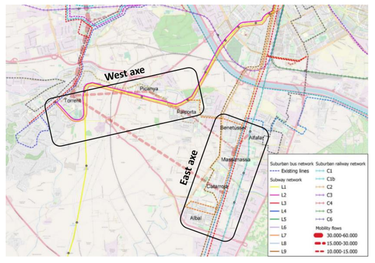
MODEL RESULTS (conclusive iteration)

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
MODE#1 ON				
DIFCOST	0.538	0.207	2.597	0.009
Intercepts				
MODE#1	3.082	0.164	18.809	0.000

$$V_{Metrobús} = -3{,}082 + 0{,}538 \cdot DIFCOST$$

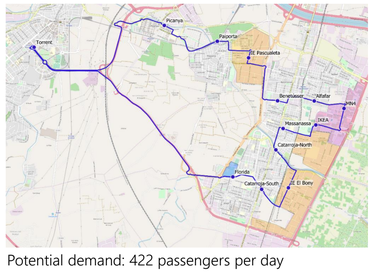
7. APPLICATION FOR IMPLEMENTING A NEW METROBÚS LINE

Two unconnected axes at the southern zone of the Metropolitan Region of Valencia have been identified. The East axe has wide industrial estates (IE) and a large commercial area that attract a great number of people. **We have decided to set up here a new suburban bus line**.



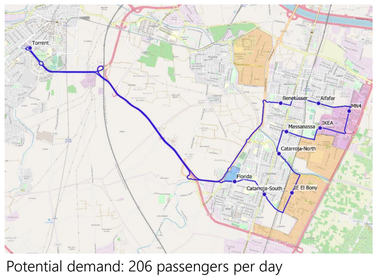
The **following solutions** have been proposed:

SOLUTION 1



Potential demand: 422 passengers per day

SOLUTION 2



Potential demand: 206 passengers per day

An **economical analysis** of both solution has been made:

	SOLUTION 1	SOLUTION 2
REVENUE OF THE SERVICE (€)	238.746,50	116.544,50
CONTRIBUTION DUE TO DEFICIT (€)	40.712,50	149.531,73
TOTAL COSTS OF THE SERVICE (€)	279.459,00	266.076,23
OPERATION RESULTS (€)	0,00	0,00

Solution 1 has been chosen, as it provides better economic results.