

Modelling urban growth: a prospective population, housing and job location model

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SUMMARY

1. Introduction
2. Structure of the model
3. Assumptions
4. Results

1 INTRODUCTION



Objectives of the urban growth model:

Knowing... in a three future stages (2014-2019-2024)

- 1) The population and its spatial distribution
- 2) The employment (labour market) and its spatial distribution
- 3) The amount of principal housing

... within Catalonia

1. Introduction

2. Structure of the model

3. Assumptions

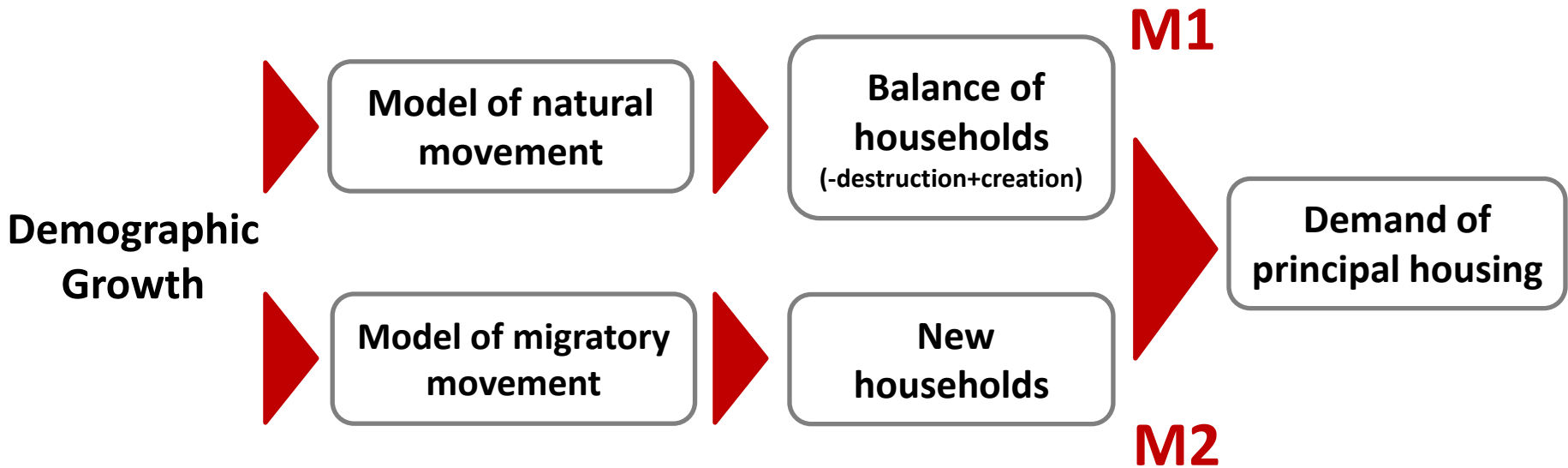
4. Results

2 STRUCTURE OF THE MODEL



The model is based on the creation of households as a structural element of demand for housing. Distinguishing, households that are created by the natural movement of those that are created by the migratory movement

General Model



2 STRUCTURE OF THE MODEL

M1 MODEL OF NATURAL MOVEMENT

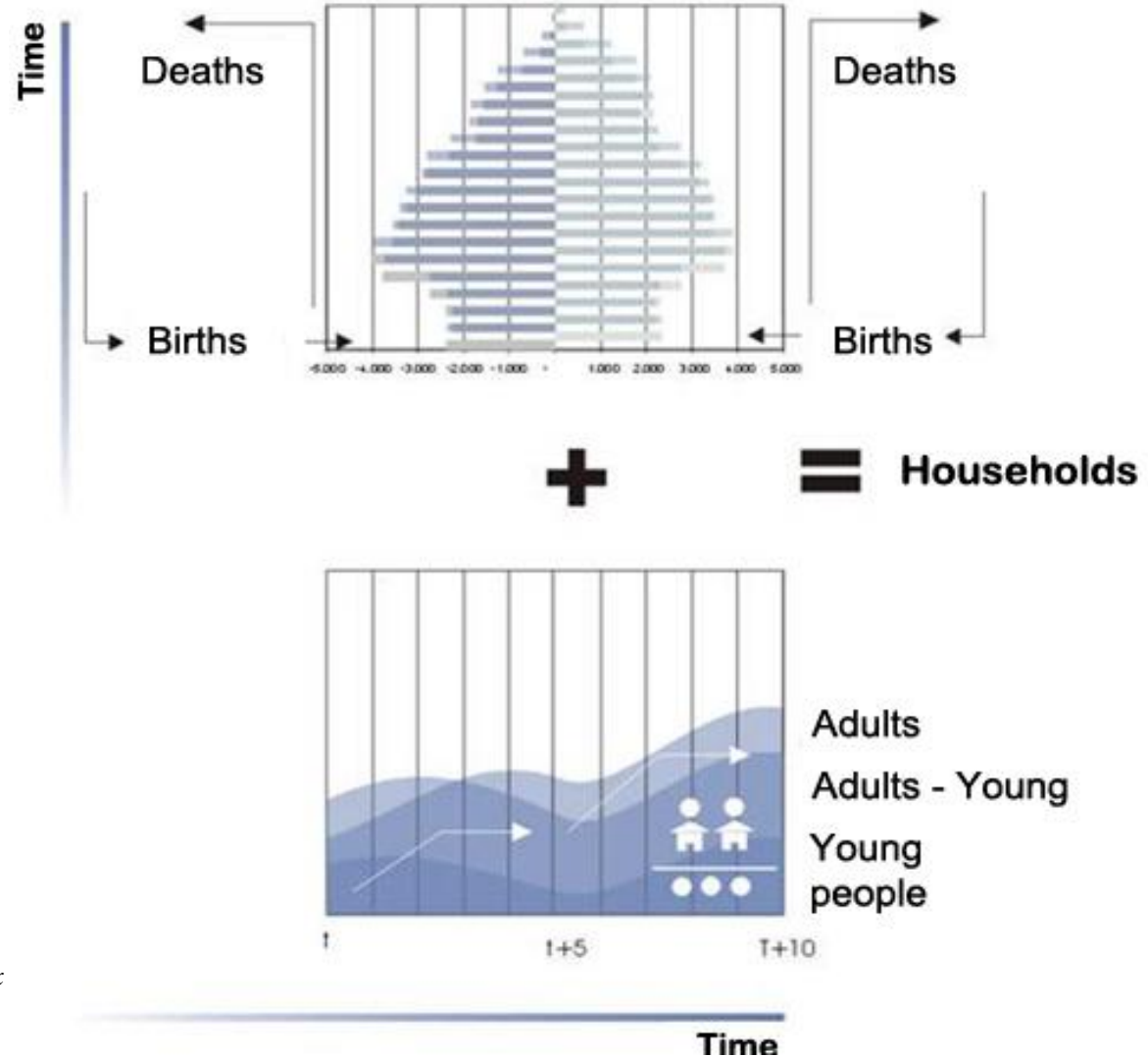
Natural movement of the population

$$Fer_{19-24_t} = \frac{Births_{19-24_t}}{Women_{18-23_{t-1}}}$$

$$Mor_{19-24_t} = \frac{Deaths_{19-24_t}}{Population_{19-24_t}}$$

Patterns of household formation

$$Hpop(nat)_{y-x} = POP(nat)_{yx} * TP_{y-x}$$



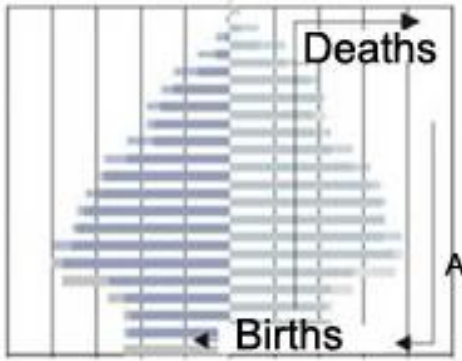
2 STRUCTURE OF THE MODEL



M2 MODEL OF MIGRATORY MOVEMENT

a

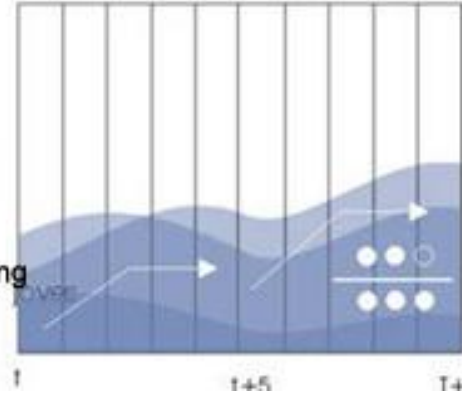
SM1 Submodel of RWP



Evolution of age structure

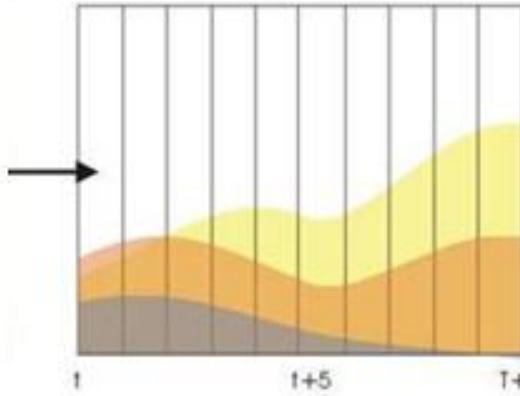
+

Adults
Adults - Young
Young people



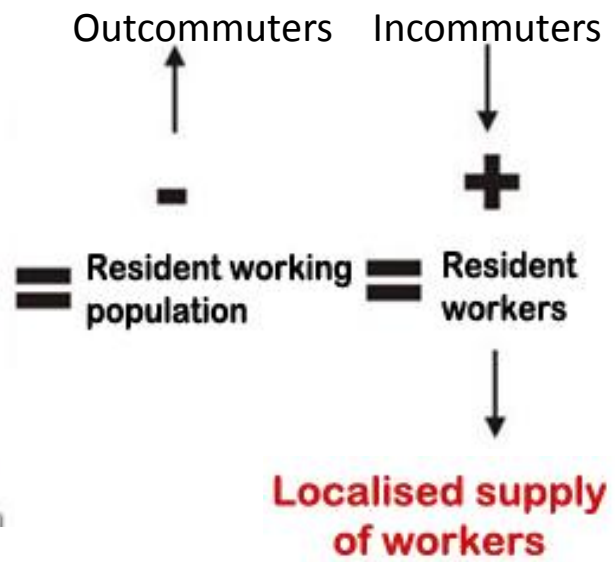
Evolution of occupation specific rates

SM2 Inputs Submodel of localised activity



Evolution of workplace creation

SM3 Inputs Submodel of mobility



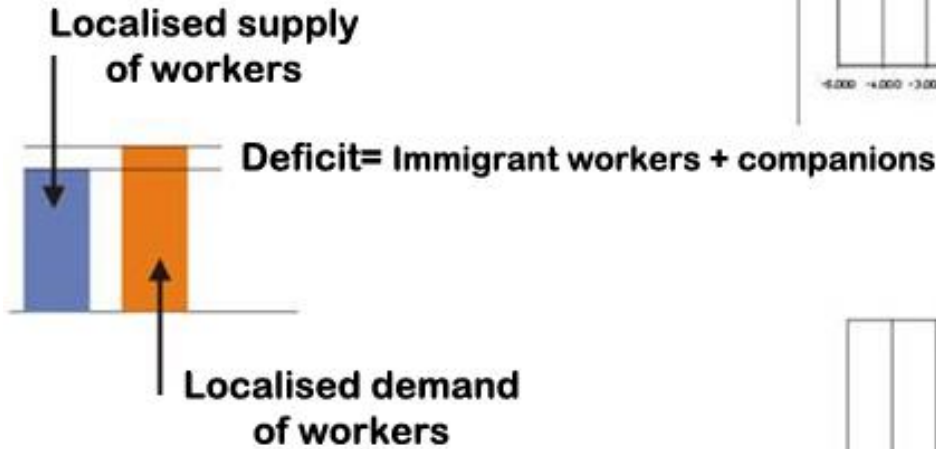
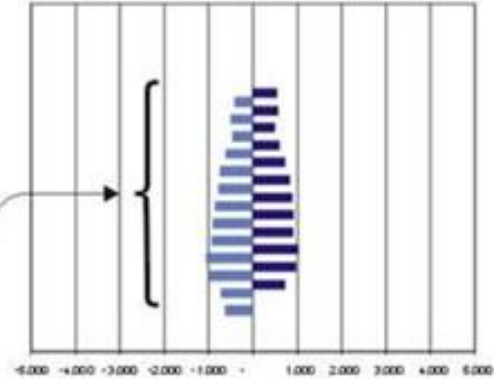
== **Localised demand of workers**

2 STRUCTURE OF THE MODEL

M2 MODEL OF MIGRATORY MOVEMENT

$$F_{ij} = RWP_i \frac{LTL_j^\alpha}{\sum_{j=1}^n \frac{LTL_j^\alpha}{d_{ij}^\beta}} \quad RWP_i = (TOE_{20-24}) * POP_{i20-24}$$

Probability of age distribution

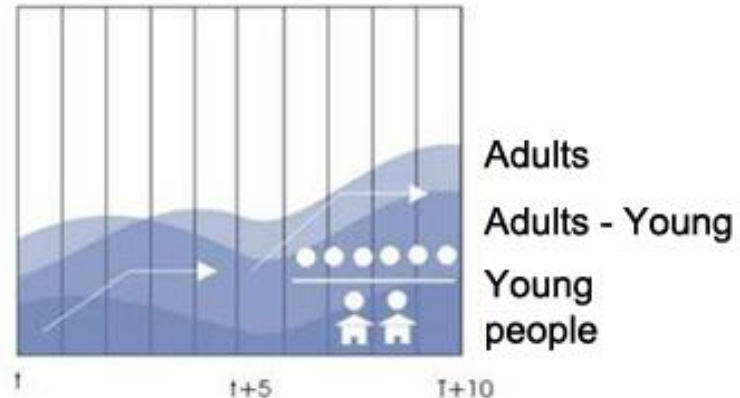


+ = Immigrants households

$$AT_i = \int_j A \cdot M_i^{k1} \cdot M_j^{k2} / d_{ij}^{r1} - \int_j B \cdot M_i^{k1} \cdot M_j^{k2} / d_{ij}^{r2}$$

$$ATP_i = AT_i - ATM \quad ATM = \int_j AT_i \cdot M_i \cdot di$$

$$\frac{dM_i}{dt} = G \cdot (AT_i - ATM) / ATM \cdot M_i$$



Specific patterns of household formation

$$Hpop(im)_{y-x} = POP(im)_{yx} * TP_{y-x}$$

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- 3. Assumptions**
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3 ASSUMPTIONS



1) Labour market assumptions:

	Time	GVA	Productivity	LTL	LTL%
Historic	1996-2001	4,34%	0,01%	606.000	4,33%
	2001-2006	3,69%	0,33%	567.300	3,34%
	2006-2009	1,28%	2,76%	- 159.500	-1,44%
Projected	2009-2014	1,25%	1,00%	44.557	0,25%
	2014-2019	2,50%	1,50%	182.223	0,99%
	2019-2024	3,50%	2,00%	288.447	1,47%

515.227 new LTL by 2024

Hypothetical scenario based on the evolution of the GVA and productivity:

- 1) GVA is ascending** corresponding to an average annual growth of 1,25% - 2,50% and 3,50%
- 2) Productivity is gradually increasing** due to the change of productive model, representing an annual growth of 1,00% - 1,50% and 2,00%

The combination of above scenario entails a LTL average annual growth of 0,25% - 0,99% and 1,47%.

3 ASSUMPTIONS



2) Occupation rates assumptions:

Occupation Global Rate (Catalonia)

	Native Global Rate	Native + immigrant Global Rate
TOE 2001	63,66%	
TOE 2009	66,48%	
TOE 2014	67,58%	67,78%
TOE 2019	68,71%	68,89%
TOE 2024	69,15%	68,94%

The progressive...

- 1) **Incorporation of women** in the workplace
- 2) **Increment of the dependency rates**
- 3) **Reduction of the unemployment rate** to a lower technical rate, around 5%
- 4) **Process of convergence with Europe** - in 2010: Germany (71,10%), Sweden (72,70%), Denmark (73,40%) and Netherlands (74,70%)

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4 RESULTS



Overall results...

1) In terms of **population evolution...**

	2001	2009	2014	2019	2024
Catalonia	6.344.191	7.475.420	7.581.452	7.781.333	8.145.566
Increment of the population (thousand of people)			2014-09	2019-14	2024-19
			106.032	199.881	364.233
Annual rate: Increment of the population			2024-2009	2024-2014	2024-2019
			0,57%	0,72%	0,92%

By 2024 there will be a increment of 670.146, representing a total population of 8 million people

4 RESULTS



Overall results...

2) In terms of **employment (labour market) evolution...**

	LTL 2009	LTL 2014	LTL 2019	LTL 2024
Catalonia	3.582.400	3.626.957	3.809.180	4.097.627
Increment (thousand of LTL)		2014-09 44.557	2019-2014 182.223	2024-2019 288.447
Annual Increment (2024-2009)				515.227
(%)				0,9%

By 2024 there will be a increment of 515.227 LTL, representing a total of 4 million LTL (localised workers) in Catalonia

4 RESULTS



Overall results...

3) In terms of principal housing needs...

Principal Housing

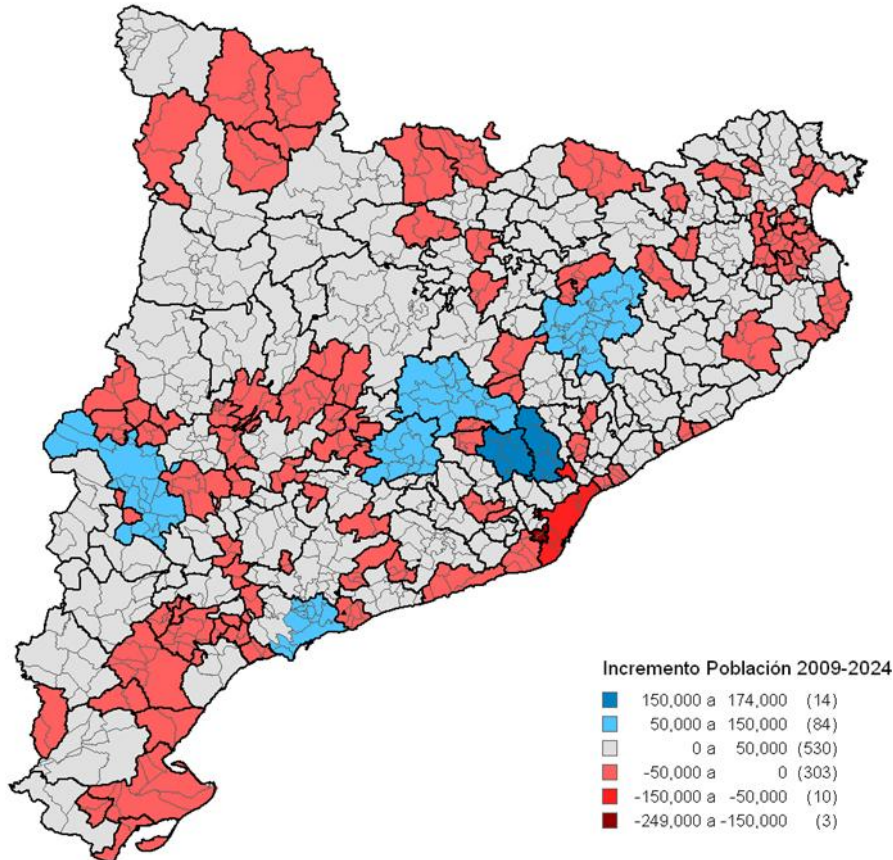
	2001	2009	2014	2019	2024
Catalonia	2.315.856	2.831.424	2.937.460	3.046.653	3.196.009
Principal Housings 2008 (Ministry of Housing)		2.830.754			
Increment of housings (accumulated)			2014-09	2019-14	2024-19
			106.036	109.193	149.356
Total of housings (2009-2024)				364.585	

If the prospects of growth maintains, by 2024 there will be a needs of principal housing of 363.585 in Catalonia

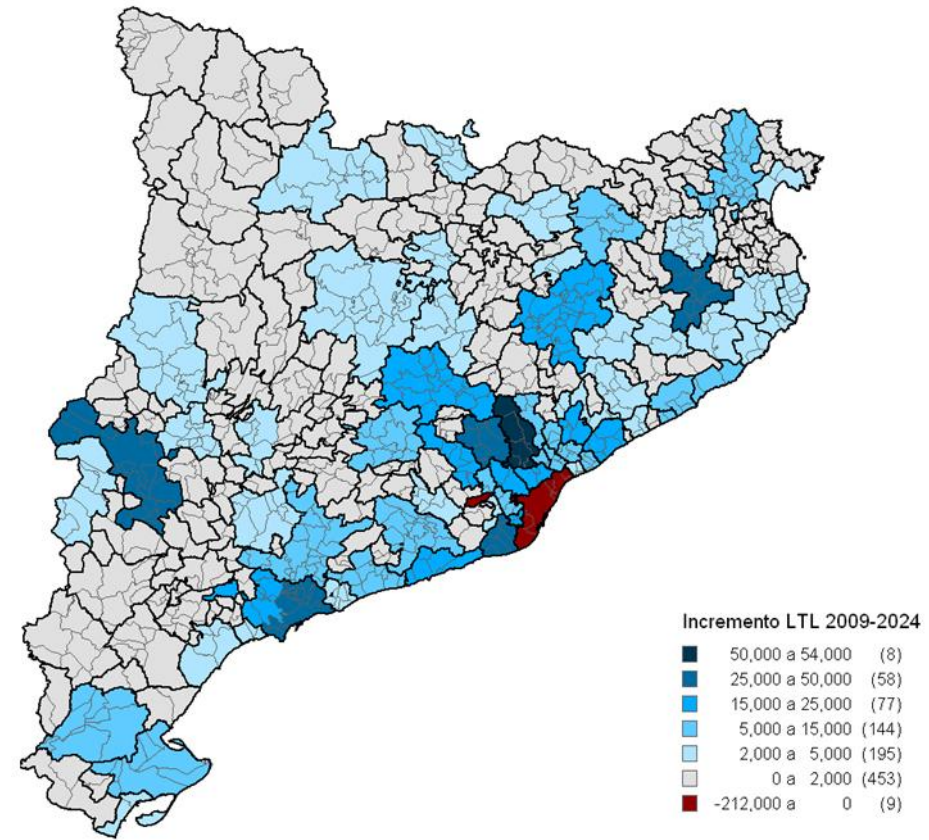
4 RESULTS

Results at territorial scale (functional systems)

R1 POPULATION EVOLUTION (2024)



R2 OCCUPATION EVOLUTION (2024)

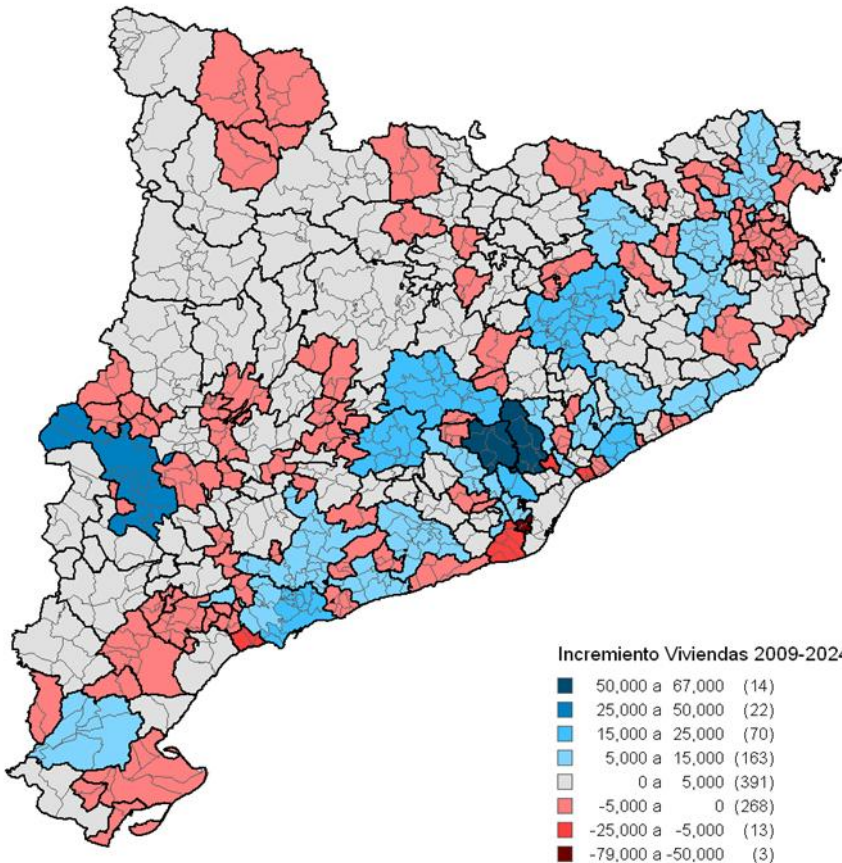


4 RESULTS

Results at territorial scale (functional systems)

R3

EVOLUTION OF PRINCIPAL HOUSEHOLD NEEDS (2024)



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