

# swiss mobility conference

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## Statistical instrumentation of the notion of 'residential cost': first lessons from the EMC<sup>2</sup> travel survey of Grenoble 2019-2020

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# Energy poverty and the notion of residential cost

## Growing concern about fuel poverty in the 2000s

- *Debates on Peak Oil (Wingert, 2005)*
- *Institutionalisation of the notion of fuel poverty in housing (Grenelle de l'environnement 2010)*

## Work on the idea of affordable housing, including housing and mobility costs:

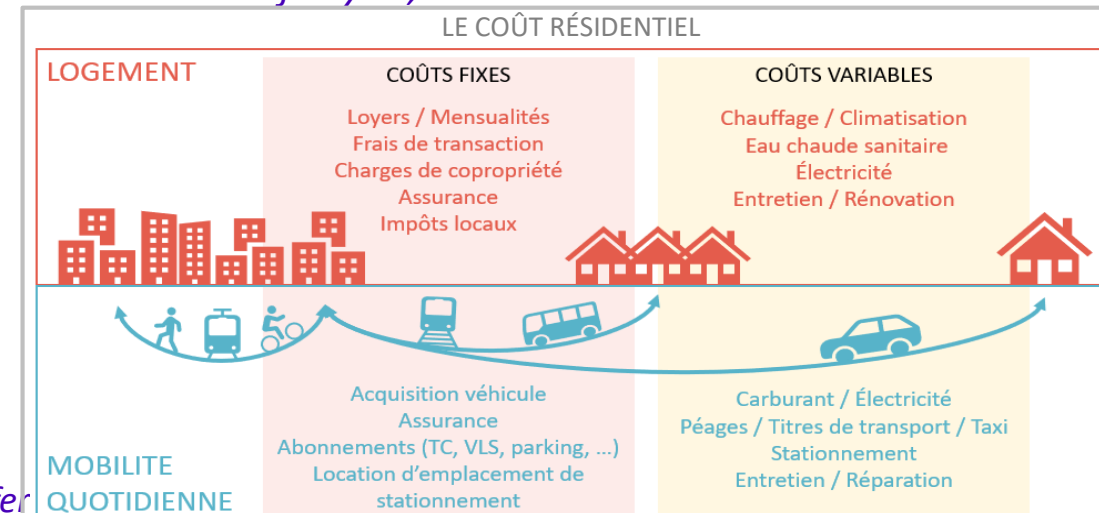
- *Housing +Transportation Affordability Index in the United States (Haas et al., 2006 ; CNT, 2012 ; Morency et al., 2022)*

## At the crossroads, numerous studies on housing + mobility energy expenditure

- *Mapping (from the work of Alterre Bourgogne, 2007, to the Géodip database of ADEME and ONPE, 2021)*
- *Proposal for 'residential cost' by Bruno Maresca (2013), from his work on energy poverty*

↳ Promote **a systemic approach** that integrates housing + mobility expenses within household lifestyles, in connection with territorial dynamics and the socio-technical system

↳ Take into account the **individual and collective scales of the issues**

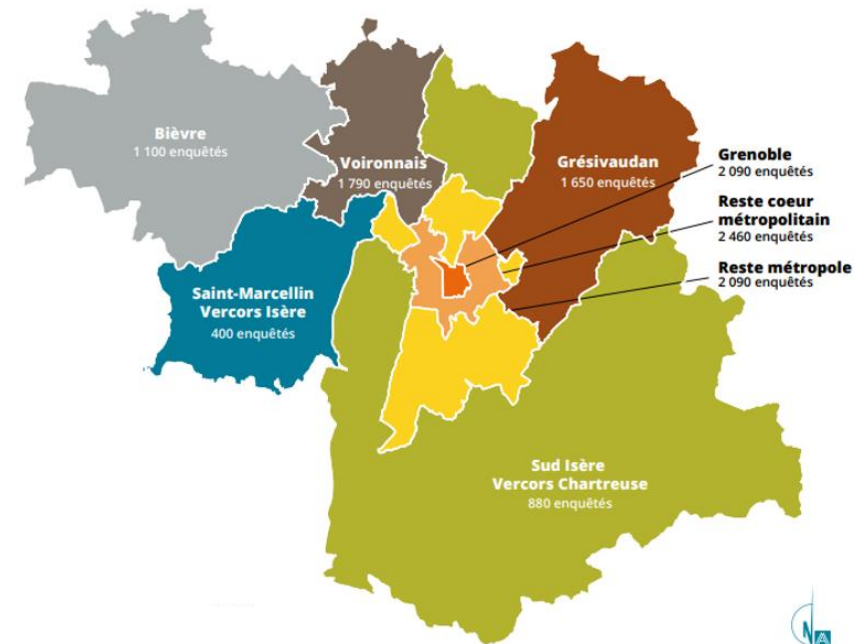


# The COUT-RES project: going beyond the statistical limits of RC

**Observation:** There is no disaggregated basis allowing joint analysis of housing expenditure, mobility expenditure and household income according to their residential location.



Hence the idea of a Residential Cost module in the French Local Travel Survey (EMC<sup>2</sup>) experimented in Grenoble 2019-2020, replicated in Clermont 2022-2023



# The COUT-RES project, an approach with two objectives

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## **Methodological objective: test and develop a CR module in the EMC<sup>2</sup> travel survey**

- Opportunity to use the Fidéli database in the Grenoble EMC<sup>2</sup> project
- Replication of the module in Clermont-Ferrand (2022-2023)

## **Analytical objective: gain a better understanding of residential costs and the issues involved**

- Measurement of residential cost and its components
- Analysis of the factors explaining variations in RC (location, income, status, etc.)
- What economic, social and environmental issues are emerging, and how are local stakeholders addressing them?

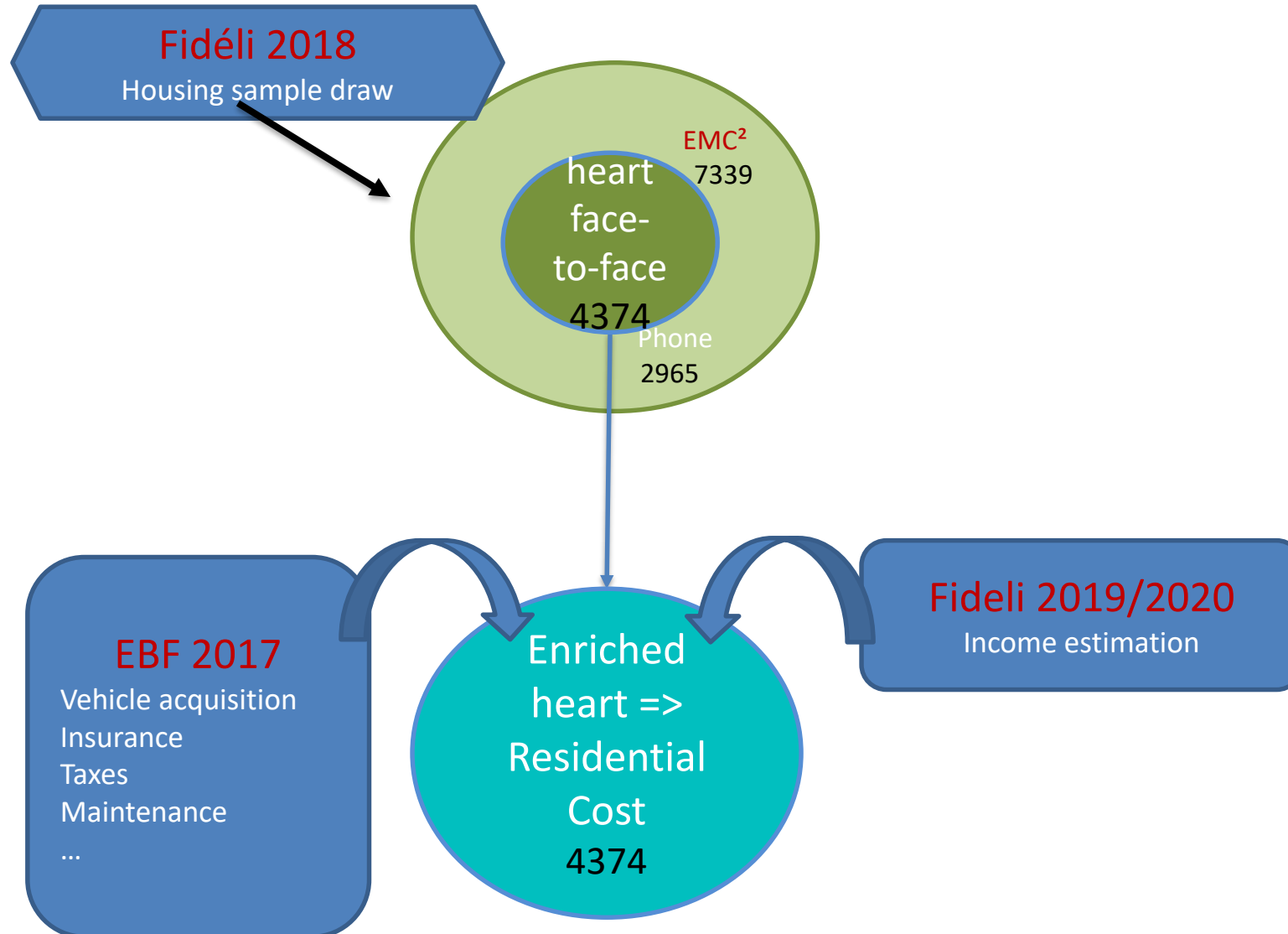
*A study financed by the Auvergne-Rhône-Alpes Region and carried out in partnership between academics (LAET, EVS and TERRITOIRES) and practitioners (CEREMA, Agence d'Urbanisme de la Région Grenobloise, Syndicat Mixte des Transports en Commun de l'Agglomération Clermontoise).*

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# Methodological lessons

## from the residential cost module of the Grenoble EMC<sup>2</sup> travel survey

# From EMC<sup>2</sup> to estimating household residential costs



# From EMC<sup>2</sup> travel survey to estimating household residential costs

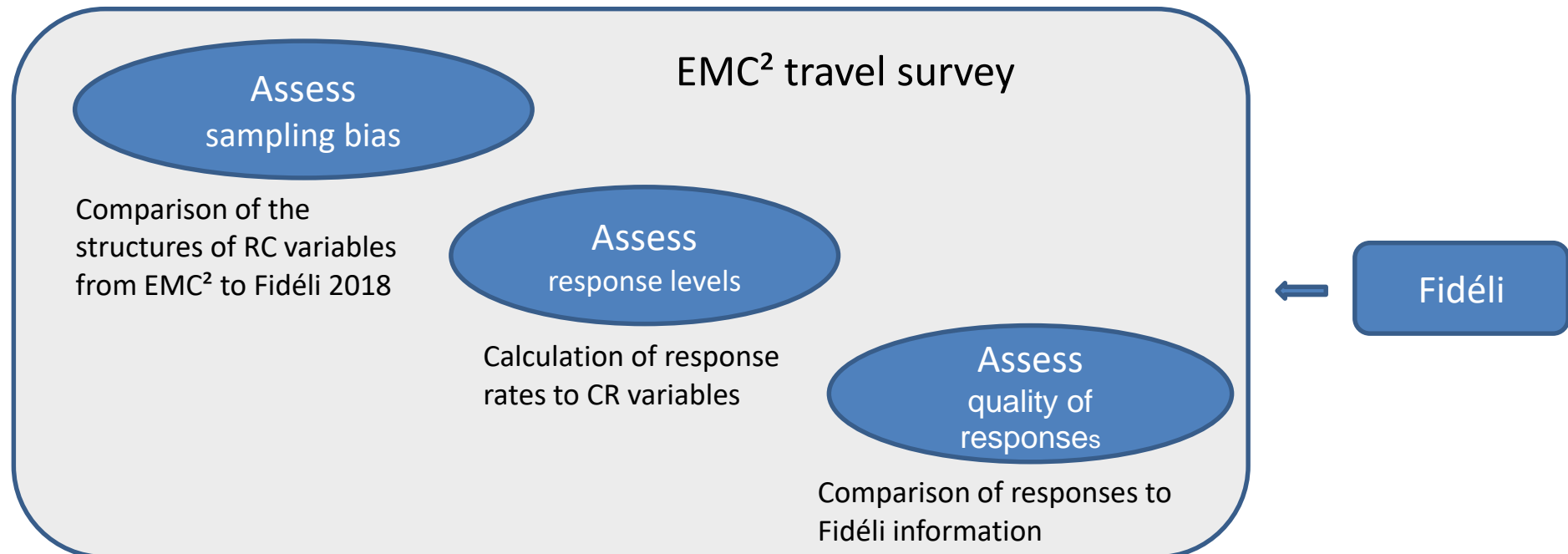
	EMC2 standard	Module CR - Grenoble	A compléter par d'autres bases <sup>1</sup>
Logement	<ul style="list-style-type: none"> <li>- Type d'habitat</li> <li>- Type d'occupation</li> </ul>	<ul style="list-style-type: none"> <li>- Loyer</li> <li>- Remboursement de prêt</li> <li>- Aides au logement</li> <li>- Surface chauffée</li> <li>- Type de chauffage</li> <li>- Énergie principale</li> <li>- Année de construction</li> </ul>	<ul style="list-style-type: none"> <li>- Coût de l'énergie (Prix)</li> <li>- Assurance</li> <li>- Taxes foncières et habitation</li> <li>- Entretien</li> <li>- Charge de copropriété</li> <li>- Autres charges (ordures, eau, assainissement)</li> </ul>
Mobilité	<ul style="list-style-type: none"> <li>- Nombre de véhicules (avec type de possession)</li> <li>- Énergie/année de mise en circulation/puissance de chaque voiture</li> <li>- Nombre de deux-roues (avec les caractéristiques de chacun)</li> <li>- Nombre de vélos à disposition</li> <li>- Stationnement</li> <li>- Possession d'abonnement TC (par personne)</li> </ul>	<ul style="list-style-type: none"> <li>- Distance parcourue</li> <li>- Consommation de carburant</li> <li>- Péages</li> <li>- Coût du stationnement nuit</li> <li>- Coût du stationnement autre</li> </ul>	<ul style="list-style-type: none"> <li>- Coût de l'acquisition des véhicules</li> <li>- Entretien et réparation</li> <li>- Assurance</li> <li>- Prix des abonnements TC</li> <li>- Dépenses ponctuelles (train, avion, taxi, ...)</li> <li>- Autres charges (Vignettes, amendes ...)</li> </ul>
Autre		Ressources mensuelles	

# Methodological lessons from EMC<sup>2</sup> Grenoble

## Advantages of the Fidéli database as a drawing base

### Access to the database and matching Fidéli / EMC<sup>2</sup> travel survey

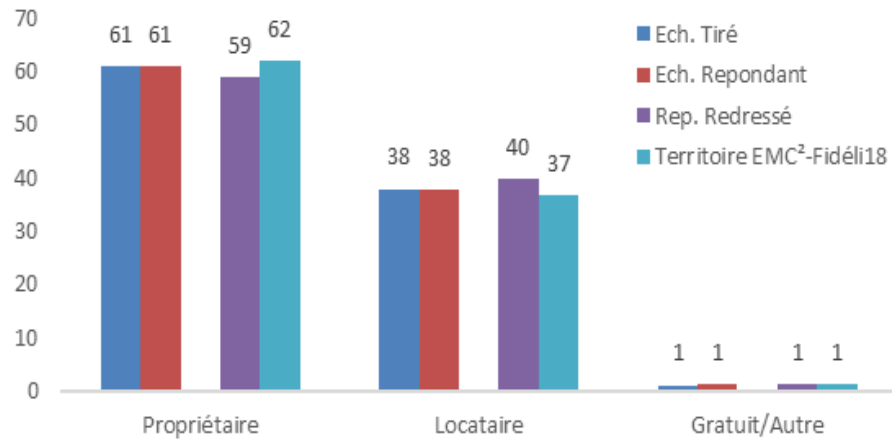
- Possibility of using information from the tax authorities
- A database with better knowledge of the housing stock
- Assessing the reliability of responses to the EMC<sup>2</sup> survey



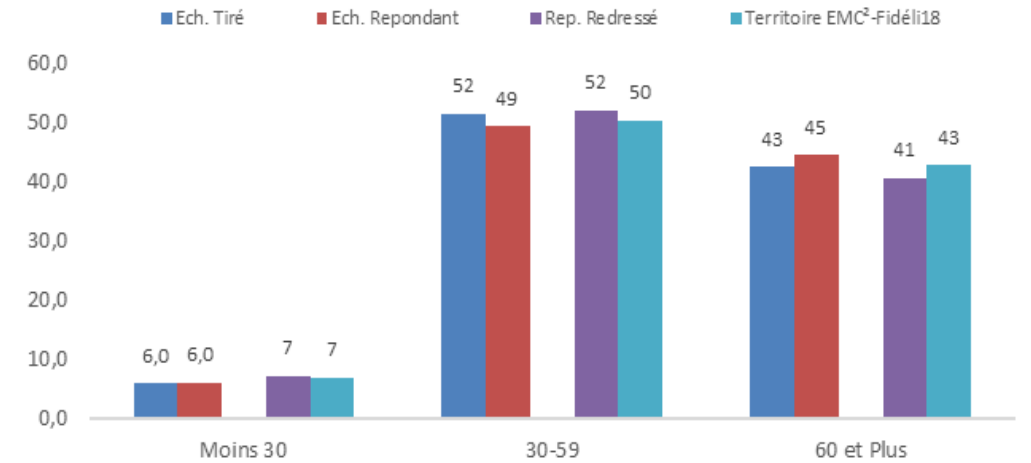


# A limited sampling bias

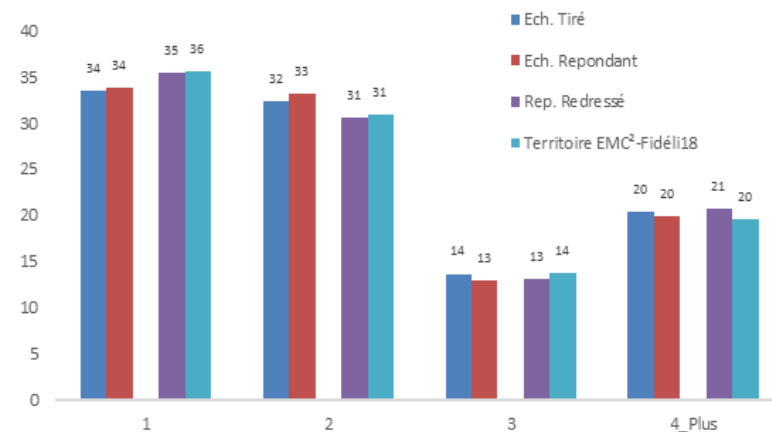
## Type of tenancy



## Age of the reference person



## Household size



# Households that respond well to the questions in the module

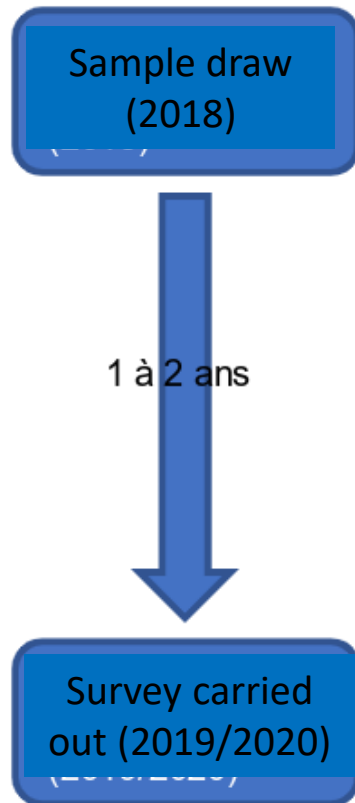
Response rate:

	Total FAF	Potentiellement concernés	Nombre de répondants	Non renseignées (Pas concernés)	Réponses Oui	Refus	Ne sait pas	% Oui
Ressources	4 374	4 374	4 374	0	3 098	1 099	177	71%
Loyer	4 374	1 619	1 619	0	1 495	0	124	92%
<u>Remb. Prêt</u>	4 374	185	185	0	169	0	16	91%
Aide Log.	4 374	1 619	385	1 234	370	0	15	96%
Surface <u>Chauf.</u>	4 374	4 374	4 374	0	4 273	0	101	98%
Type chauffage	4 374	4 374	4 374	0	4 361	0	13	99%
<u>Energie princ.</u>	4 374	4 374	4 199	175	4 131	0	68	94%
Année <u>Const.</u>	4 374	4 374	4 374	0	3 832	0	542	88%
Péage	4 374	3 557	3 557	0	3 429	0	128	96%
Station. Nuit	4 374	151	151	0	140	0	11	93%
Autre Station.	4 374	3 557	3 557	0	3 442	0	115	97%
Carburant	4 374	3 557	3 542	15	3 292	0	250	93%
Kilométrage	4 374	3 557	3 557	0	3 378	0	179	95%

# Assessing the quality of responses: Need to match EMC<sup>2</sup> and Fidéli 2019/20

Between 2018 and 2019/20 households may have:

- Changed in structure (births, deaths, separation, reunification)
- Changed their SOC (taking or losing a job, changes in income)
- Moved house
- Carried out work on their home
- ...



ECH001	EMC <sup>2</sup> 2019/20	Fideli - 2018
Nb personnes	1	3
Nb enfants < 18 ans	0	2
Ages (2020)	65	39/7/9
Type de logement	Collectif	Collectif
Mode d'occupation	Locataire	Locataire
Année construction	Avant 1949	1909
Surface <u>chauf.</u> /Surface	84	96
Tranche de revenu	Refus	3700 à 5000 €

ECH002	EMC <sup>2</sup> 2019/20	Fideli - 2018
Nb personnes	2	3
Nb enfants < 18 ans	0	0
Ages (2020)	52/50	52/51/26
Type de logement	Collectif	Collectif
Mode d'occupation	Propriétaire	Propriétaire
Année construction	Avant 1949	1948
Surface <u>chauf.</u> /Surface	198	200
Tranche de revenu	Plus de 8000 €	Plus de 8000 €

## Quality of responses: a relatively good correspondence between EMC<sup>2</sup> and Fidéli

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**Test:** percentage of “good matches” between two qualitative variables (score)

	Housing type	Tenancy type	Construction period	Age of the person of reference	Gender of the person of reference	Nb of employees /household	Household size
Score (%)	93.6	89.7	<b>62.9</b>	71.2	84	<b>65.8</b>	<b>65.9</b>

- The **scores are correct** for variables that are unambiguous and easily known (type of dwelling, tenure)
- **Scores are lower** for variables with different definitions between databases, or containing information that households are unfamiliar with, or likely to change easily over time

# The specific case of income

=> An essential question for analysing **social issues** and for determining the CR

=> A question that is traditionally **less frequently answered**, and whose reliability is unknown

## Question asked in the survey:

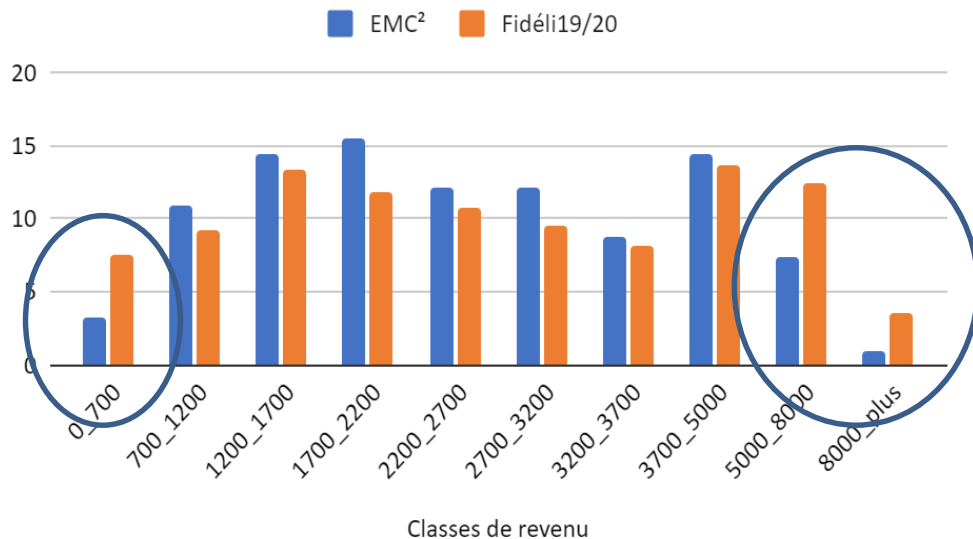
***Pouvez-vous m'indiquer dans quelle tranche se situe les ressources mensuelles de votre ménage (salaires et traitements de tous les membres du ménage, allocations sociales et Familiales, pensions, retraites, etc...)?***

*Can you tell me which band your household's monthly income falls into (wages and salaries of all household members, social and family benefits, pensions, etc.)?*

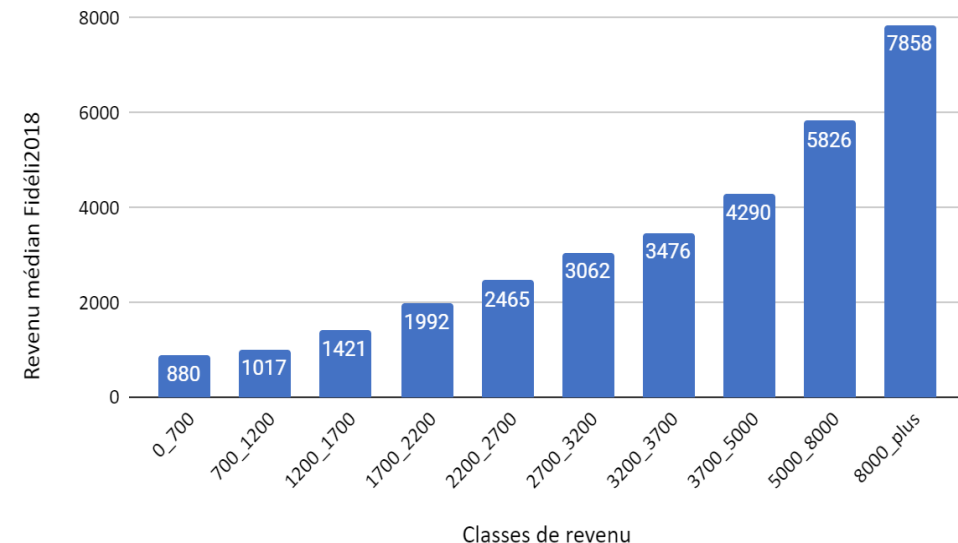
Response rate (70%)

## Comparison with Fidéli: errors mainly at the two ends of the classes

Distribution des revenus



Médiane Fidéli2018 par rapport aux classes EMC²



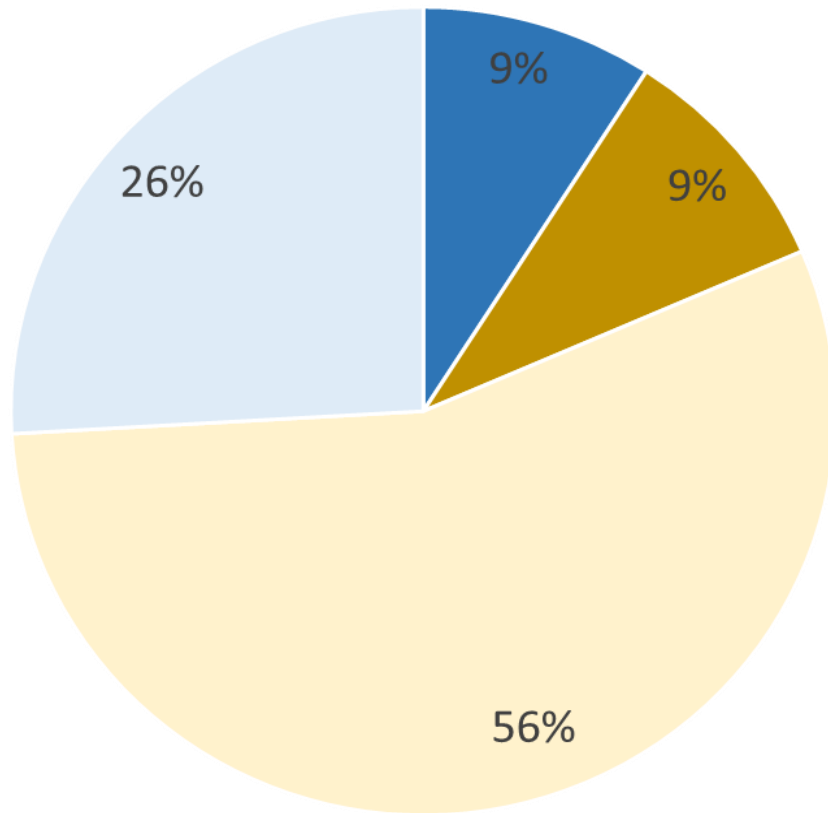
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## **First results:**

### **Household residential costs and energy expenditure**

# Grenoble average residential costs : €1,209/month/household

Items for the monthly residential cost of a Grenoble household



**RC = €1,209/month/household**

**Housing = 2/3**

**Transport = 1/3**

**Energy = 18%**

**Equal parts for mobility and housing**

■ Energie Mob ■ Energie log ■ Logement ■ Mobilité

*From 2019-20 Grenoble EMC<sup>2</sup> RC module*

# Grenoble average residential costs : €1,209/month/household

## For further analysis after these first figures

- Taking the composition of the household into account:

$$\Rightarrow RC/\text{consumption units} = RC/CU$$

- Taking household resources into account:

$$\Rightarrow \text{Cost effort ratio} = (RC/\text{Resources})$$

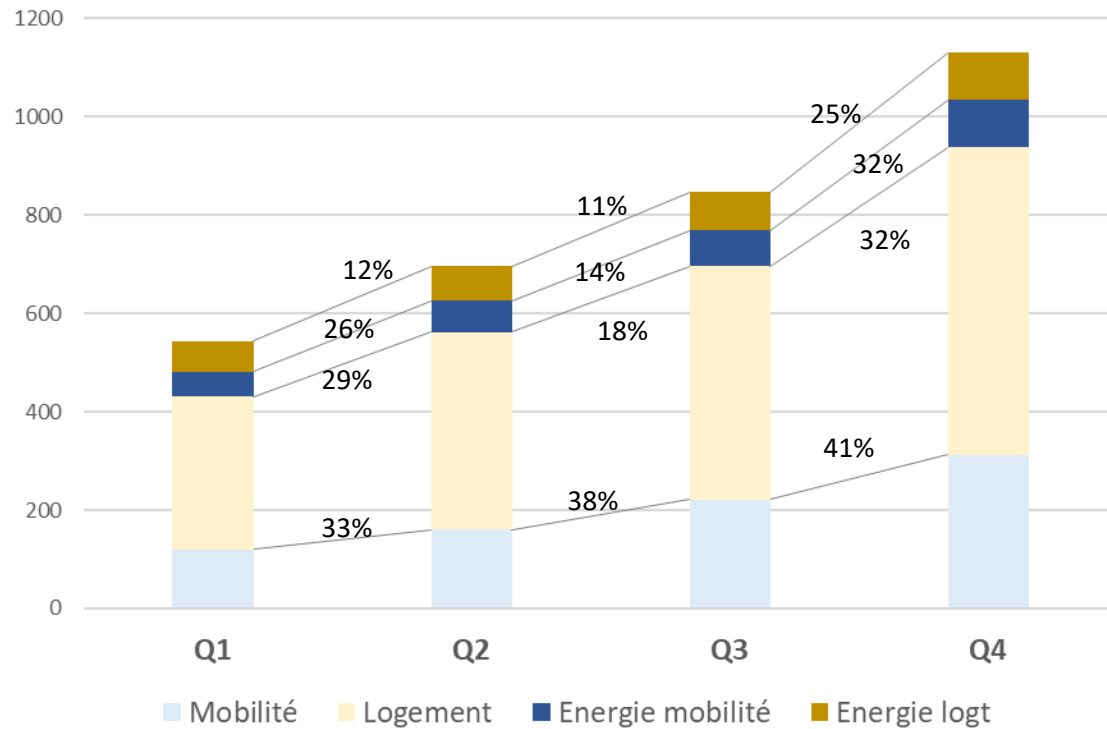
$$\Rightarrow \text{Remaining expenditure} = (\text{Resources} - RC)/CU$$

⇒ In the remainder of this presentation, we use monthly RC per CU and monthly remaining expenditure per CU.



# Residential cost, resources and location

## Residential cost/UC by income quartile

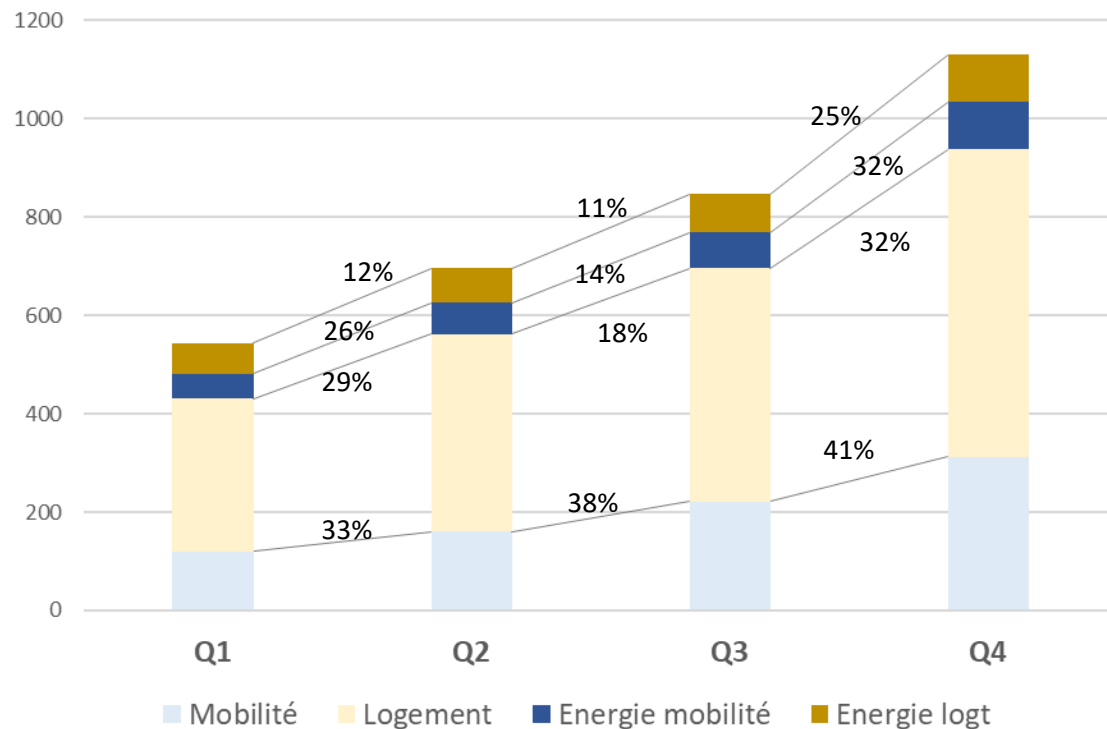


A partir du module CR de l'EMC<sup>2</sup> Grenoble 2019-20

1) First of all, an income effect

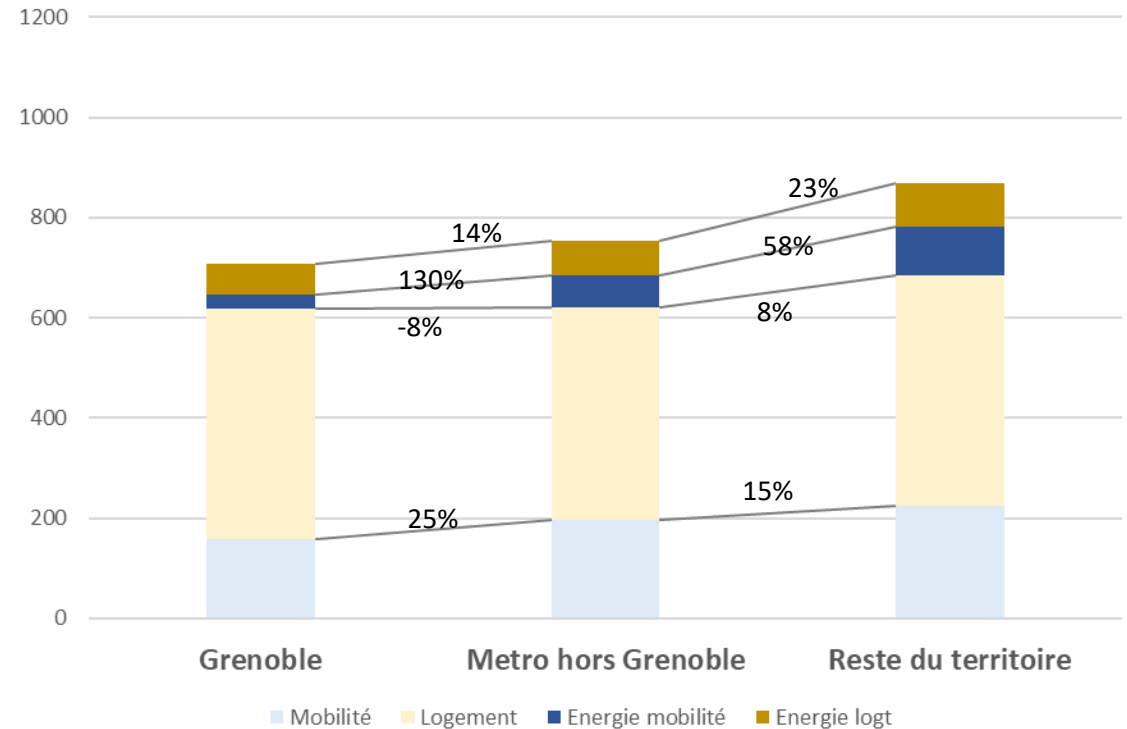
# Residential cost, resources and location

## Residential cost/UC by income quartile



A partir du module CR de l'EMC<sup>2</sup> Grenoble 2019-20

## Residential cost/UC by location



A partir du module CR de l'EMC<sup>2</sup> Grenoble 2019-20

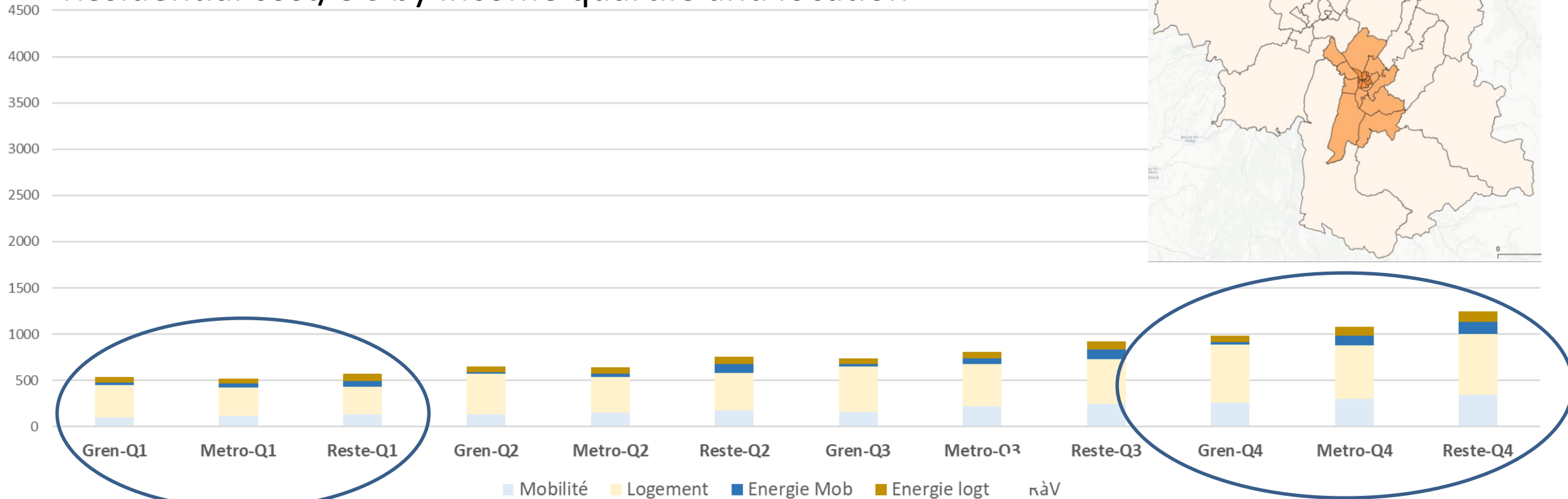
1) First of all, an income effect

2) Location: an economic impact on mobility

=> car ownership rate, and fuel cost

# Residential cost, resources and location

Residential cost/UC by income quartile and location



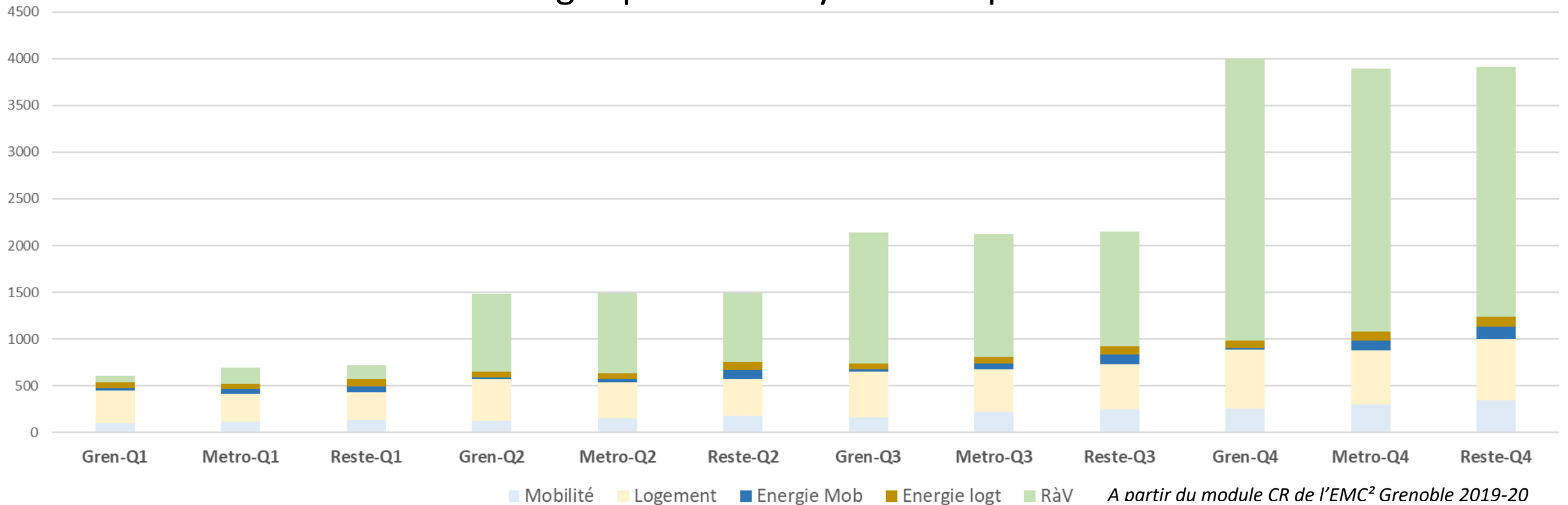
## Location impact:

- 1) First quartile: firstly on the energy item
- 2) Last quartile: impact on all items

A partir du module CR de l'EMC<sup>2</sup> Grenoble 2019-20

# Economic pressure from CR varies greatly according to income level

## Residential cost and remaining expenditure by income quartile and location



**1) From a social point of view, the CR issue concerns the first income deciles**

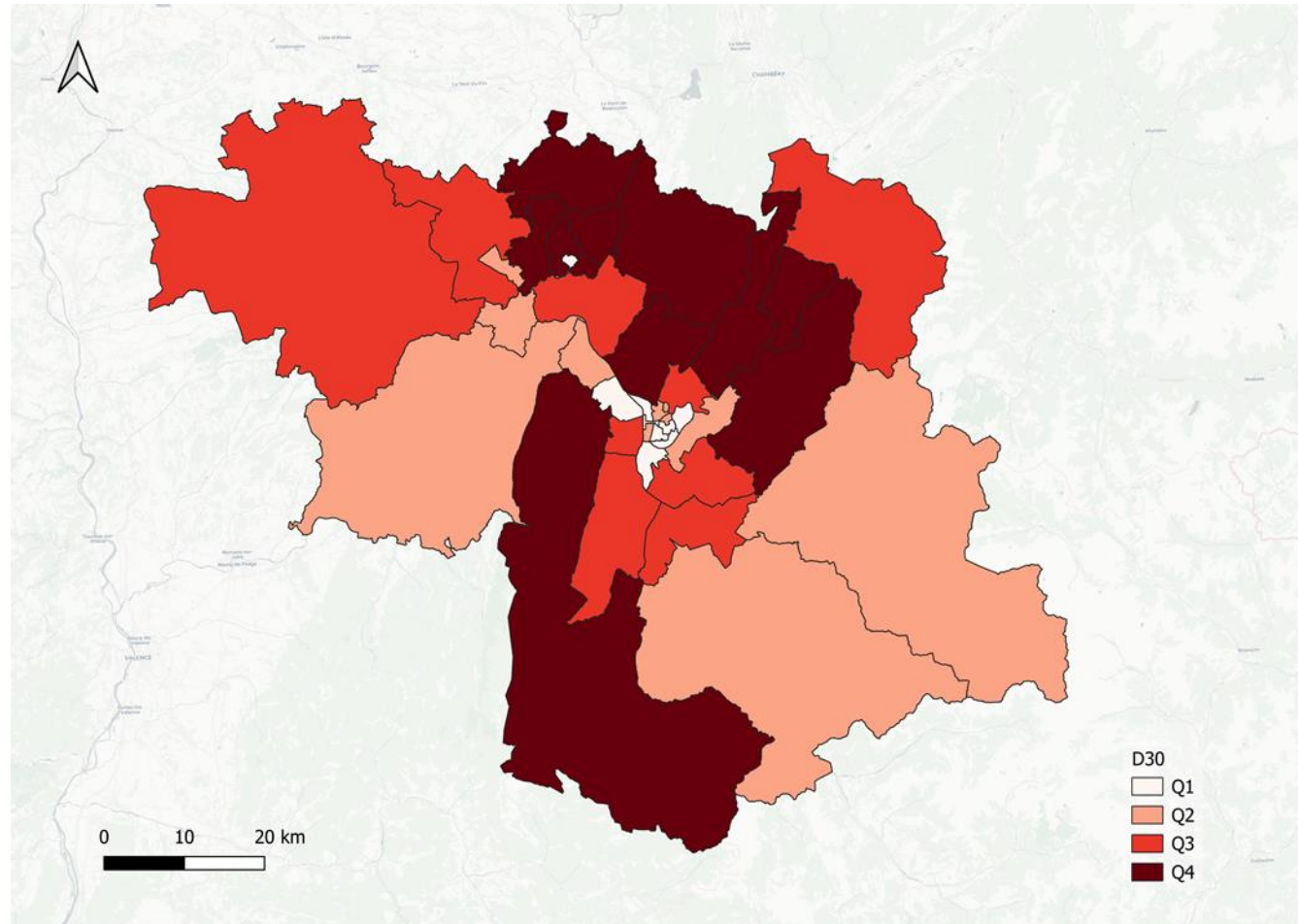
**2) Weight of energy costs for the first income quartile, particularly in the periphery**

=> energy item higher than the RExp in the center, = 90% of the RExp in the periphery ie RExp of Q1 dependent on a volatile item

**3) The need for further analysis to identify constraining factors**

=> household composition, age of reference person, household member activity,...

# Mapping RC issues

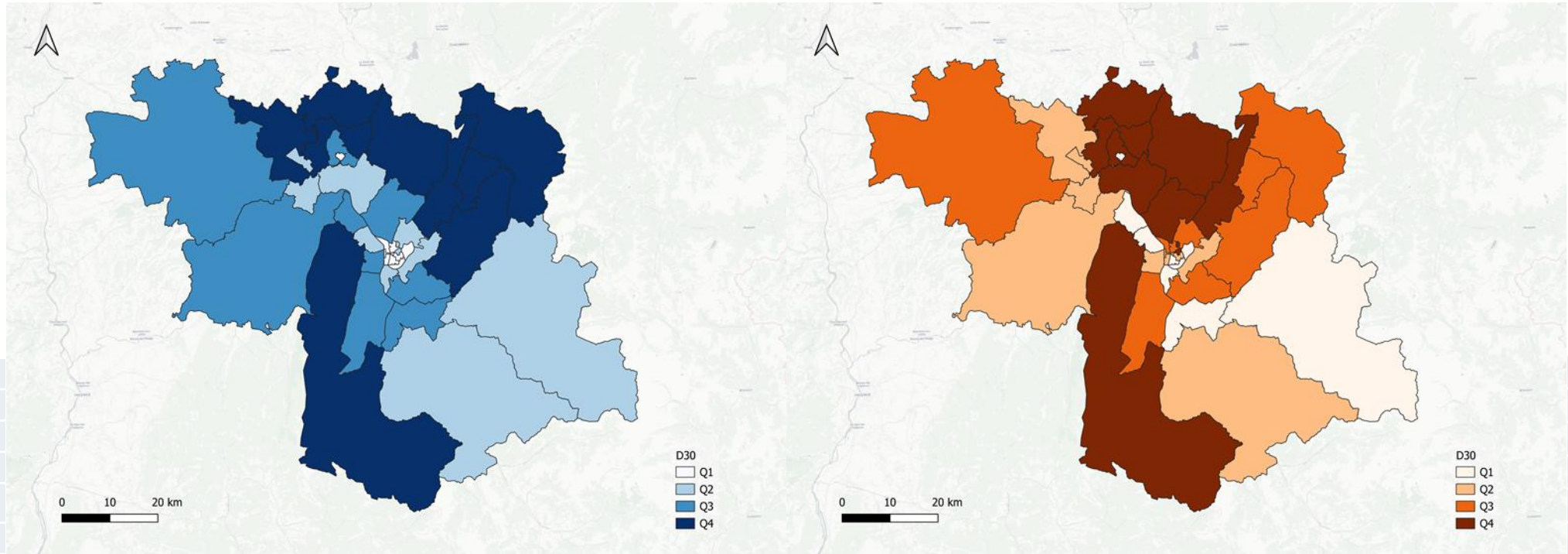


Areas	RC/CU
Q1	665
Q2	765
Q3	853
Q4	936
Average	805

Quartile of D30 zones according to average CR/UC per zone - calculations based on the RC module of Grenoble 2019-20 EMC<sup>2</sup>

# Mapping RC issues

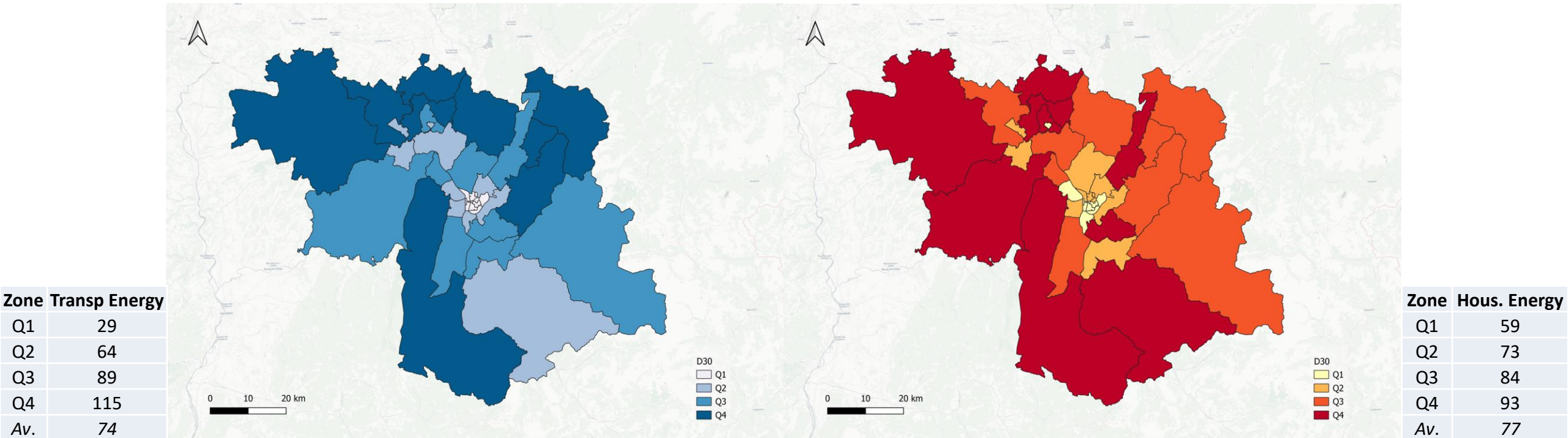
## Transport and housing costs (including energy) by area of location



Quartile of D30 zones according to average expenditure per CU per area for transport (blue) and housing (orange), excluding energy, Calculations based on the RC module of the Grenoble 2019-20 EMC<sup>2</sup>.

# Mapping RC issues

## Energy expenditure on transport and housing by zone of residence

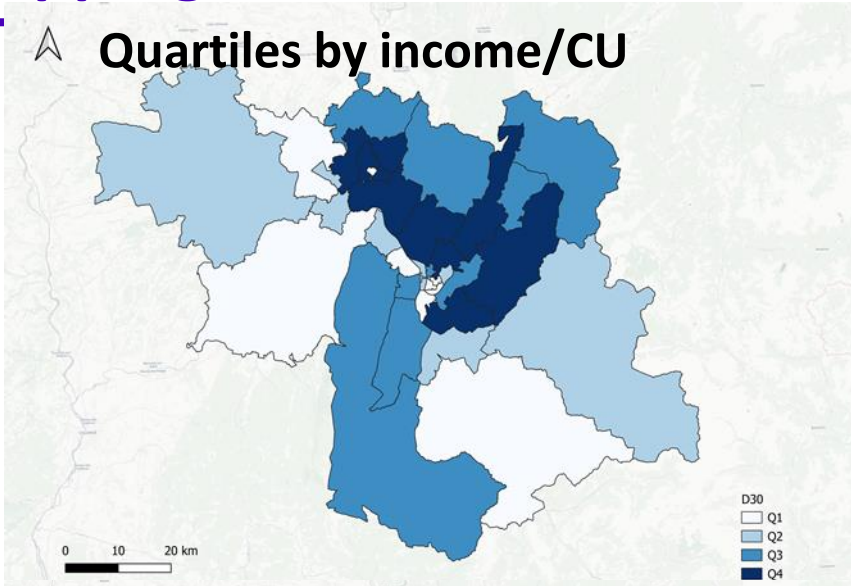


*Quartile of D30 zones according to energy average expenditure per CU per zone related to transport (blue) and housing (orange) Calculations based on the RC module of the Grenoble 2019-20 EMC<sup>2</sup>*

# Mapping RC issues

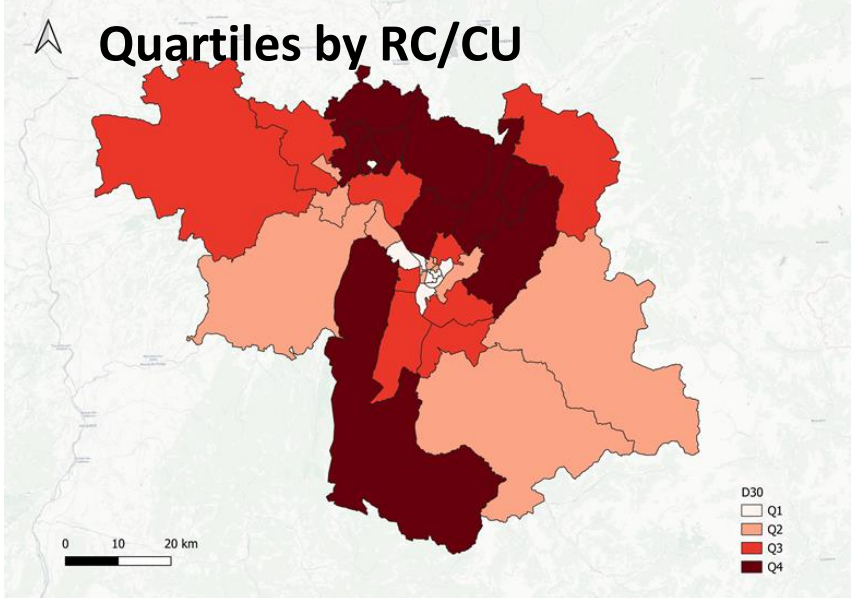
Quartiles by income/UC

Zone	Inc/CU
Q1	1649
Q2	1899
Q3	2082
Q4	2419
Average	2012



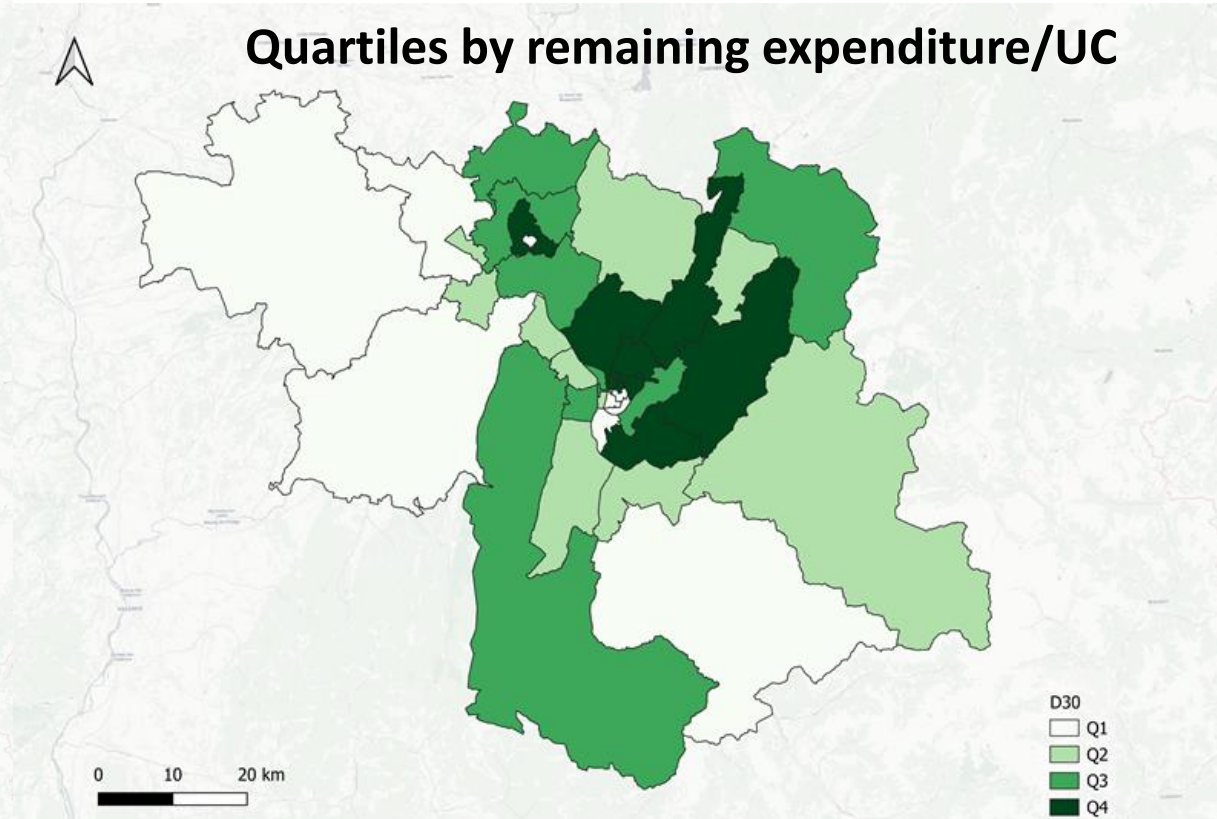
Quartiles by RC/UC

Zone	RC/CI
Q1	665
Q2	765
Q3	853
Q4	936
Average	805



Quartiles by remaining expenditure/UC

Zone	REx/CU
Q1	932
Q2	1101
Q3	1265
Q4	1533
Average	1208



Quartiles of D30 zones according to average income/UC (red), RC/UC (blue) and remaining expenditure/UC (green) - Calculations based on the RC module of the EMC<sup>2</sup> Grenoble 2019-20Q EMC<sup>2</sup>



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# Conclusion

# Conclusion

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- **The need to combine housing and mobility** to take proper account of the social and environmental challenges posed by spatial dynamics
- **The experimental RC module of the EMC<sup>2</sup>** appears to be an effective tool for taking these issues into account
- **First results :**
  - ⇒ **The RC is extremely restrictive for the most modest households** (measured in terms of income/UC)
  - ⇒ **For these modest household, the energy item is crucial** (equivalent or bigger than the remaining expenditure) => risk of adaptation by privation: on other items, on heating, until transport exclusion
  - ⇒ Spatial analysis are becoming accurate when made by areas (and not only by distance from the CBD)
  - ⇒ Interest to deepen the **Grenoble 2019-20 database analysis**, which will allow a proper comparison with results of the RC module of the **Clermont-Ferrand 2022-23 EMC<sup>2</sup>**

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# Thank you for your attention



*AURA Region support*

