MOBIL-TUM

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From Individual to Collective Costs of Urban Mobility

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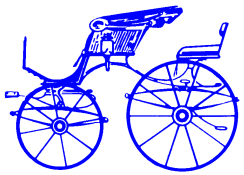

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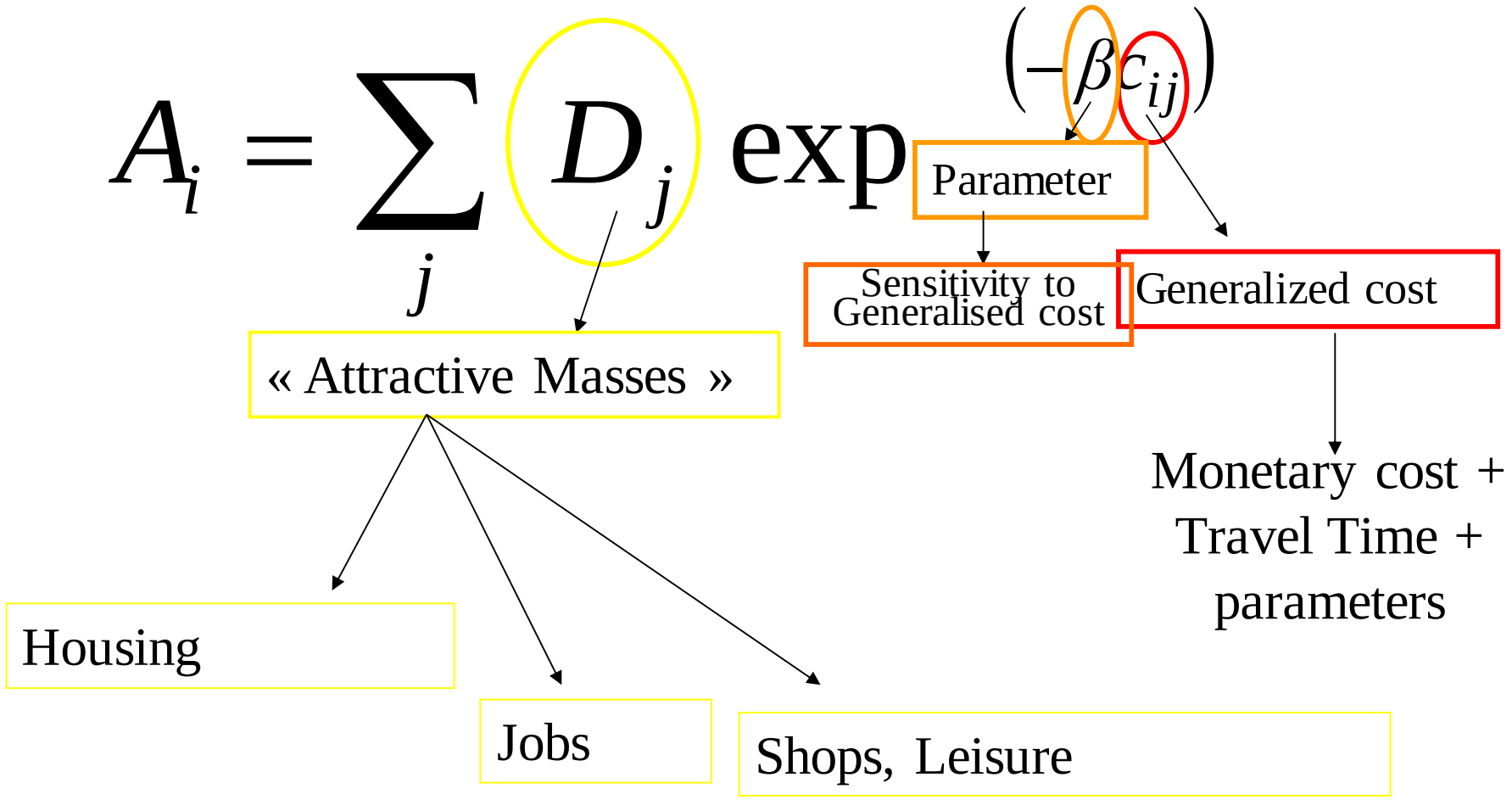
Economic theory of urban accessibility

Hansen 1959, Koenig 1974



Energy and Equity (Ivan Illich and J.P. Dupuy 1973)

- The more you increase speed, the more you reduce equity
- From the generalized cost to the generalized speed or « effective speed »
- Ef. Speed = 1 / [(1/S) + (k/w)]

« Effective Speed » and « Social Effective Speed »

- Average speed = harmonic average
  $n/ [(1/V_1)+(1/V_2)]$
- Effective speed of bike
- 1/ [(1/V)+(k/W)]
- 1/ [(1/14)+ (0.001/8) = 13.9 km/h
- Supersonic effective speed
- 1/ [(1/2000)+ (1/6)] = 6km/h… not sustainable

- High speed rail (HSR) effective speed

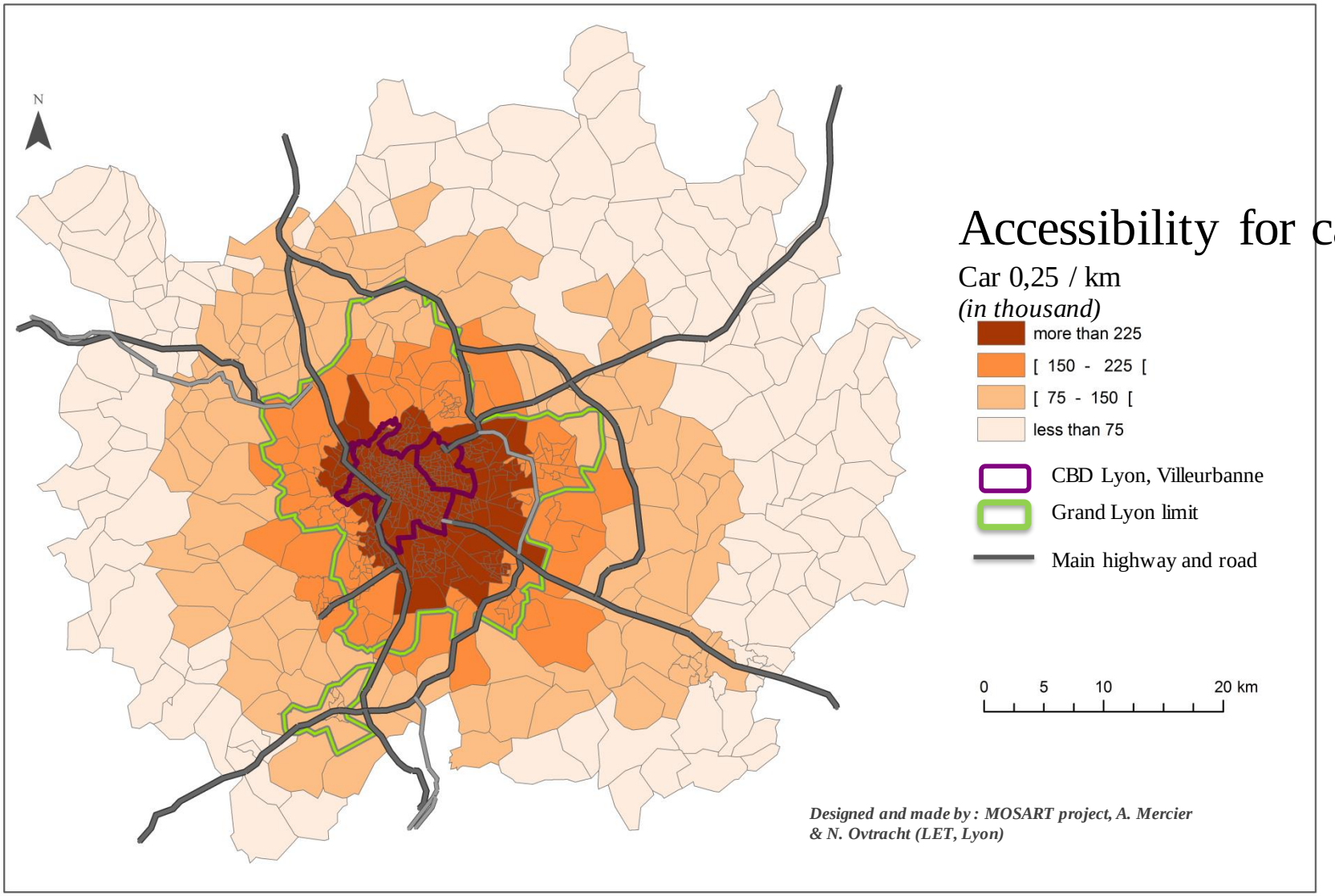
1/ [(1/200)+ (0.15/8)] = 40km/h

- Heavily Subsidized HSR social effective speed
- 1/ [(1/200)+ (0.5/8)] = 14.8km/h
- Regional train
- 1/ [(1/100)+ (0.30/8)] = 21km/h

Social effective speed in Lyon urban area

- Car effective speed = 1/ [(1/V)+(k/W)]
- 1/ [(1/20)+ (0,25/10) = 13,3 km/h
- PT effective speed = 1/ [(1/V)+(k/W)]
- 1/ [(1/15)+ (0,10/10) = 13,1 km/h

- Car “social effective speed” = 1/ [(1/V)+(Ks/W)]
- 1/ [(1/20)+ (0,50/10) = 10km/h
- PT “social effective speed” = 1/ [(1/V)+(Ks/W)]
- 1/ [(1/15)+ (0,30/10) = 10,3 km/h


N
Accessibility for car
Car 0,25 / km
(in thousand)
more than 225
[150 - 225 [
[75 - 150 [
less than 75
CBD Lyon, Villeurbanne
Grand Lyon limit
Main highway and road
0
5
10
20 km
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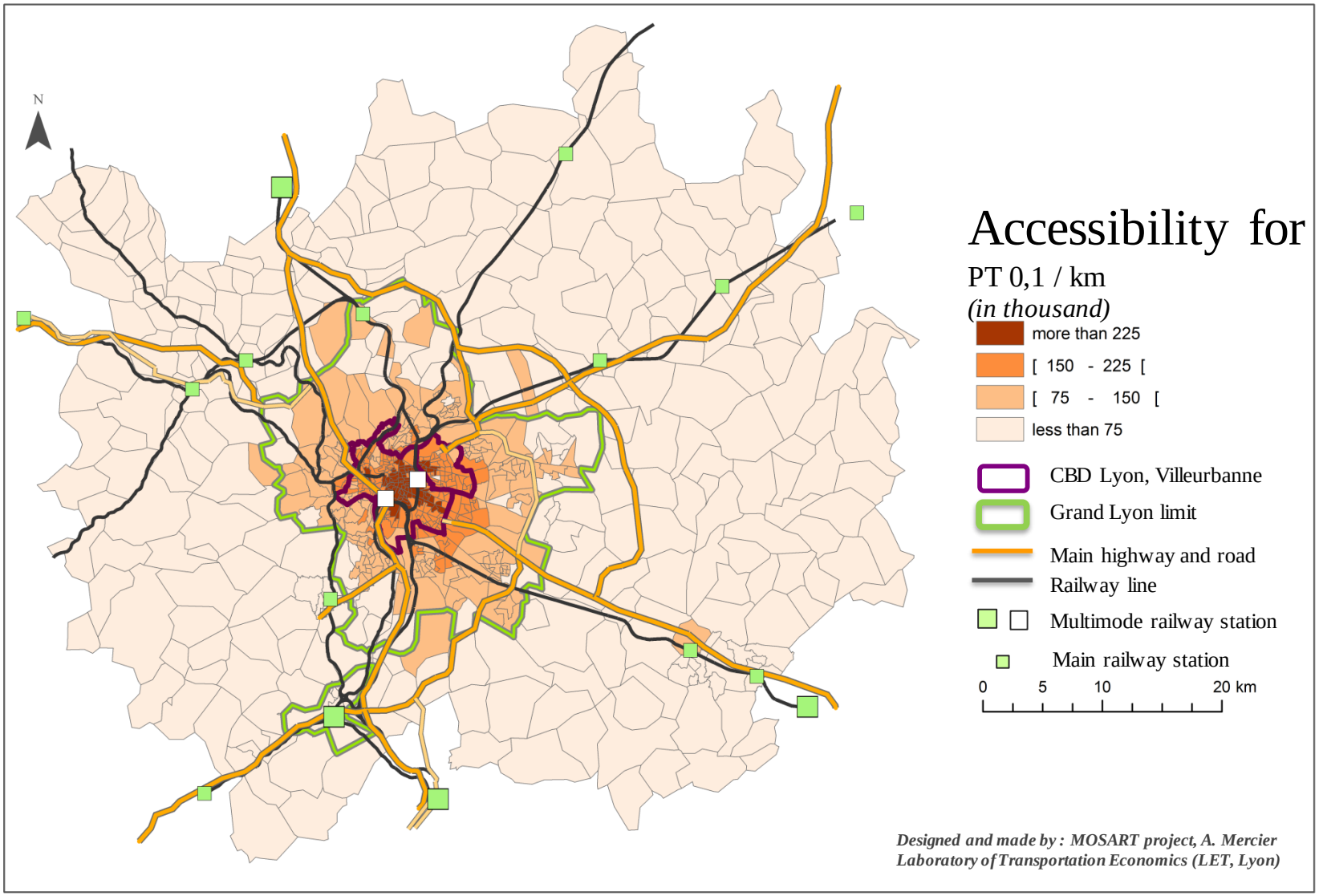
N
Accessibility for PT
PT 0,1 / km
(in thousand)
more than 225
[150 - 225 [
[75 - 150 [
less than 75
CBD Lyon, Villeurbanne
Grand Lyon limit
Main highway and road
Railway line
Multimode railway station
Main railway station
0 5 10 20 km
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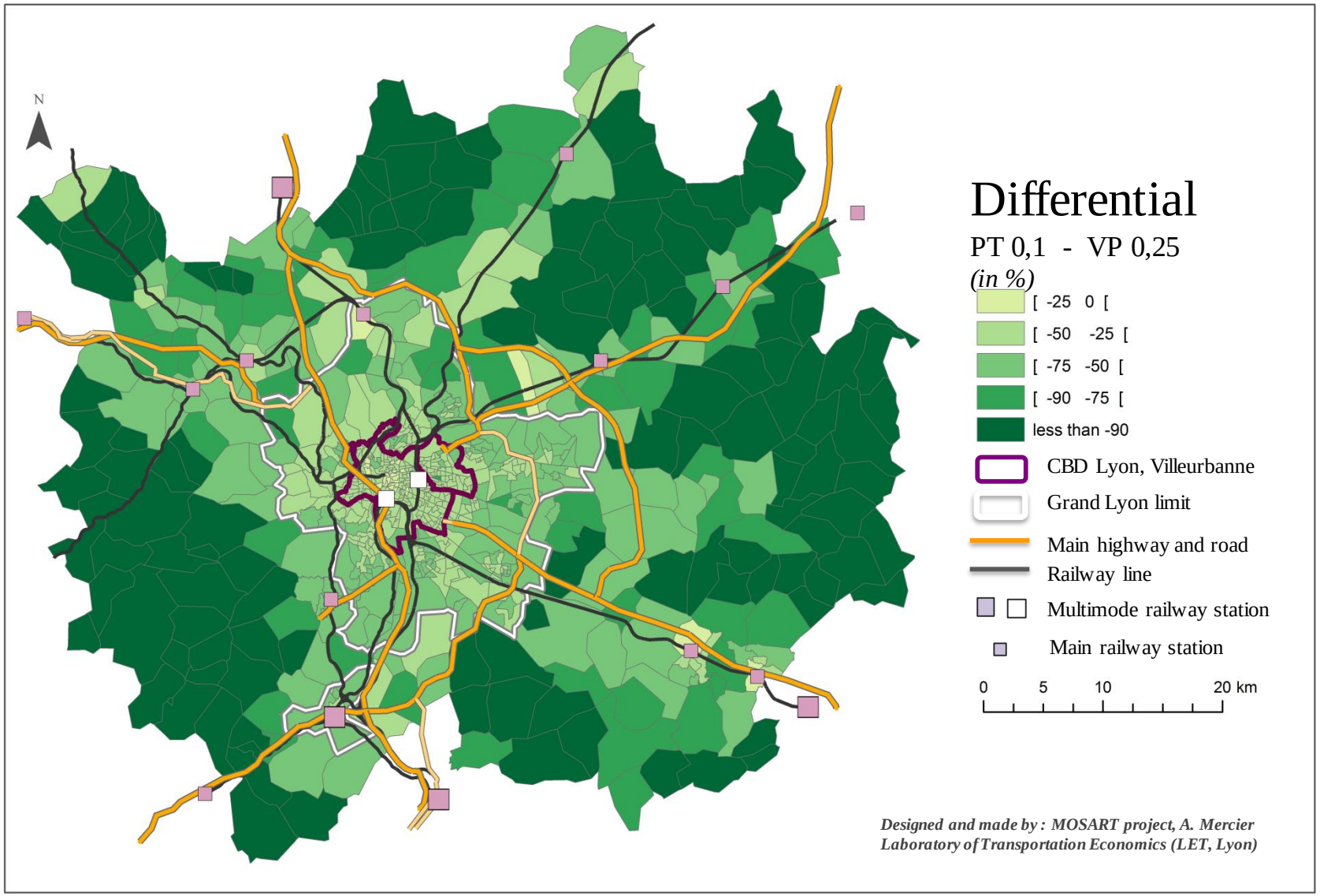
N
Differential
PT 0,1 - VP 0,25
(in %)
[-25 0 [
[-50 -25 [
[-75 -50 [
[-90 -75 [
less than -90
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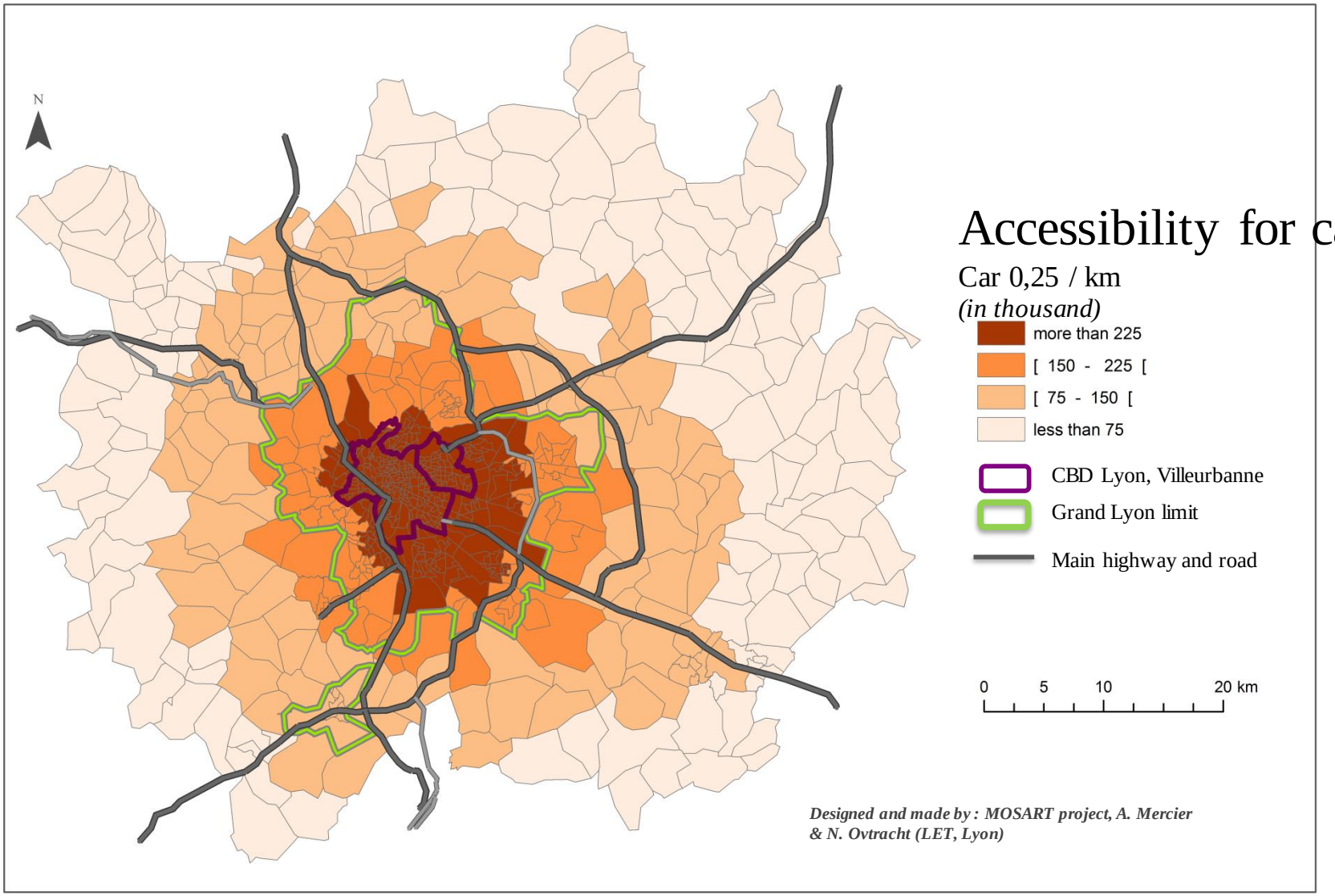
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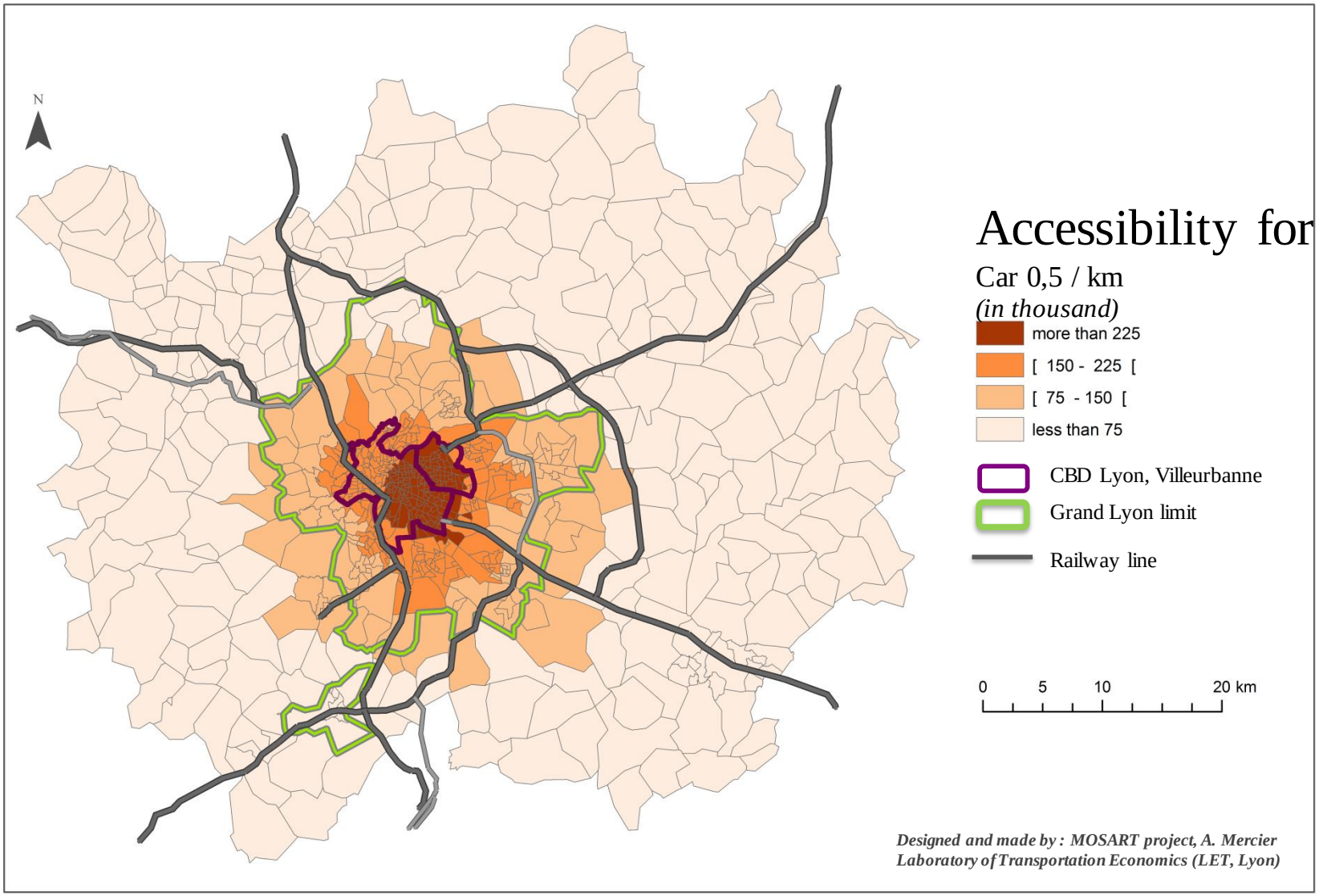
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Accessibility for car
Car 0,5 / km
(in thousand)
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[75 - 150 [
less than 75
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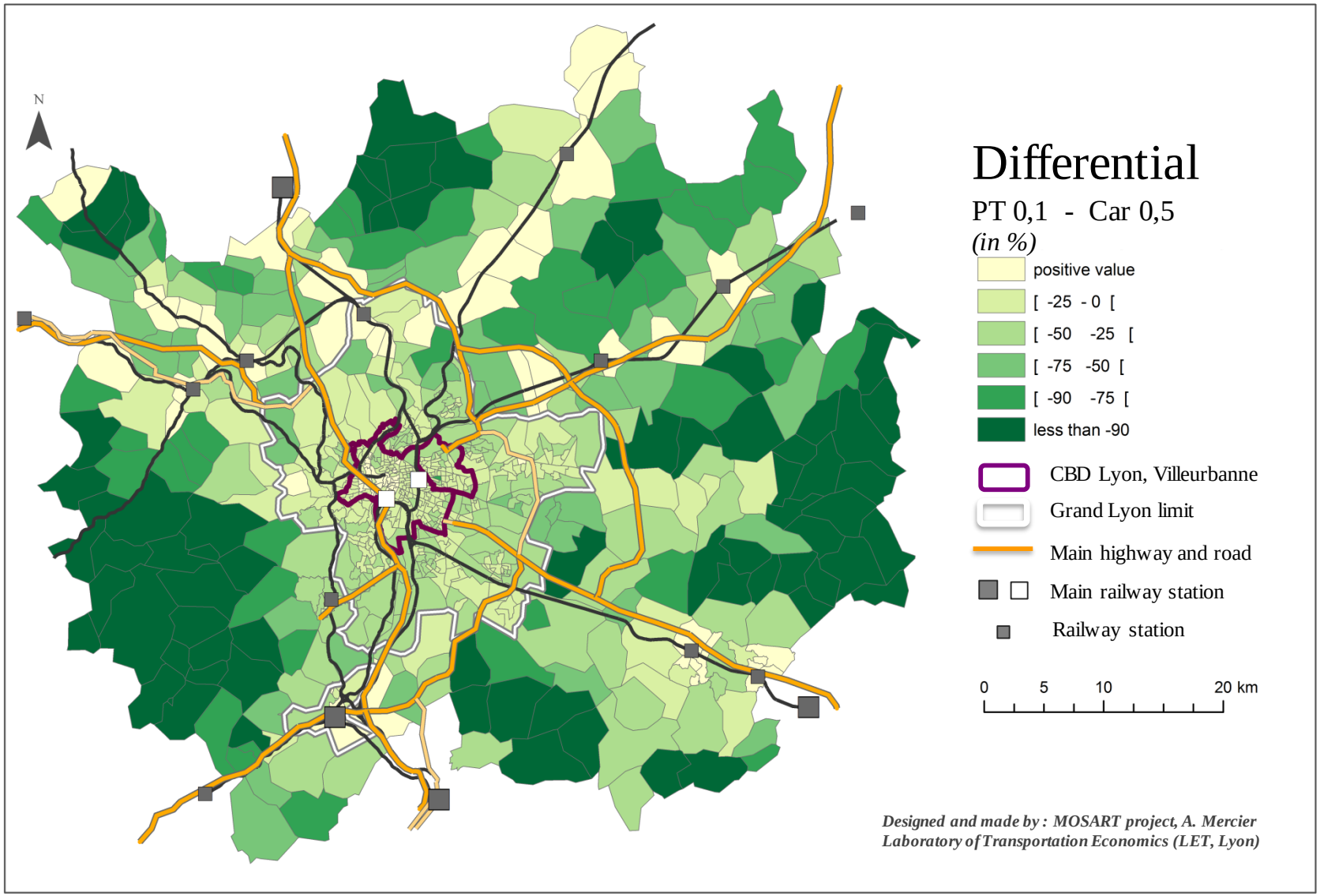
N
Differential
PT 0,1 - Car 0,5
(in %)
positive value
[-25 - 0 [
[-50 -25 [
[-75 -50 [
[-90 -75 [
less than -90
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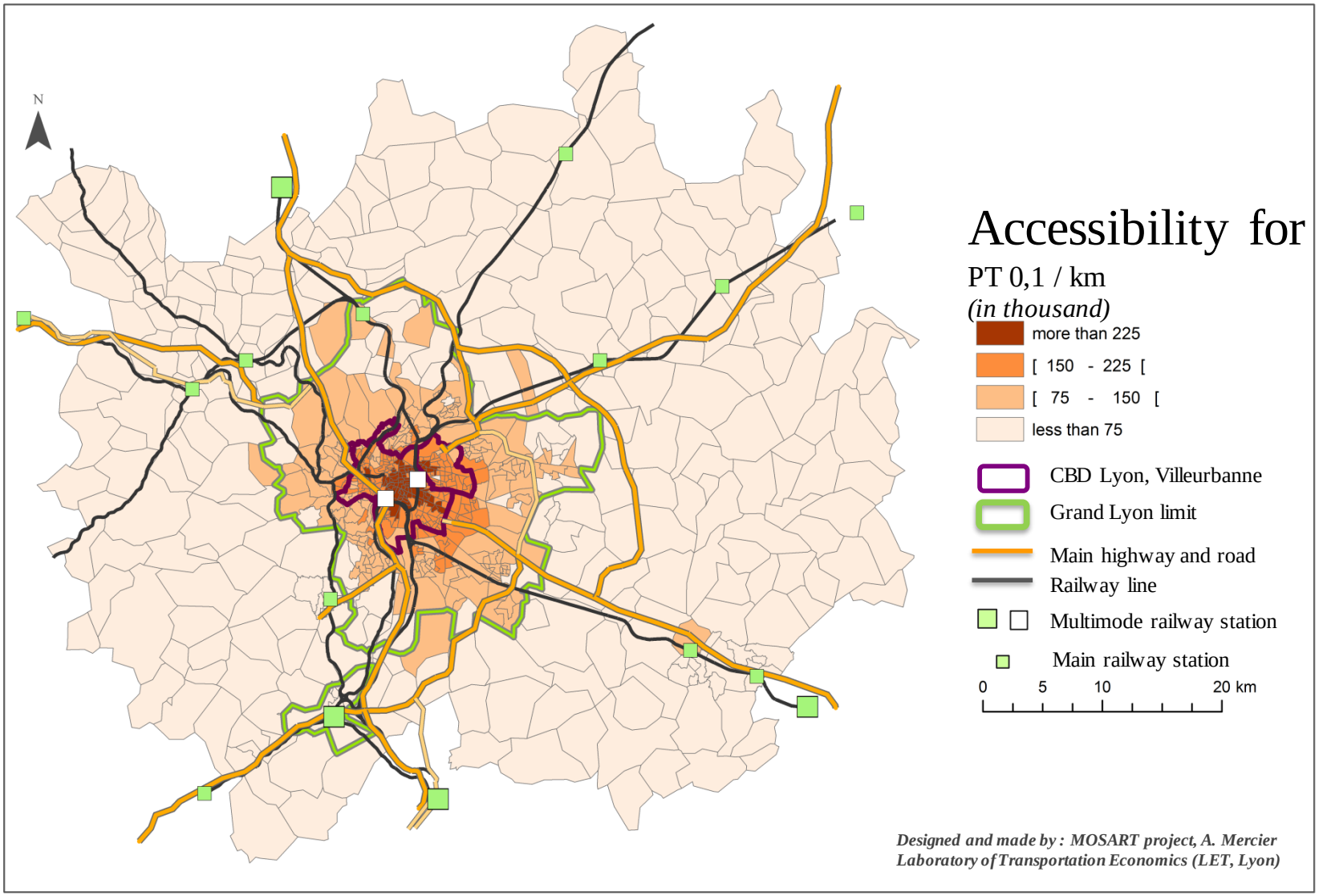
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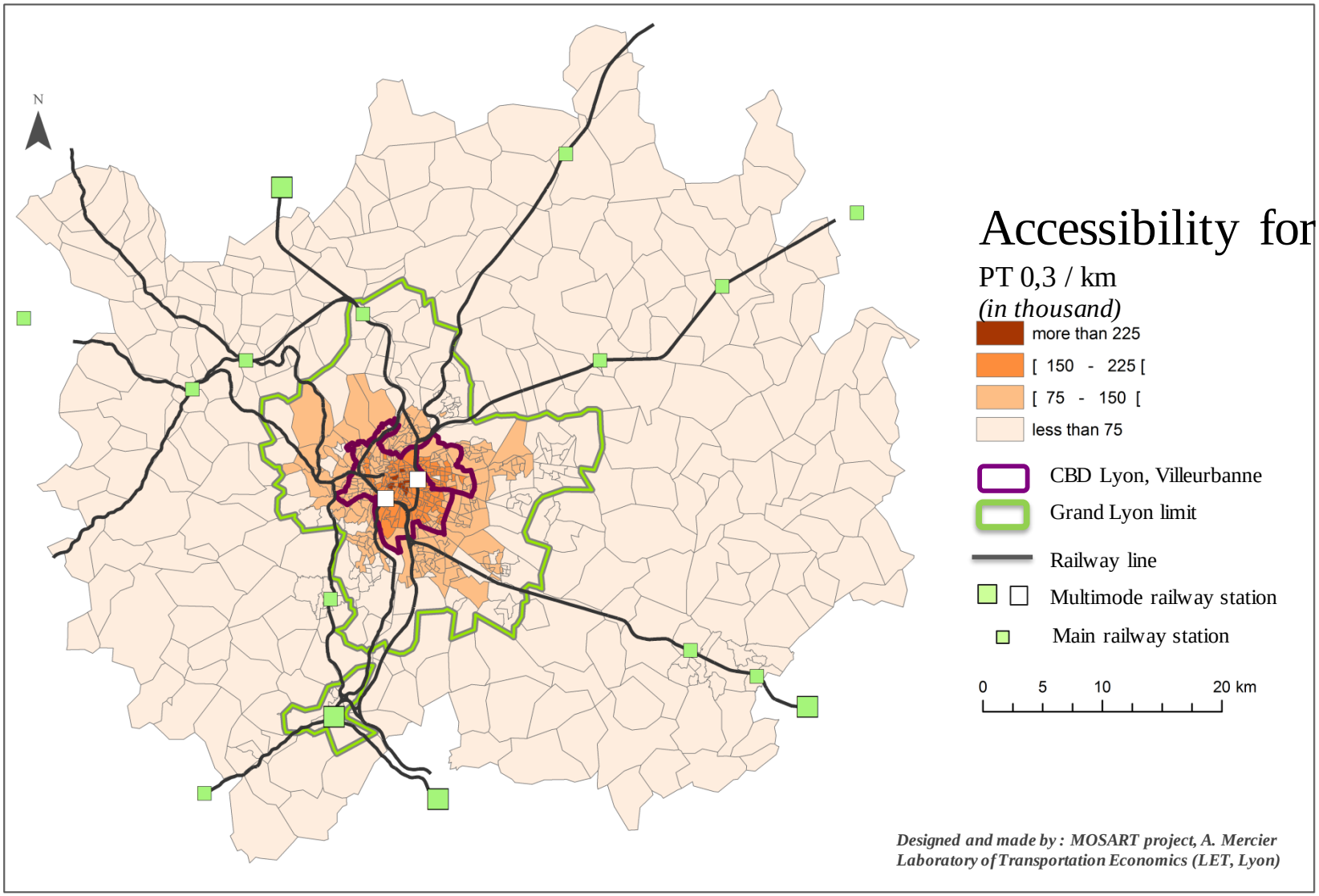
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[150 - 225 [
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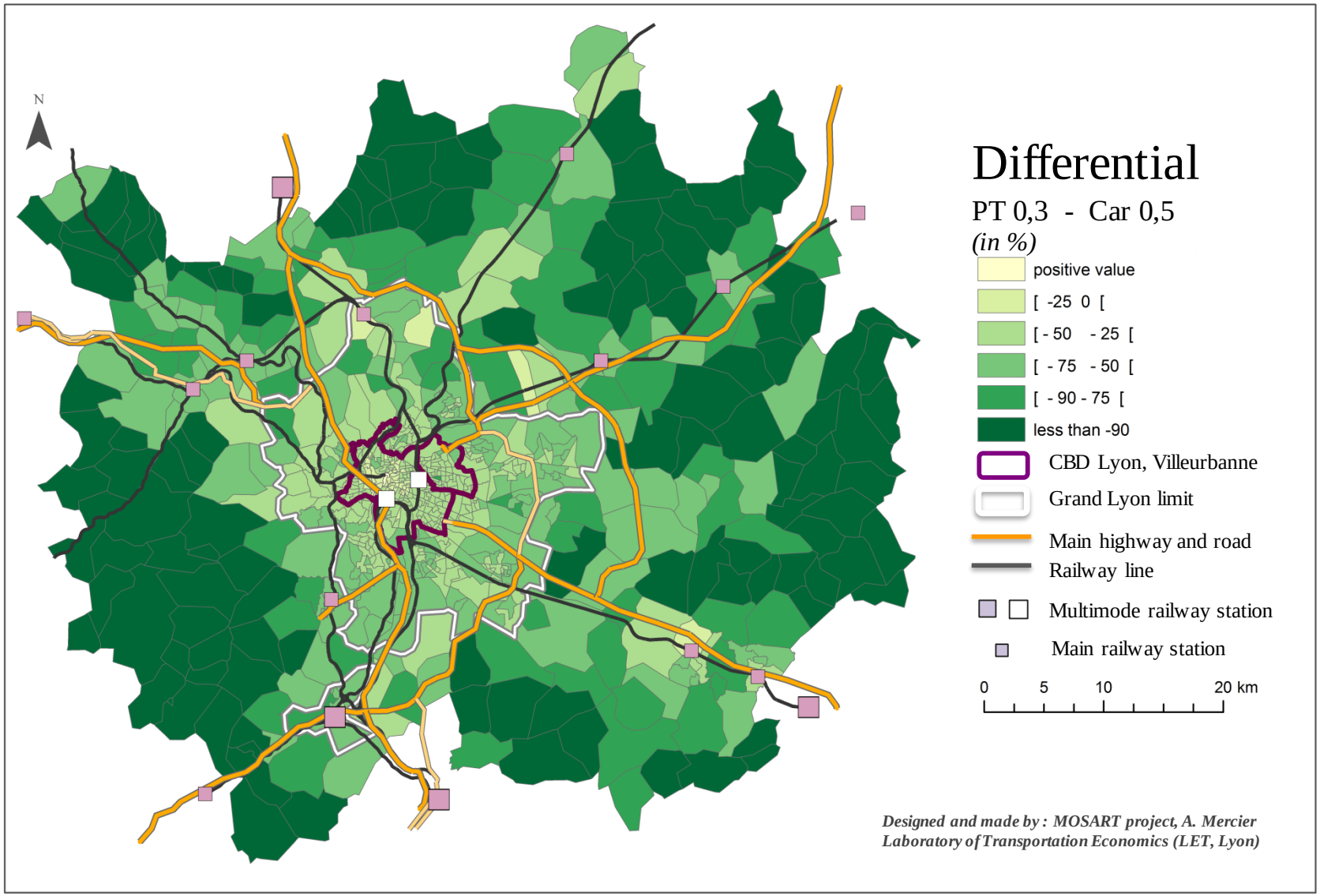
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(in %)
positive value
[-25 0 [
[- 50 - 25 [
[- 75 - 50 [
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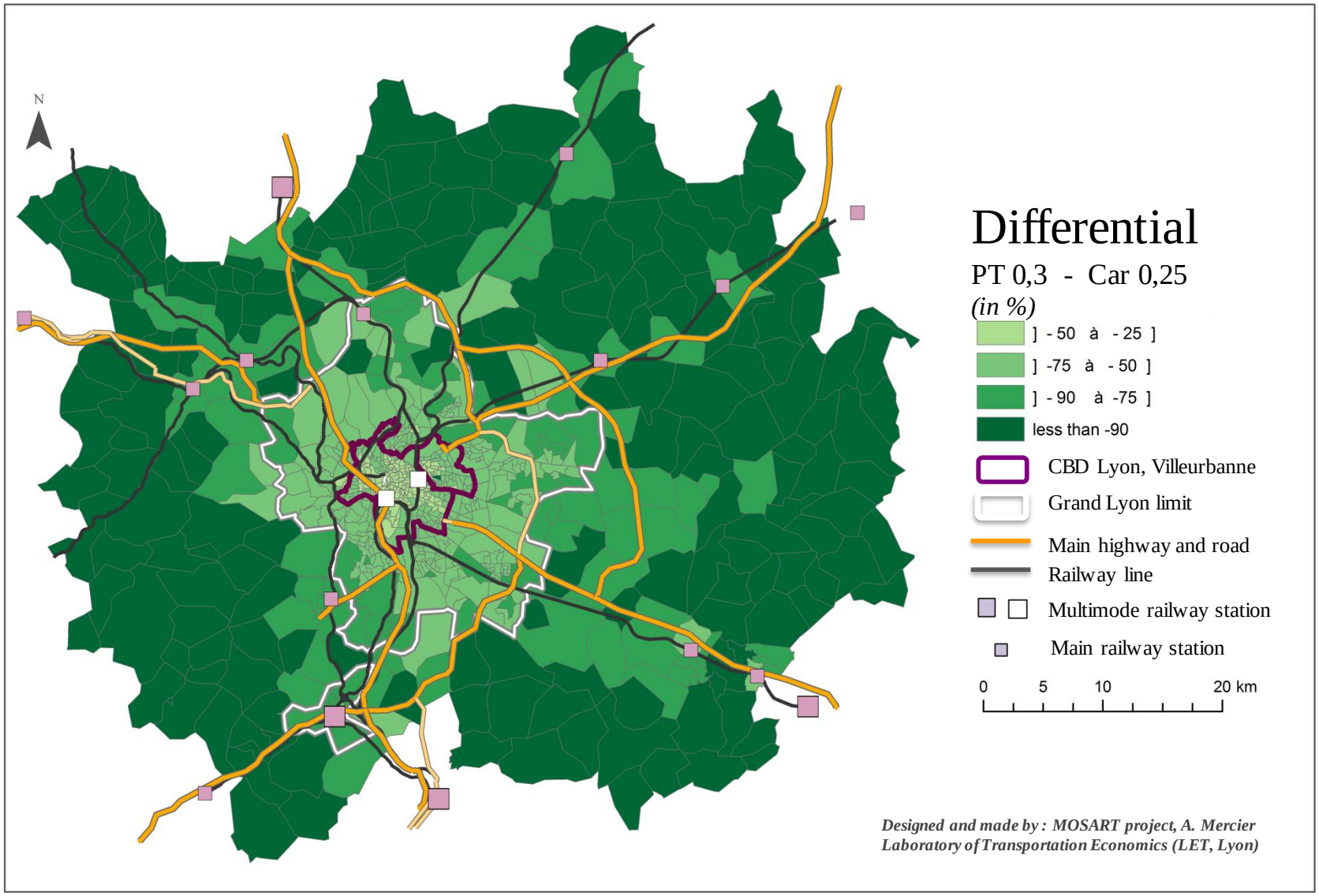
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Differential
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(in %)
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Conclusion

- Taking into account individual costs of urban mobility is not enough
- Collective costs and “social effective speed” are necessary to avoid some opportunistic behaviors (higher speed whatever the cost!)
- “Social effective speed”, turned into map based tools are very stimulating