Developing the bike sharing system to promote urban sustainable mobility: the case of Lyon city

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#polis14

Outline of presentation

1. **Bike sharing development**

2. **Lyon's bike sharing system**

3. **Data and some analysis**

4. **Perspectives and conclusions**

Bike sharing system (BSS) development

Definition: service of short term bike location with a system of stations, bikes and docks

Advantage: no theft, no maintenance, mobility cost, no bike park, whenever we want

NVA WHITE BIKE PLAN

**1990s
Denmark
2e generation**

**2014
E-bike sharing
*4e generation***
- BiciMad - Spain
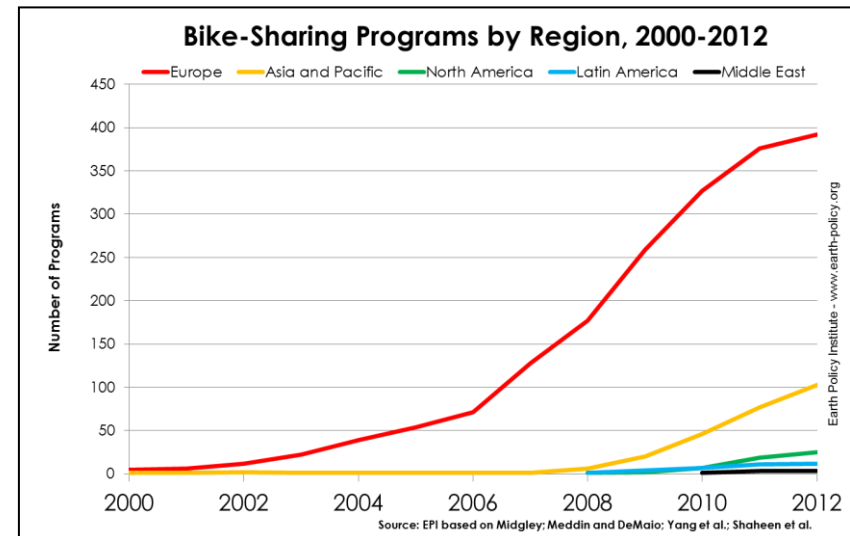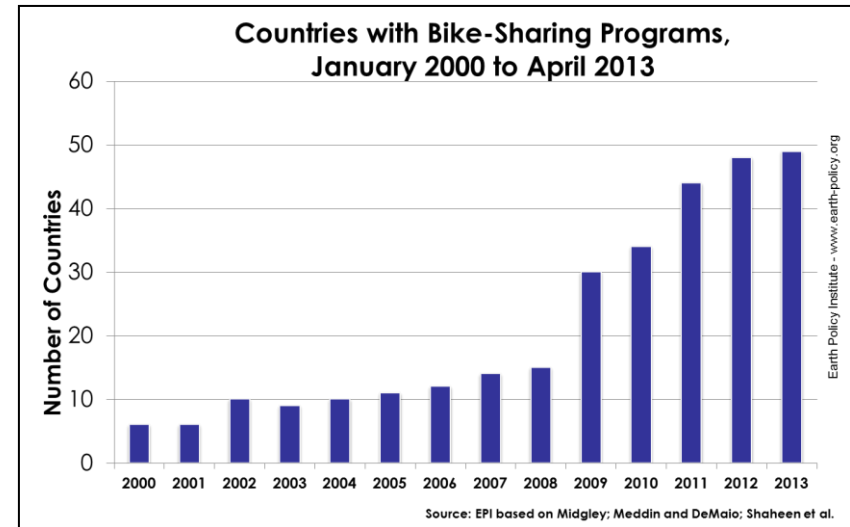- Bycyklen - Denmark

**1960s
Netherland
1st generation**

**2005
Lyon – France
3rd generation**

Bike sharing system (BSS) development

↗ **In the world: 49 countries, more than 500 cities, 700 000 bikes**

Countries with Bike-Sharing Programs, January 2000 to April 2013

Source: EPI based on Midgley; Meddin and DeMaio; Shaheen et al.

↗ **In France: more than 30 systems, important success in Paris and Lyon**

Bike-Sharing Programs by Region, 2000-2012

Europe — Asia and Pacific — North America — Latin America — Middle East

Source: EPI based on Midgley; Meddin and DeMaio; Yang et al.; Shaheen et al.

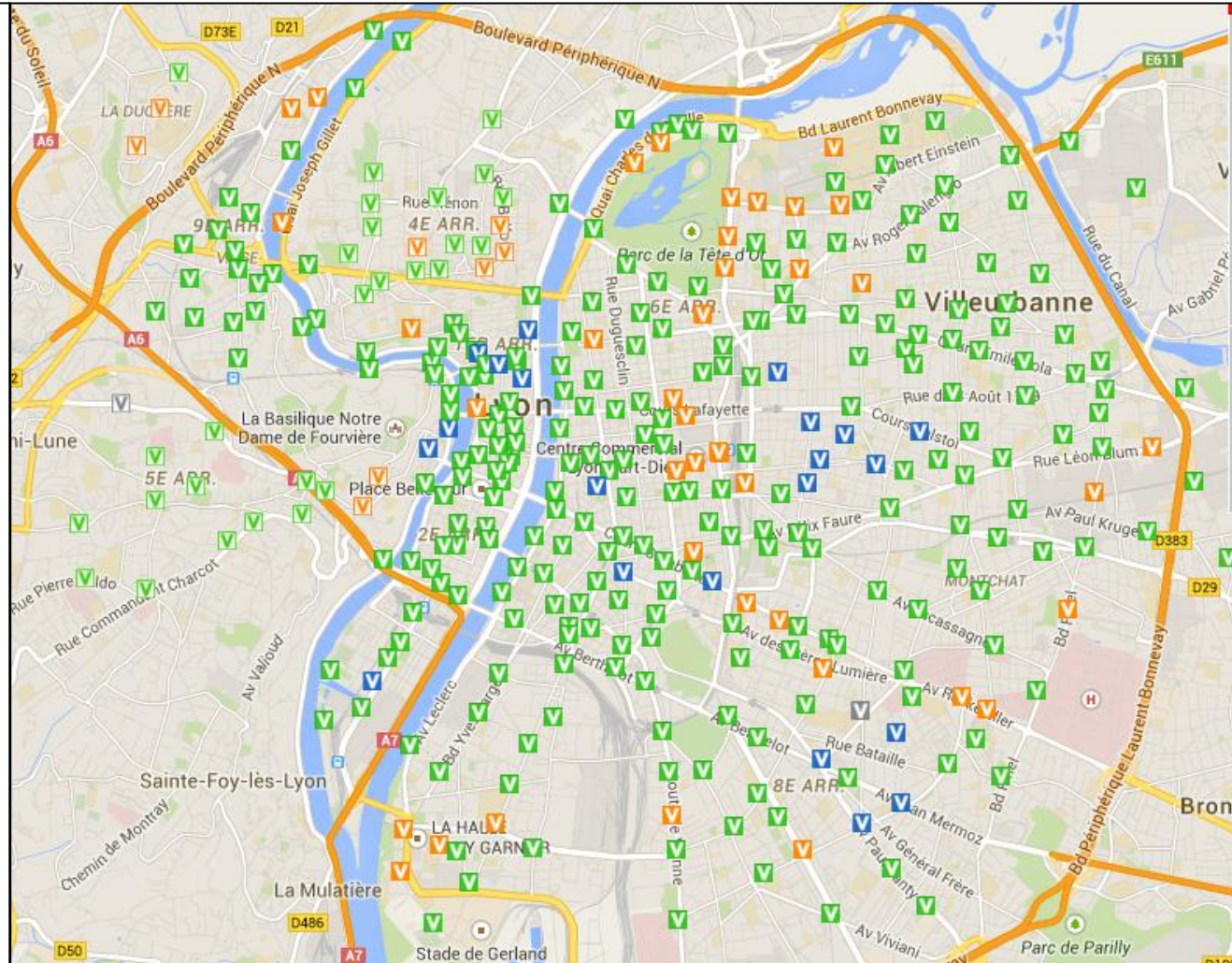POLIS | CITIES AND REGIONS NETWORKING FOR INNOVATIVE TRANSPORT SOLUTIONS

Lyon's BSS – Vélo'v

- ↗ **One of the first BSS of 3rd generation**
- ↗ **Started in May 2005: 173 stations, 2 000 bikes, 20 000 long-term subscribers**
- ↗ **In 2014: 345 stations and 4 000 bikes**
- ↗ **BSS trips represent 33% bikes trips in Lyon in 2009**

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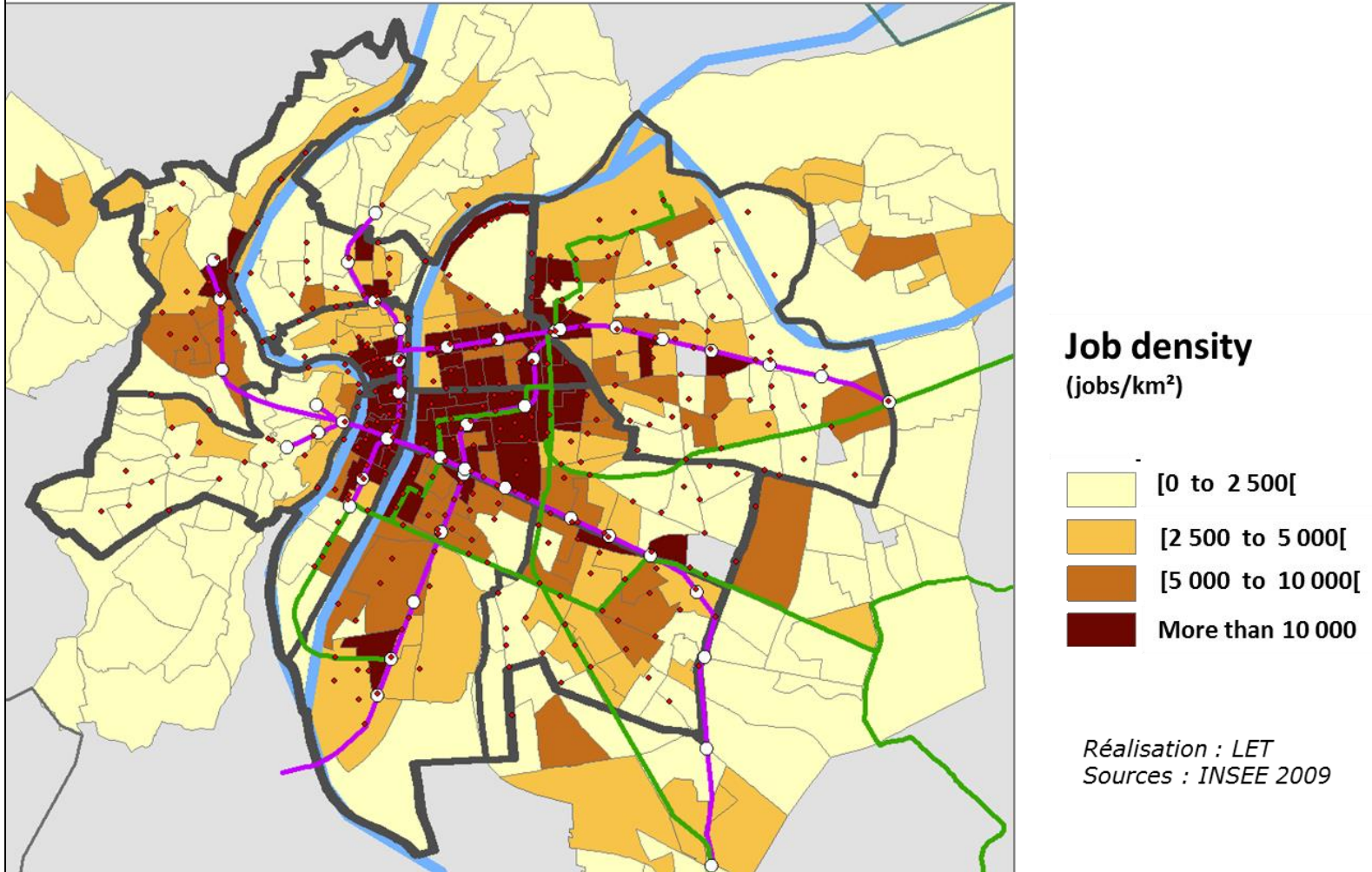
Lyon bike sharing system (2014)

- **345 stations**

- **4 000 bikes**

- **Long term - subscribers and short term subscribers**

- **53 000 yearly subscribers**

- **20 000 trips daily ridership**

- **+6 millions trips / year**

- **20% trips by short-term subscribers**

Source : http://www.onlymoov.com/ (2014)

Job density Lyon (2009)

Job density at IRIS level in Lyon (2009)

Job density
(jobs/km²)

[0 to 2 500[

[2 500 to 5 000[

[5 000 to 10 000[

More than 10 000

Réalisation : LET
Sources : INSEE 2009
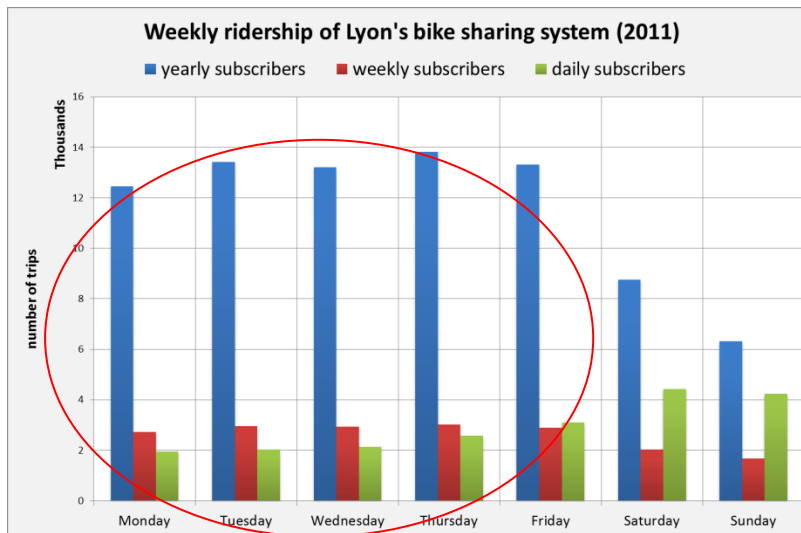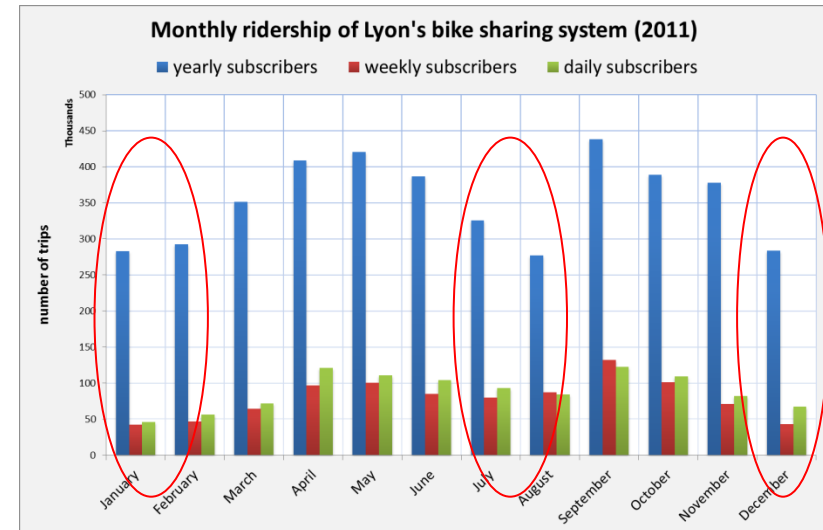
Data – Vélo'v (2011)

↗ Data:

- ❑ 341 stations, 4 000 bikes, 50 500 yearly subscribers
- ❑ About 6 300 000 trips Vélo'v in the 2011, sources JC Decaux – operator of Lyon's BSS
- ❑ Each trip gives us information about: station out | date and hour out | station in| date and hour in | type of subscriptions (daily, weekly, yearly)
- ❑ Socio-economic data of Lyon geo-computed by MOSART platform

↗ This data allows us to analyze Lyon BSS usage by:

- ❑ Seasons and month
- ❑ Day of week
- ❑ Period of day
- ❑ Type of subscribers
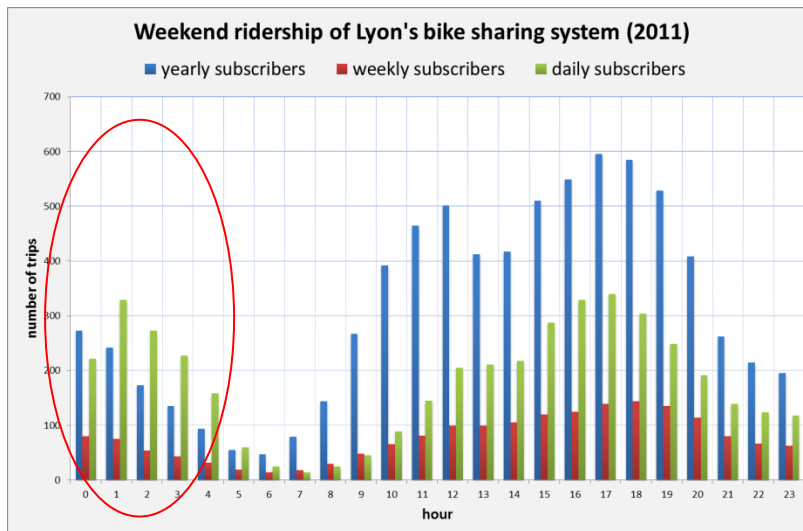
Lyon BSS monthly and weekly usage analysis

- ➚ **BSS usage decrease during winter and holiday months**
- ➚ **same trend for long-term and short-term subscribers**

Monthly ridership of Lyon's bike sharing system (2011)
■ yearly subscribers ■ weekly subscribers ■ daily subscribers

Weekly ridership of Lyon's bike sharing system (2011)
■ yearly subscribers ■ weekly subscribers ■ daily subscribers

- ➚ **yearly subscribers dominate on weekday**
- ➚ **short-term subscribers usage increases on weekend**

Lyon's BSS daily usage analysis

- ↗ **3 peak periods**
- ↗ **yearly subscribers domination**
- ↗ **commuting trips**

Weekday ridership of Lyon's bike sharing system (2011)

Weekend ridership of Lyon's bike sharing system (2011)
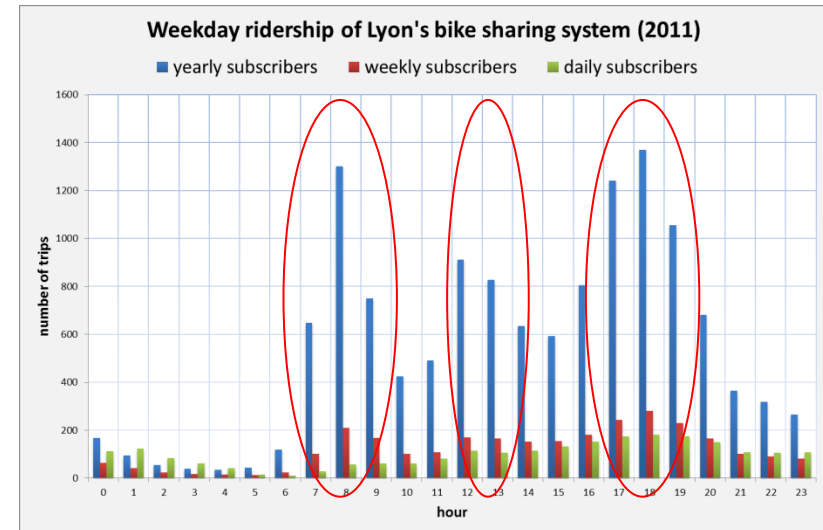
- ↗ **recreational trips**
- ↗ **night trips after public transport stop**
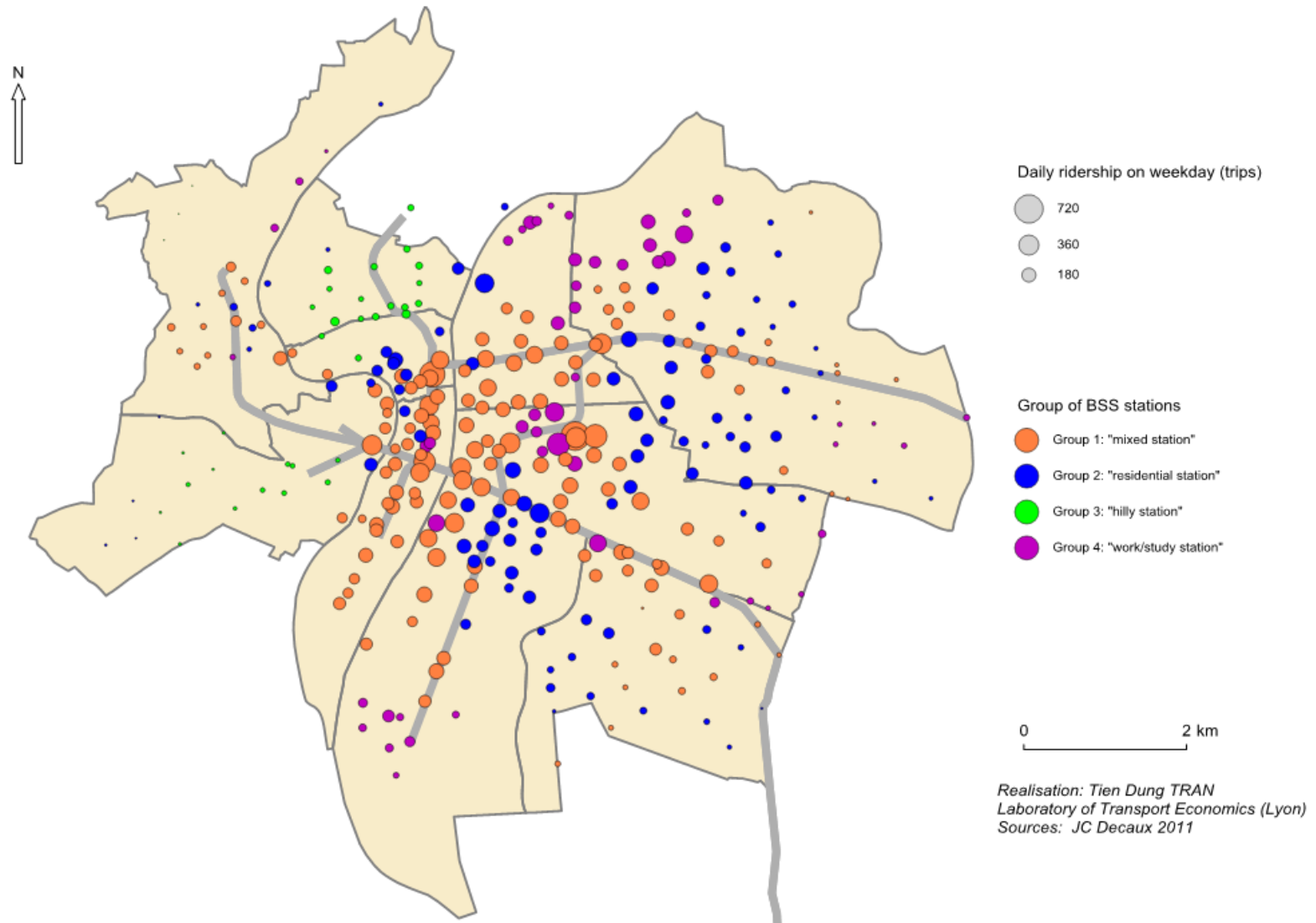- ↗ **increase of short-term subscribers usage**

Typology of BSS station

- ↗ **Methodology of classification: k-means**

- ↗ **Criteria of classification: percentage of flows in compared to total flows on weekday 3 peak periods**

- ↗ **4 groups of stations (coefficient of determination = 0.80)**

- ↗ **A correlation between the typology of stations and the built environment**

Profile of groups of stations
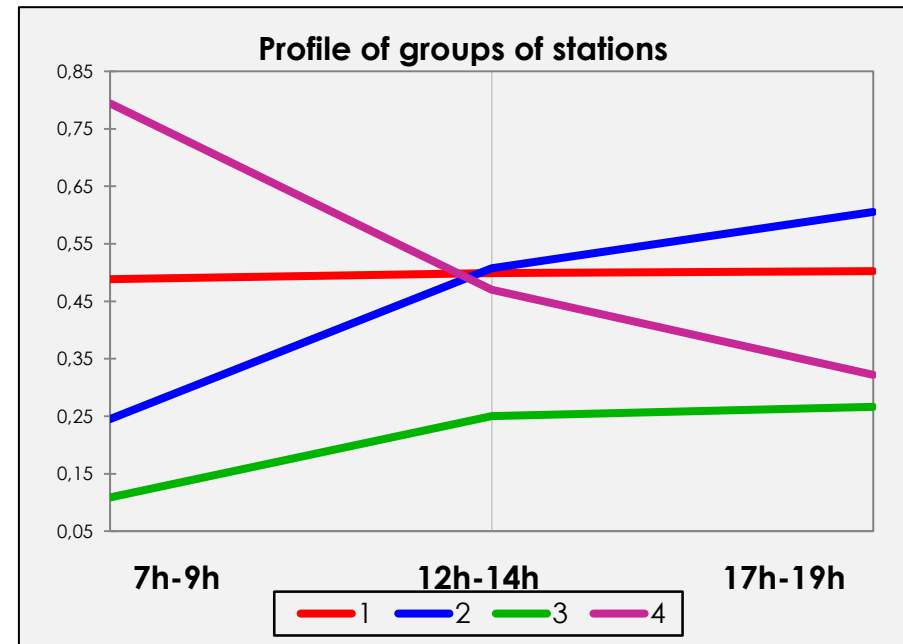
	Groupe1	Group 2	Group 3	Group 4
Number of stations	152	102	34	53
Daily flow in per station	80	45	6	54
Daily flow out per station	78	45	20	52
Total flows of group	23986	9151	876	5595

Typology of Lyon's BSS stations

Daily ridership on weekday (trips)
- 720
- 360
- 180

Group of BSS stations
- Group 1: "mixed station"
- Group 2: "residential station"
- Group 3: "hilly station"
- Group 4: "work/study station"

0   2 km

Realisation: Tien Dung TRAN
Laboratory of Transport Economics (Lyon)
Sources: JC Decaux 2011

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Typology of BSS stations - results

Variables	Groupe 1 «mixed station»	Groupe 2 «residential station»	Groupe 3 «hilly stations»	Groupe 4 «work/study station»	Average of all stations	Unit
Population	5 124	5 422.00	4 318.00	2 386.00	4 707.00	person
Job	3 032	1 492.00	922.00	2 846.00	2 332.00	job
Revenue	29 011	27 796	30 323	27 602	28 559	euros
Student in campus	919	178	377	1922	800	person
University restaurant	0.30	0.10	0.10	0.70	0.30	unit
Gare	0.10	0.00	0.00	0.00	0.00	station
Metro	0.60	0.20	0.30	0.20	0.40	station
Tramway	0.40	0.20	0.00	0.50	0.30	station
Altitude	171.00	176.00	255.00	172.00	181.00	m
Piste cyclable	1 129.00	985.00	564.00	1 099.00	1 025.00	m
Retails shop	19.90	8.10	3.90	9.70	13.20	unit
Restaurant	4.20	2.80	1.50	1.40	3.10	unit

Webmapping- morning flow analysis
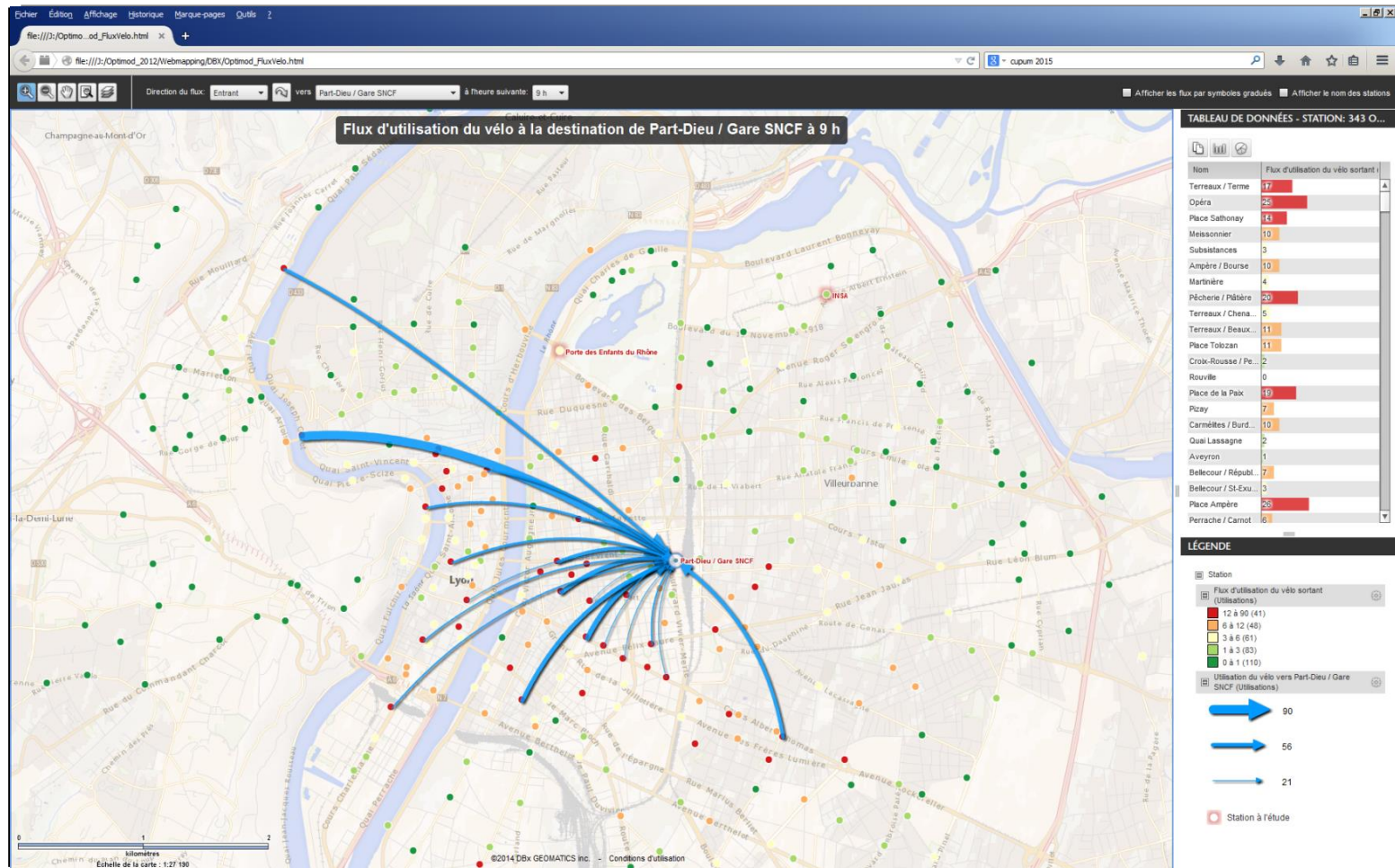
Key findings

↗ Lyon's BSS usage:

- ❑ Dominant usage of yearly subscribers during weekday
- ❑ Important usage of daily subscribers during weekend
- ❑ The topography plays an important role to BSS usage
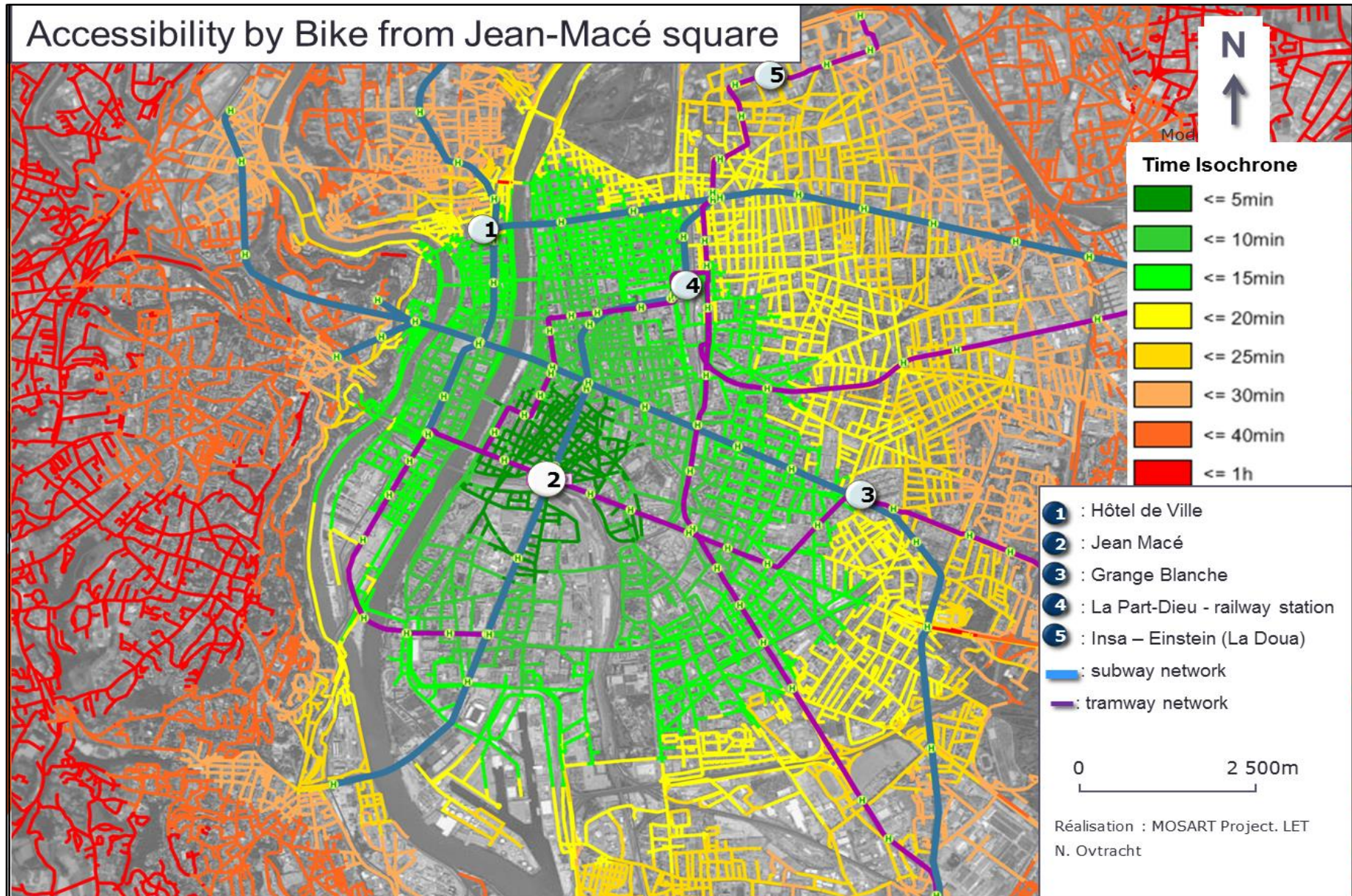- ❑ The built environment explains the difference between stations usage

↗ A segmentation in the modeling and analysis of BSS usage for a better result

↗ Take into account the built environment variables for explaining the BSS usage and for the redistribution of bikes

Perspectives

- ↗ **Build a model of prediction of BSS demand at station level using built environment variables**

- ↗ **Develop the web mapping module to complete the BSS analysis**

- ↗ **Where to put a new BSS station? (using platform MOSART) and how many slots for the new station? (using the model of prediction)**

Accessibility by Bike from Jean-Macé square

Time Isochrone

- <= 5min
- <= 10min
- <= 15min
- <= 20min
- <= 25min
- <= 30min
- <= 40min
- <= 1h

1 : Hôtel de Ville
2 : Jean Macé
3 : Grange Blanche
4 : La Part-Dieu - railway station
5 : Insa – Einstein (La Doua)
━ : subway network
━ : tramway network

0   2 500m

Réalisation : MOSART Project. LET
N. Ovtracht

Conclusions

↗ **BSS usage is dependent on:**

❑ Day of week, period of day
❑ Type of subscribers
❑ Important role of built environment

↗ **To improve the sustainable mobility:**

❑ Improve transport policy for soft mode is very important for bike usage: not only development of BSS but also bike infrastructure, etc.
❑ Reference car sharing usage analysis

↗ **The survey 2014 on Lyon BSS users will be helpful for a better understanding of BSS usage**

Acknowledgements

- **The research is supported by the Rhône-Alpes region. France.**

- **The research is in the project ANR Vél'innov about the bike sharing system of Lyon.**

- **Thanks to JC Decaux for the data and MOSART platform for the geocomputation.**

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Thanks for your attention

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