

24 maggio 2016
Giornate della Sostenibilità

*LE EMISSIONI DI CO2 DEL POLITECNICO DI MILANO
PRESENTAZIONE DEI RISULTATI DEL PROGETTO PILOTA 2015
E PRIMI RISULTATI DEGLI STUDI DI APPROFONDIMENTO*

**Study of commuters modal share and development of policies to
enhance sustainable transportation modes: the study case of Politecnico di
Milano**

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School of Architecture, Urban Planning, Construction Engineering

OUTLINE

- 1. Main results and general figures of the CAMPUS SOSTENIBILE survey**
- 2. Distribution of the main journey (Bovisa and Leonardo Campuses)**
- 3. Distribution of main journey (Mantova, Piacenza, Como, Lecco, Cremona)**
- 4. Distribution of the main journey made by train (Bovisa and Leonardo)**
- 5. Distribution of the main journey made by car (Bovisa and Leonardo)**
- 6. Distribution of the main journey made by Public Transport (Bovisa and Leonardo)**
- 7. Conclusions of the territorial interpretation (Main Journey)**
- 8. Considerations about secondary journey**
- 9. Policies proposed to increase the use of public transportation**
- 10. Final considerations**

1. Main results and Figures

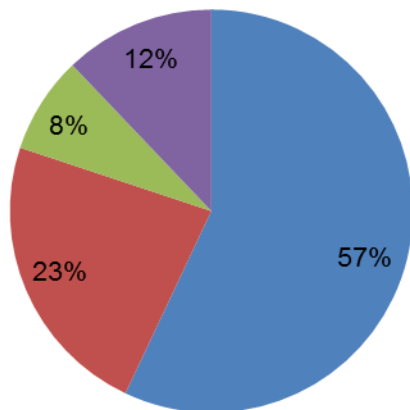
MAIN RESULTS

Students Sample 9763

Staff Sample 2185

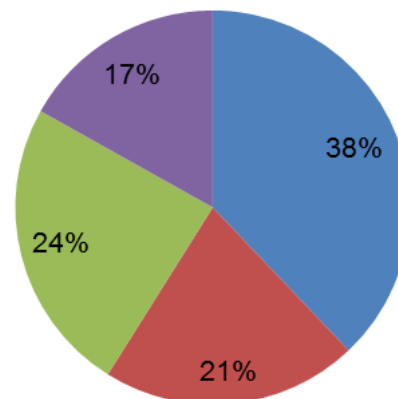
Students

■ J1pTRAIN ■ J1pPUT ■ J1pPIT ■ J1pNM



Workers distribution

■ J1pTRAIN ■ J1pPUT ■ J1pPIT ■ J1pNM



J1pTRAIN: Primary journey where train is the most used

J1pPUT: Primary journey where public transport is the most used

J1pPIT: Primary journey where private transport is the most used

J1pNM: Primary journey where non motorized is the most used

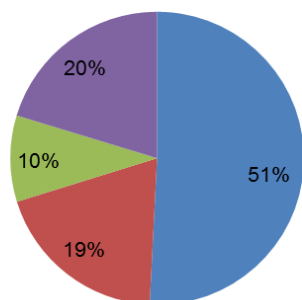
1. Main results and Figures

MAIN RESULTS AMONG UNIVERSITY STAFF

- Support Staff: Assegnista di ricerca, cococo, Dottorato (557) – 25%
- Part time professor: Docente a contratto (335) – 15%
- Technical administrative staff: Personale tecnico-amministrativo (702) – 32%
- Research Staff: Professore associate, Professore ordinario, Ricercatore Legge 240, Ricercatore universitario (591) -27%

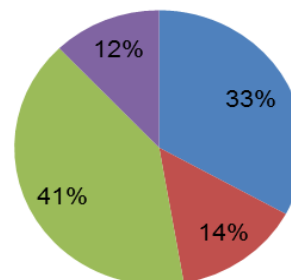
Support Staff

J1pTRAIN J1pPUT J1pPIT J1pNM



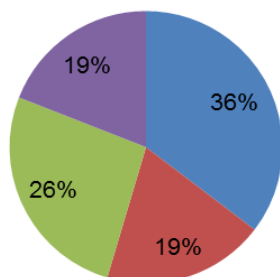
Part Time professors

J1pTRAIN J1pPUT J1pPIT J1pNM



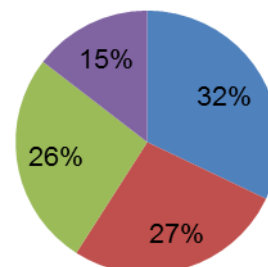
Research staff

J1pTRAIN J1pPUT J1pPIT J1pNM



Technical and administrative staff

J1pTRAIN J1pPUT J1pPIT J1pNM

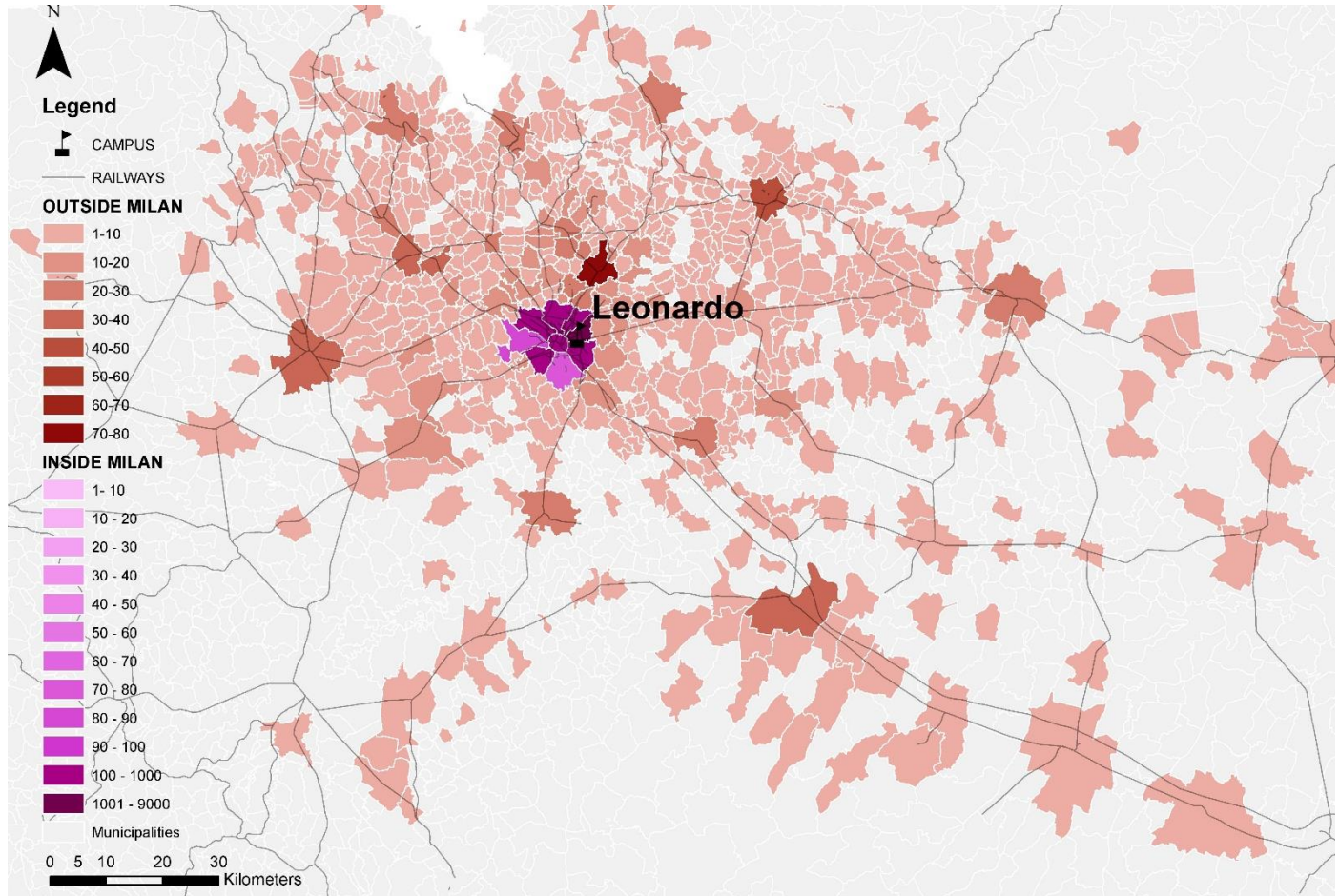


2. Distribution of the main journey Milan Campuses

CAMPUS LEONARDO

STUDENTS

- Concentration is not only located in Milan.
- Students are concentrated in municipalities located close to the train infrastructure.
- Students distribution is spread among the nine zones of Milan.

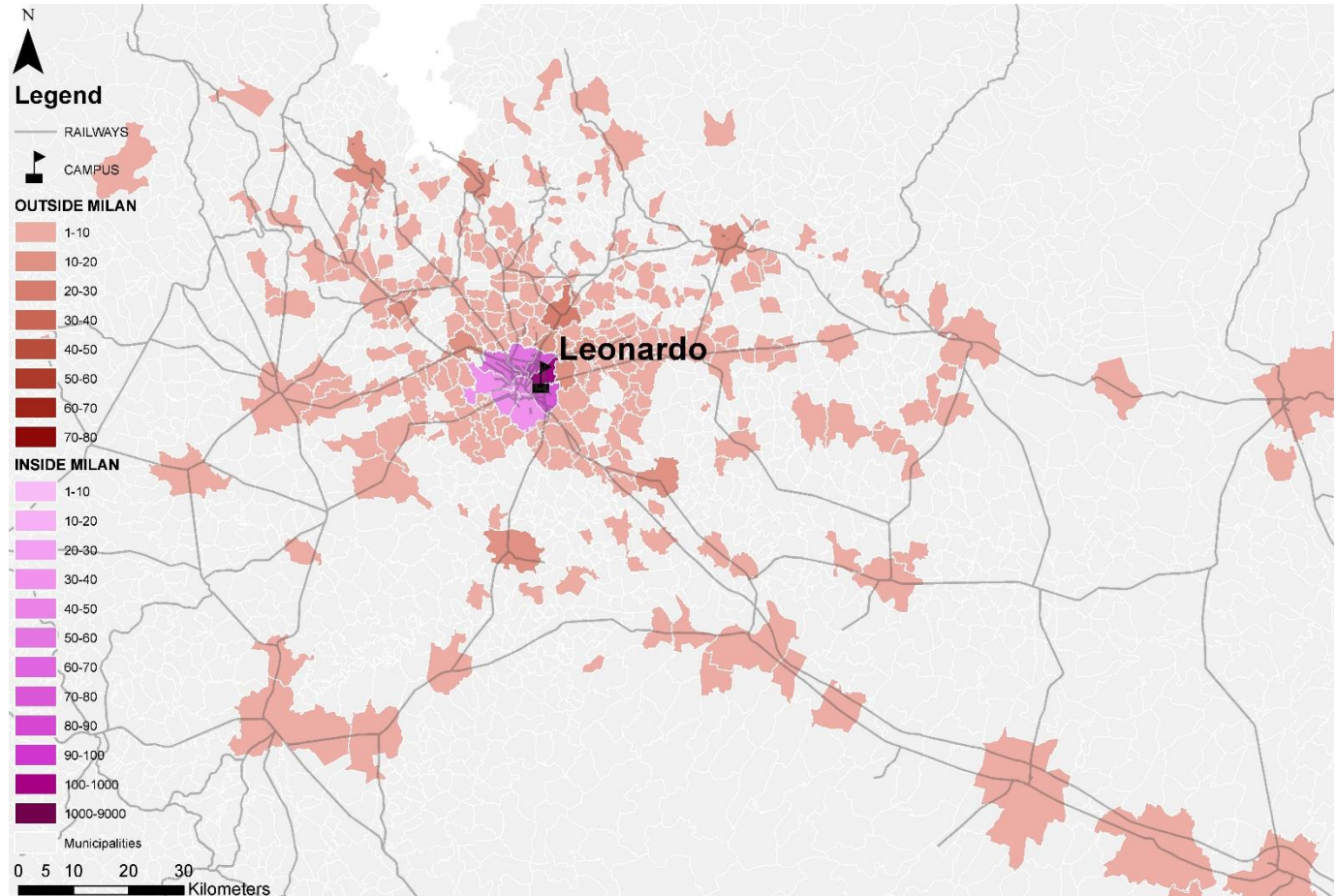


2. Distribution of the main journey Milan Campuses

CAMPUS LEONARDO

WORKERS

- Concentration is mainly located in Milan.
- Workers distribution is mainly concentrated in Lambrate.

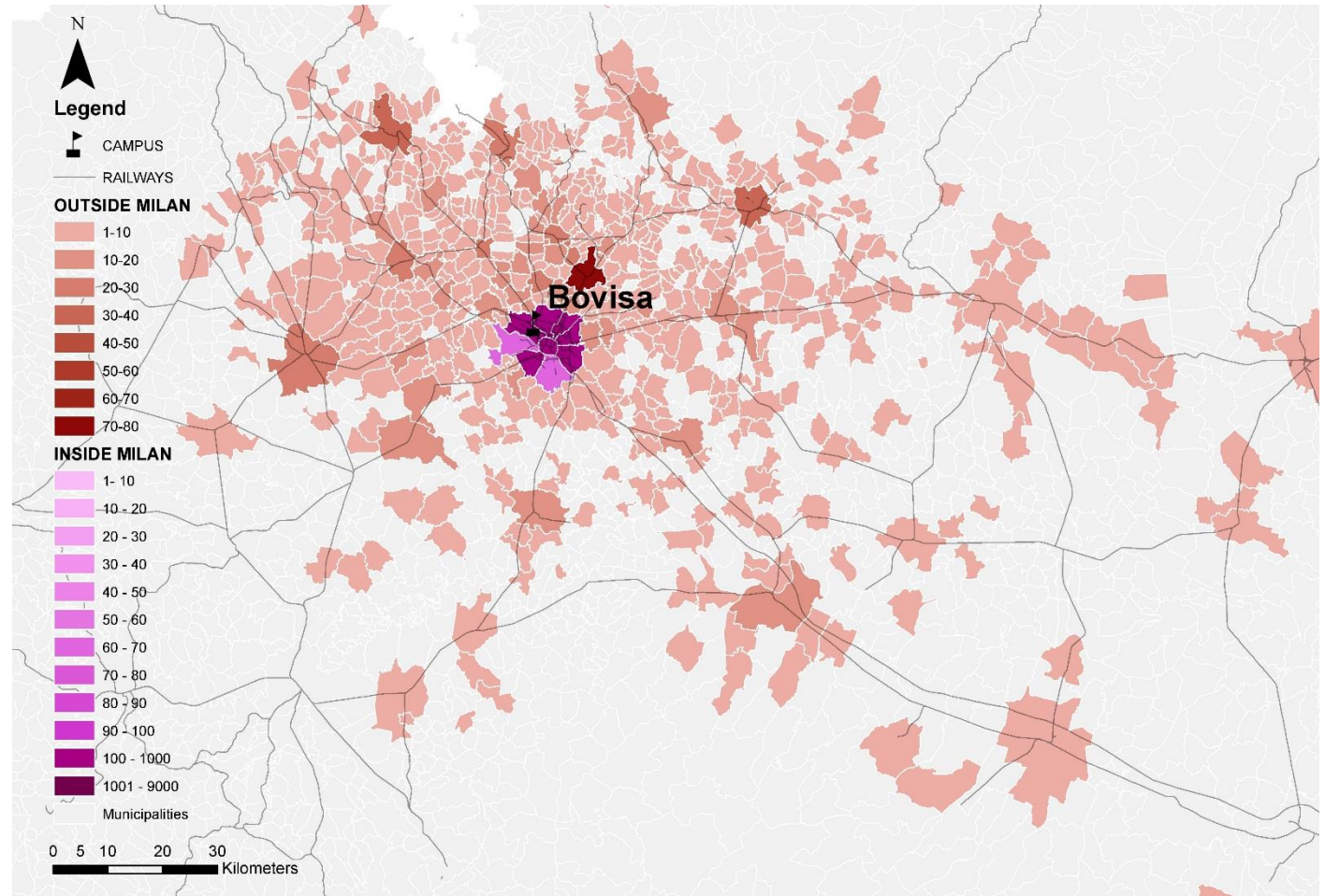


2. Distribution of the main journey Milan Campuses

CAMPUS BOVISA

STUDENTS

- Concentration is mainly located in municipalities located at the north of Milan where train infrastructure is very strong.
- Students are quite spread in the region.
- Inside Milan Zone 8 has the biggest concentration

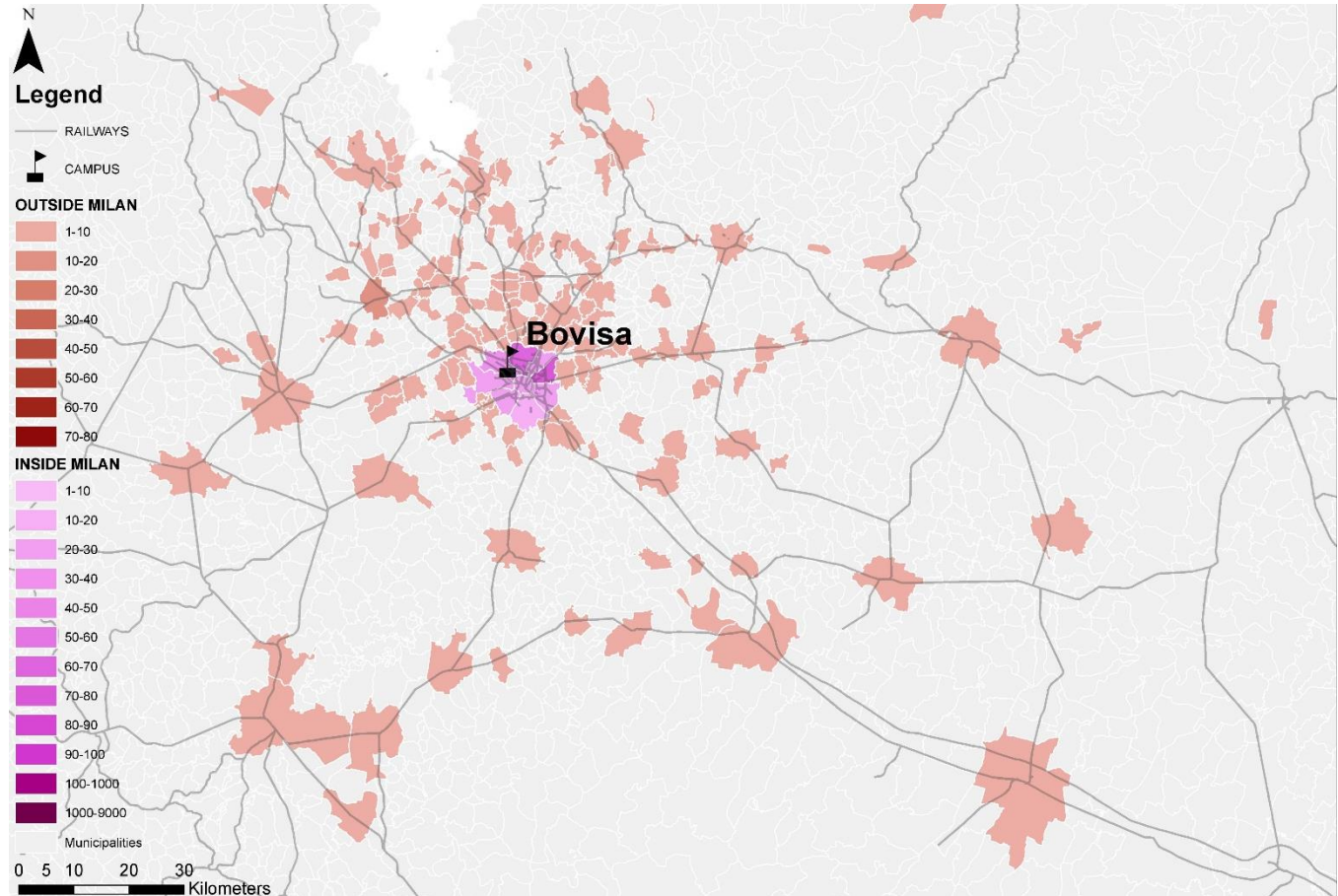


2. Distribution of the main journey Milan Campuses

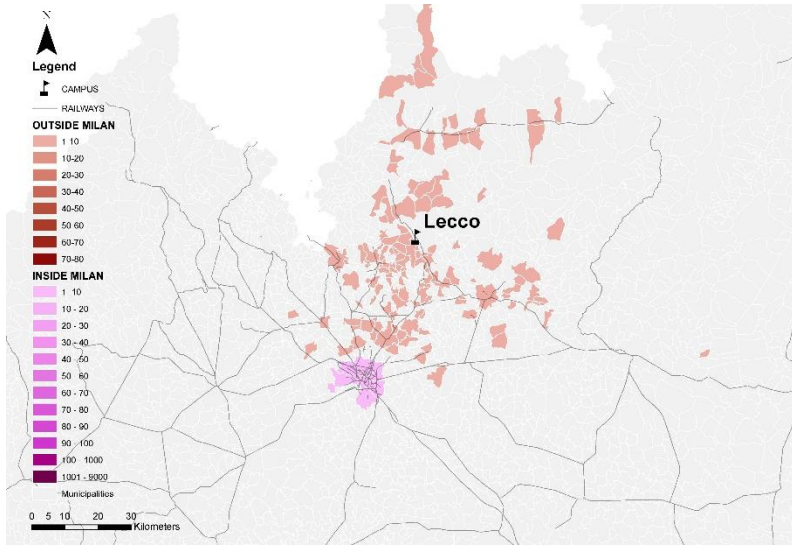
CAMPUS BOVISA

WORKERS

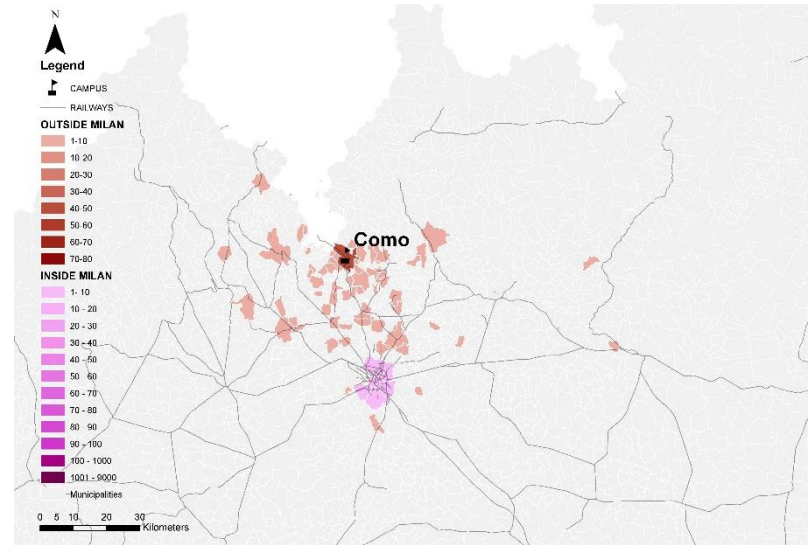
- Distributed all over the region but there is not a special high concentration
- Workers located outside Milan are located in municipalities served by good train infrastructure



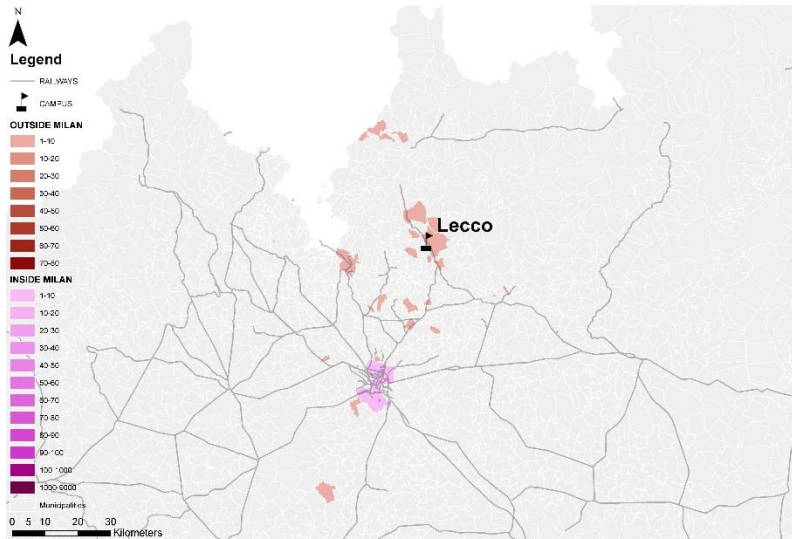
3. Distribution of the main journey Lombardia region campuses



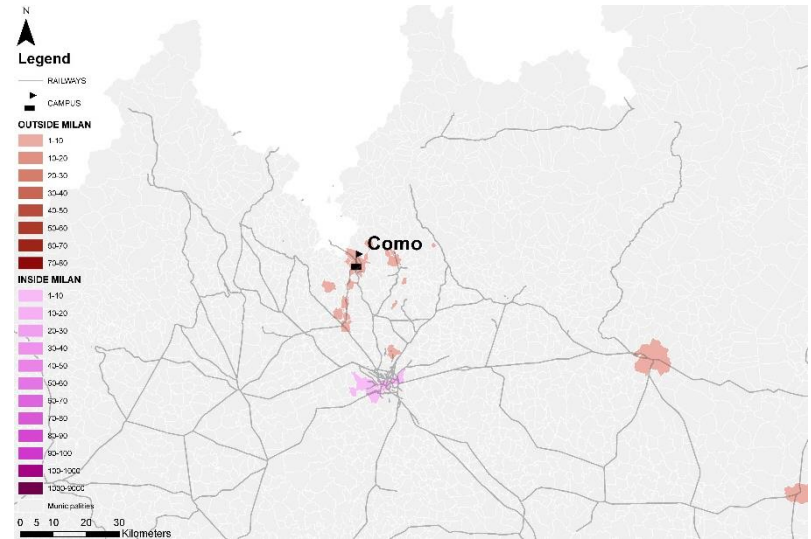
STUDENTS LECCO



STUDENTS COMO

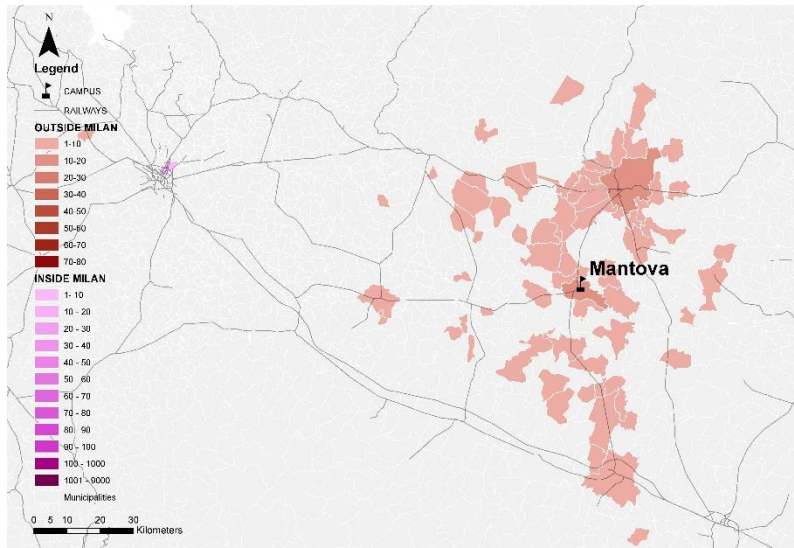


WORKERS LECCO

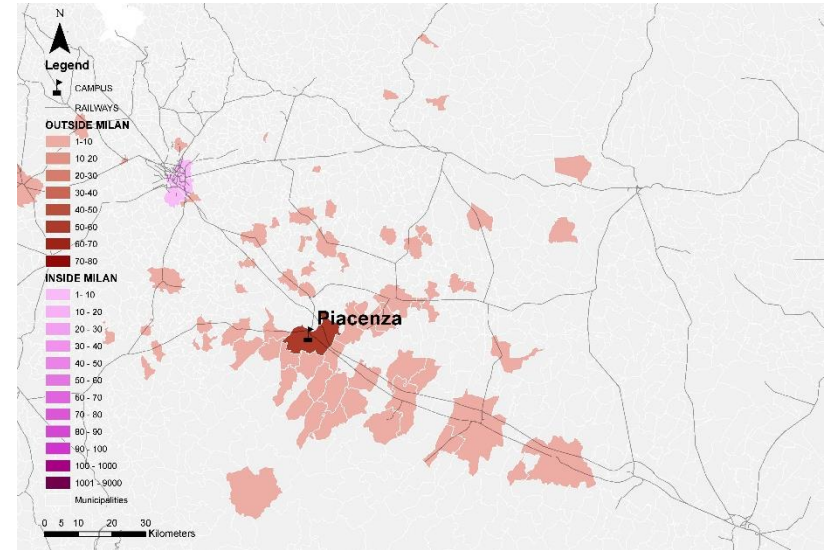


WORKERS COMO

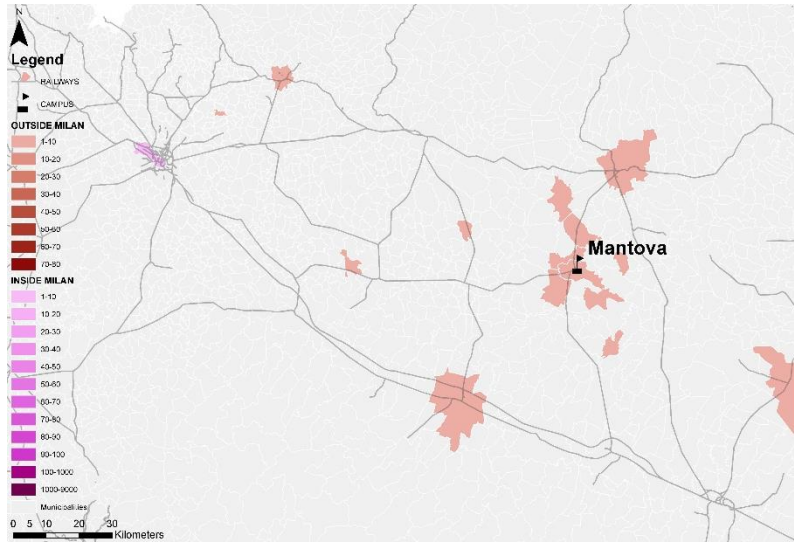
3. Distribution of the main journey Lombardia region campuses



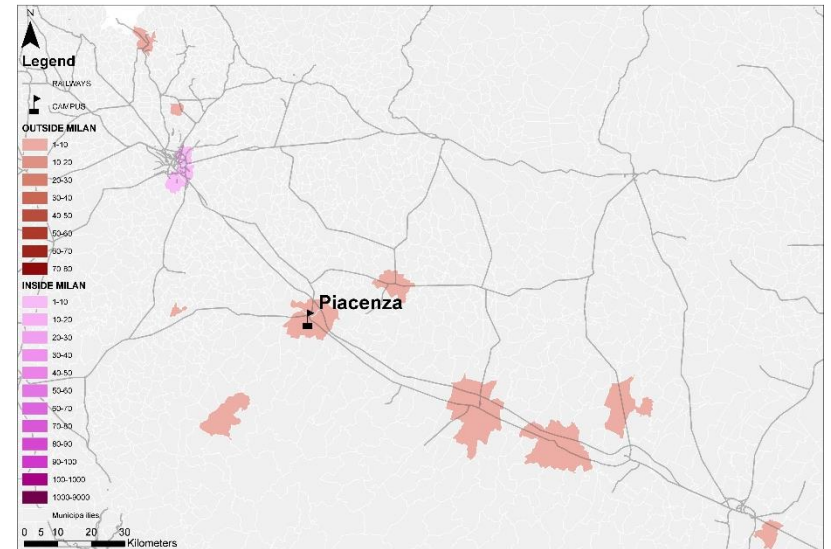
STUDENTS MANTOVA



STUDENTS PIACENZA

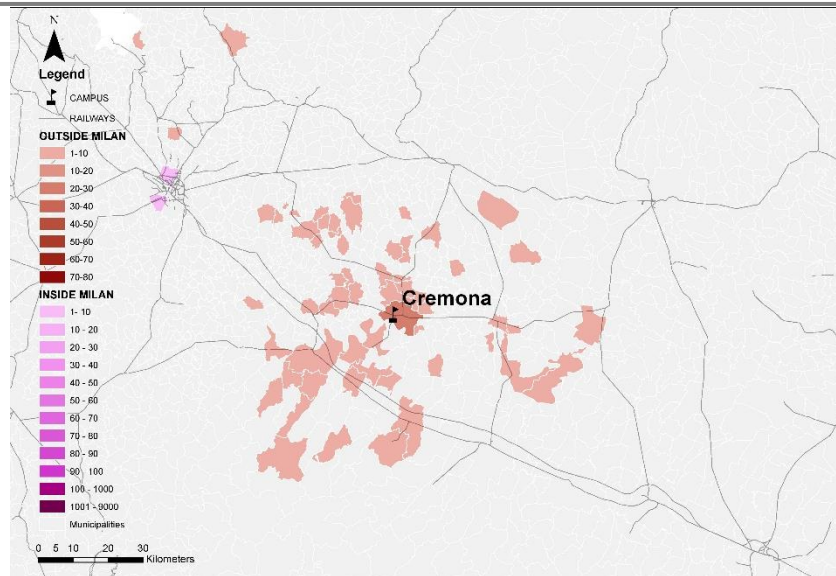


WORKERS MANTOVA



WORKERS PIACENZA

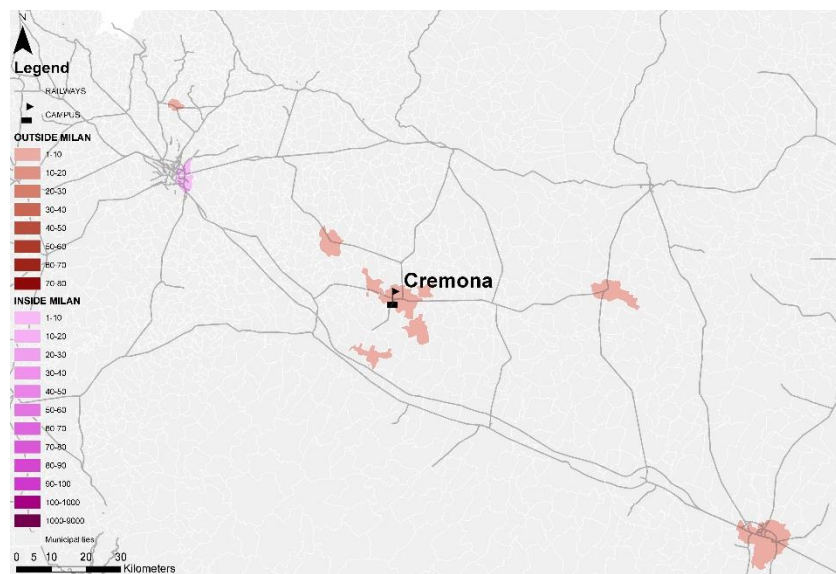
3. Distribution of the main journey Lombardia region campuses



STUDENTS IN CAMPUSES OUTSIDE MILAN

- The concentration of students for those campuses located outside Milan is generally located at municipalities close to the campus and primary in the same municipality of the campus location.

STUDENTS CREMONA



WORKERS IN CAMPUSES OUTSIDE MILAN

- The higher amount of workers is currently located in the same municipality where there is located the campus.

WORKERS CREMONA

4. Distribution of the main journey made by train

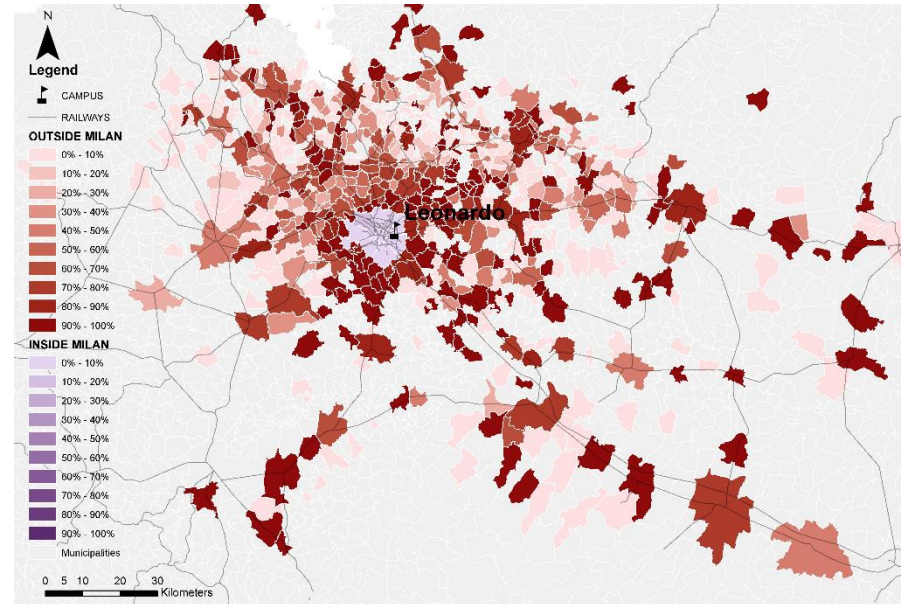
CAMPUS LEONARDO

STUDENTS (1636 journeys)

-Most used mean of transportation due to its conditions of accessibility.

-Spread along the territory with high concentration where the railway is provided.

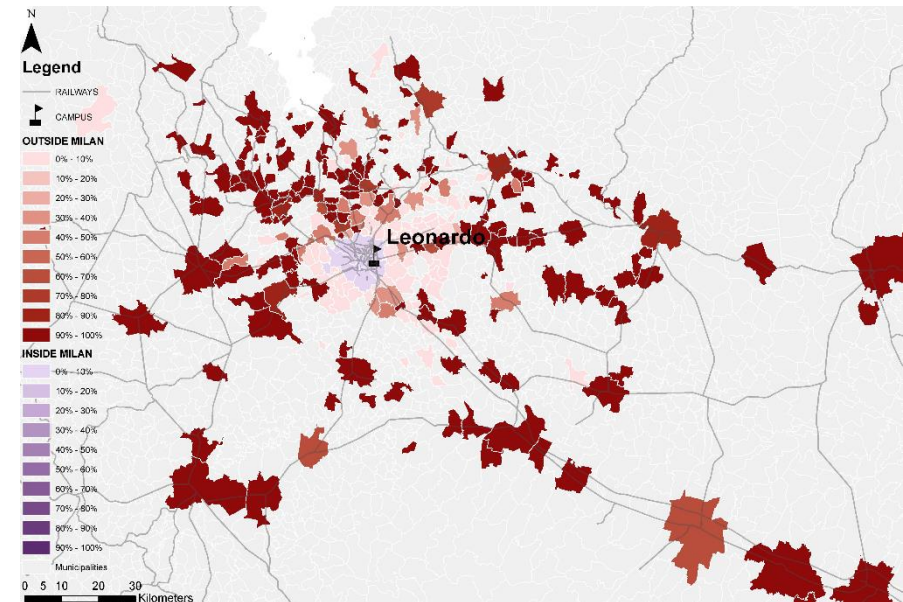
-Share inside Milan is lower than outside.



WORKERS (431 journeys)

-Similar behavior to students one.

-The concentration gets lower closer to Milan mostly at east and west.

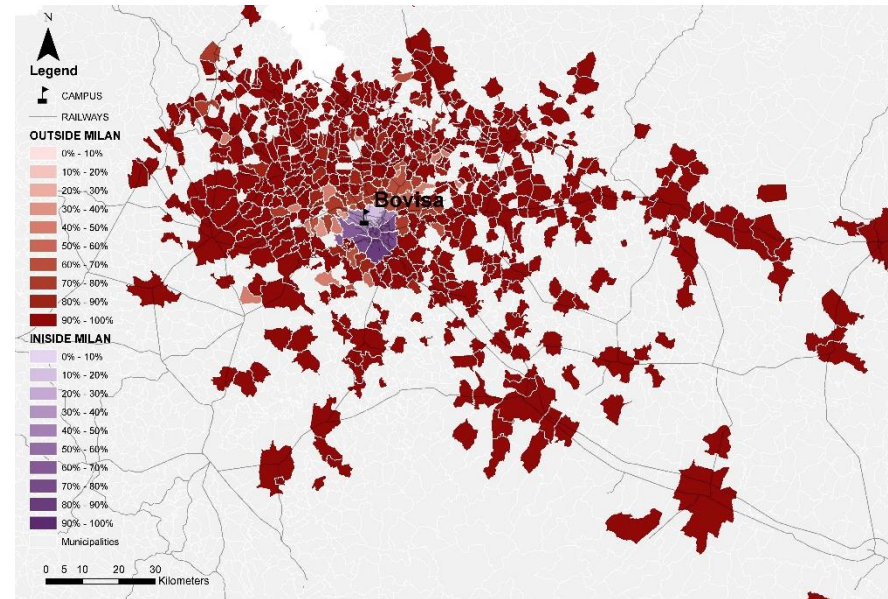


4. Distribution of the main journey made by train

CAMPUS BOVISA

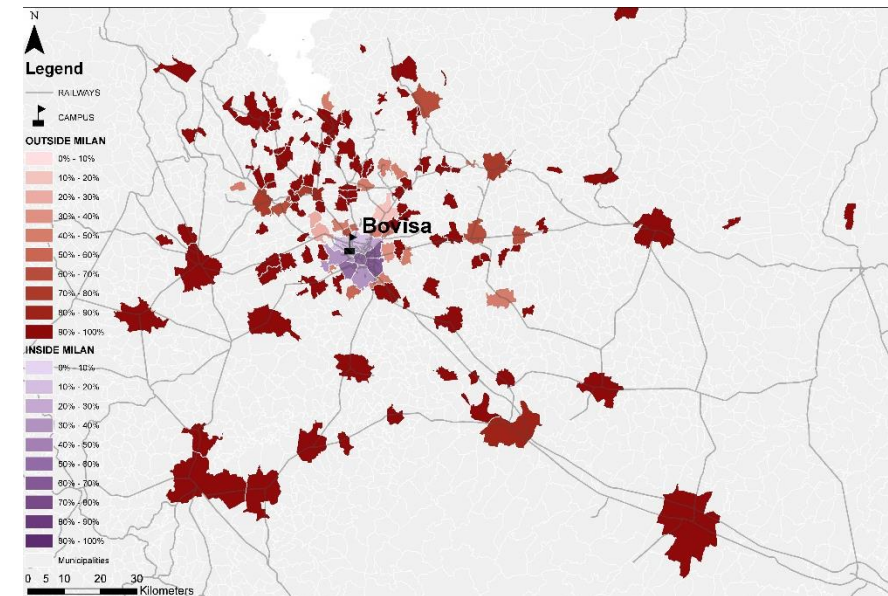
STUDENTS (2922)

- The use of the train by students in Bovisa is the most preferred mean of transportation due to its conditions of accessibility.
- Many municipalities which are not close to the train network use the train as mean of transportation.



WORKERS (362)

- Train as a mean of transportation is spread along the territory.
- Municipalities where train is used as a mean of transportation are those which have a good enough train network.

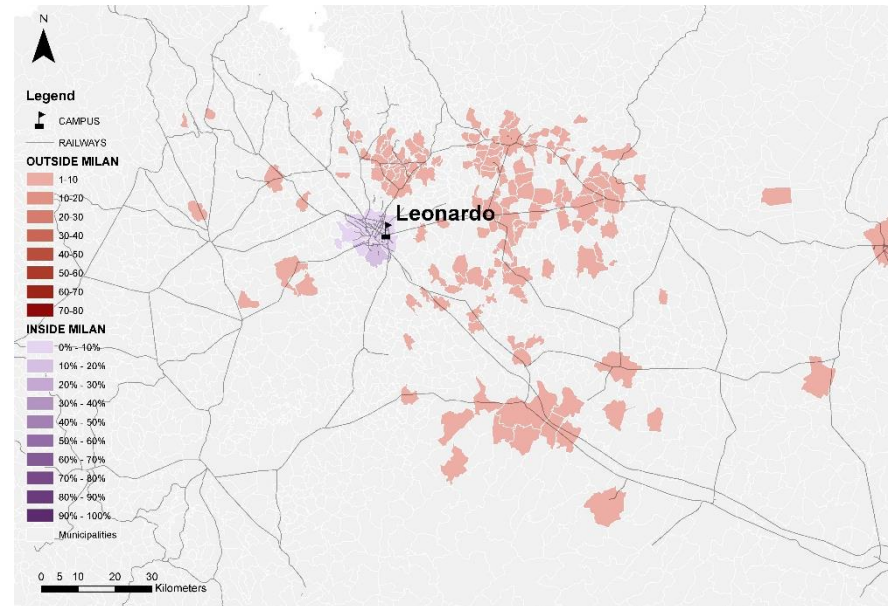


5. Distribution of the main journey made by car

CAMPUS LEONARDO

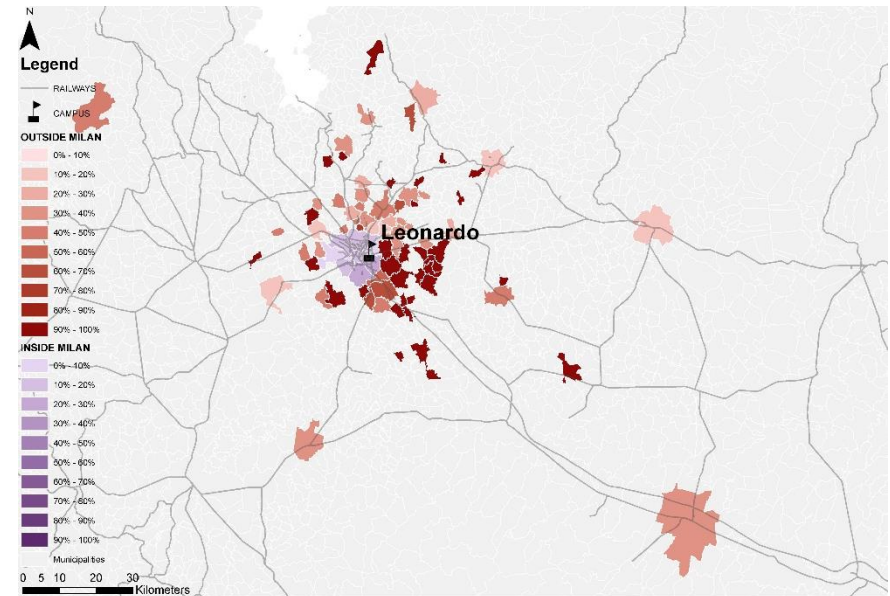
STUDENTS (1056)

- There are no places with a high percentage of car use.
- Municipalities at the east of Milan are more car dependent.
- Concentration of car users is visible in Brianza.



WORKERS (276)

- More car dependent than students outside and inside Milan.
- High concentration near the south east periphery of Milan.

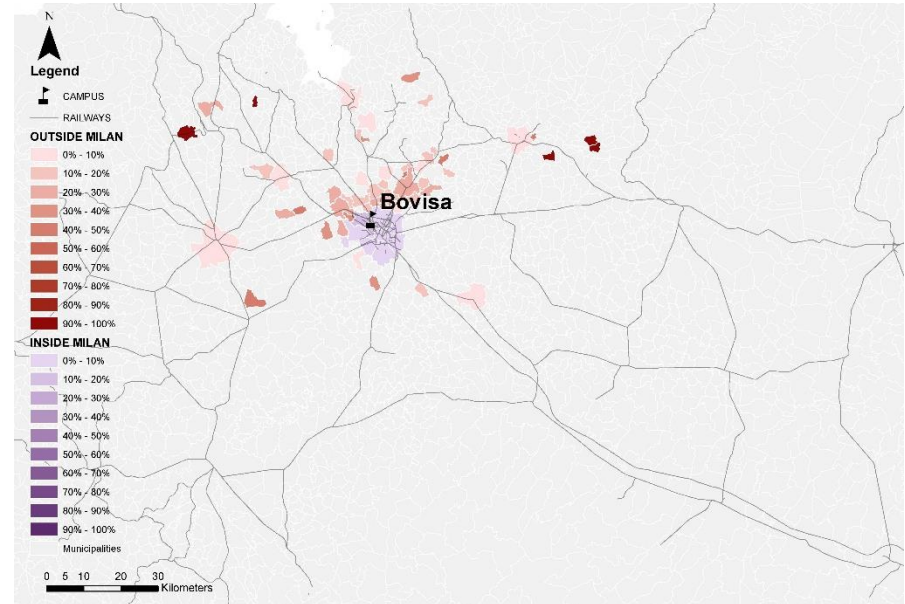


5. Distribution of the main journey made by car

CAMPUS BOVISA

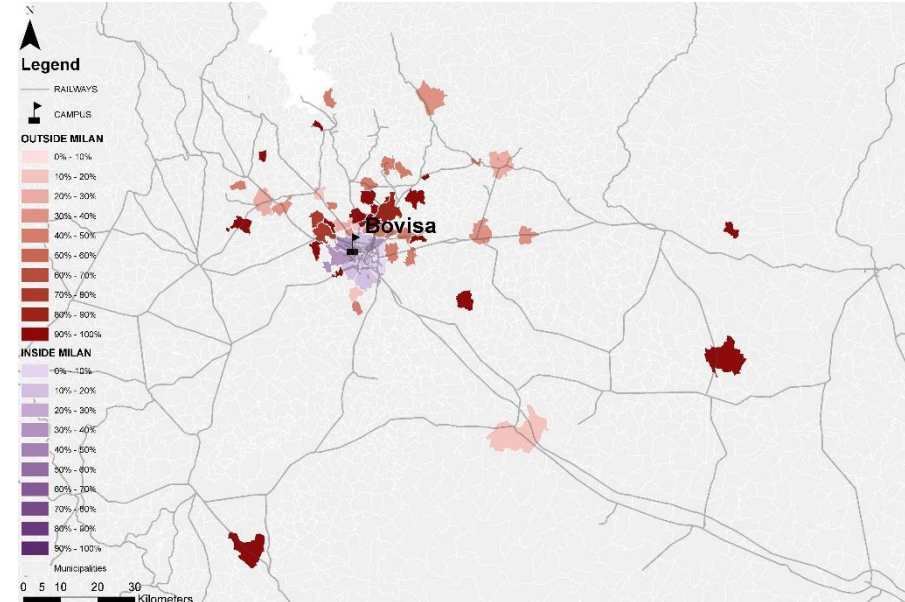
STUDENTS (248)

- Students in municipalities located in the north of Bovisa Campus are mostly the car dependents.
- Despite the existence of a consolidated train network there are places where students prefer to use the car.



WORKERS (177)

- Workers in Bovisa Campus are more likely to use the car than students if they live in areas outside Milan.
- There is a strong concentration of car users in areas faraway from the campus.

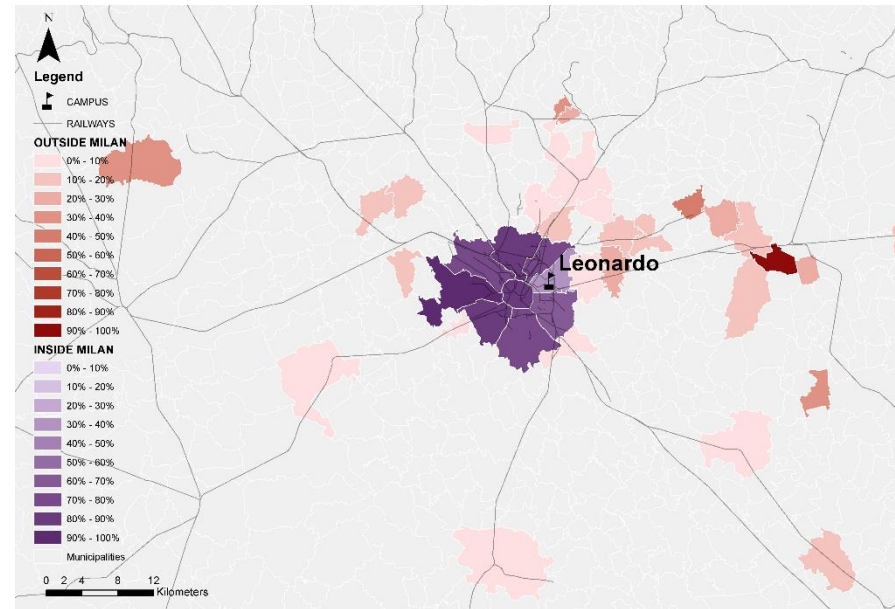


6. Distribution of the main journey made by Public Transport

CAMPUS LEONARDO

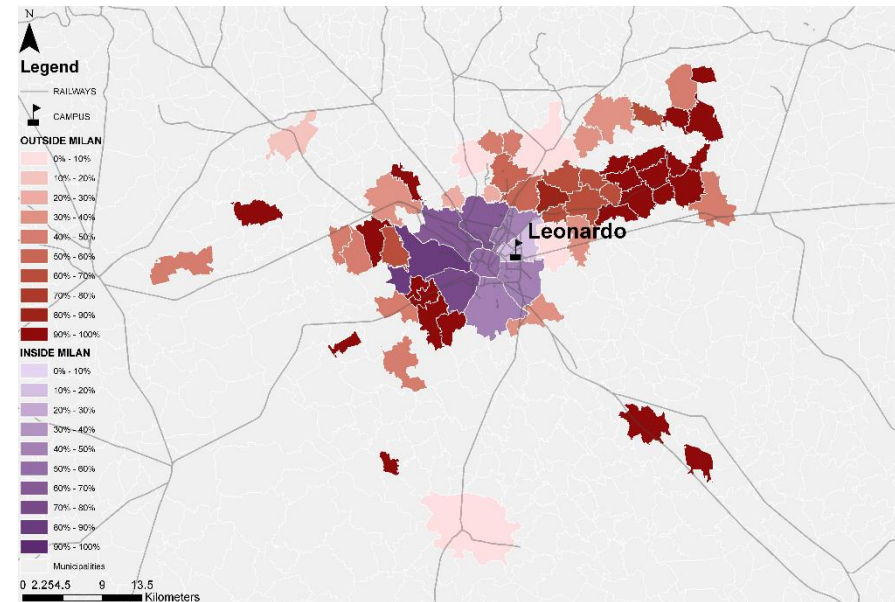
STUDENTS (1275)

- High concentration from west side of Milan.
- High concentration inside Milan however lower where Leonardo Campus is located (Zone 3).



WORKERS (416)

- High concentration in the municipalities close to Milan. Mostly in the north-east.
- Use more PuT than students outside Milan.
- Use less PuT than students inside Milan. Zone 3 is the area with less share.

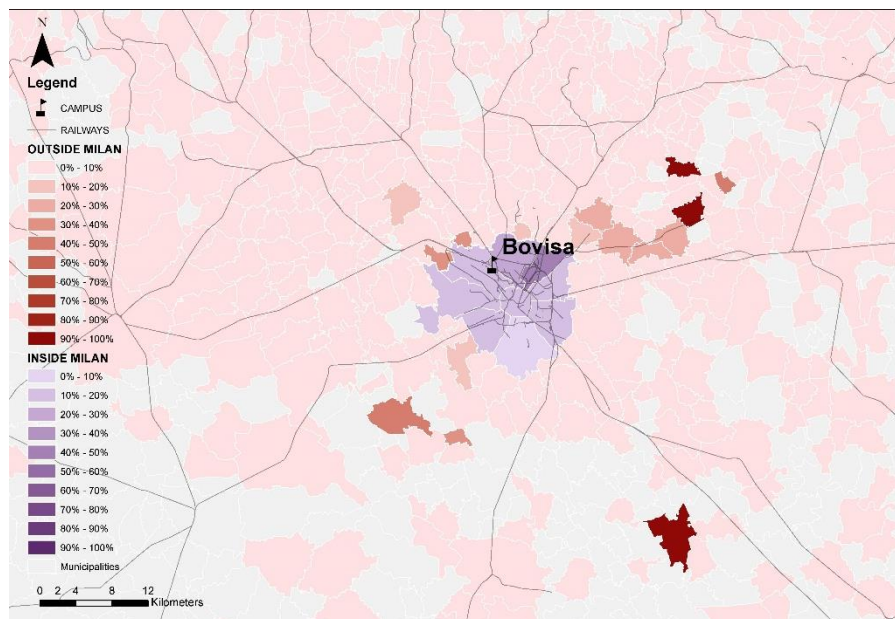


6 Distribution of the main journey made by Public Transport

CAMPUS BOVISA

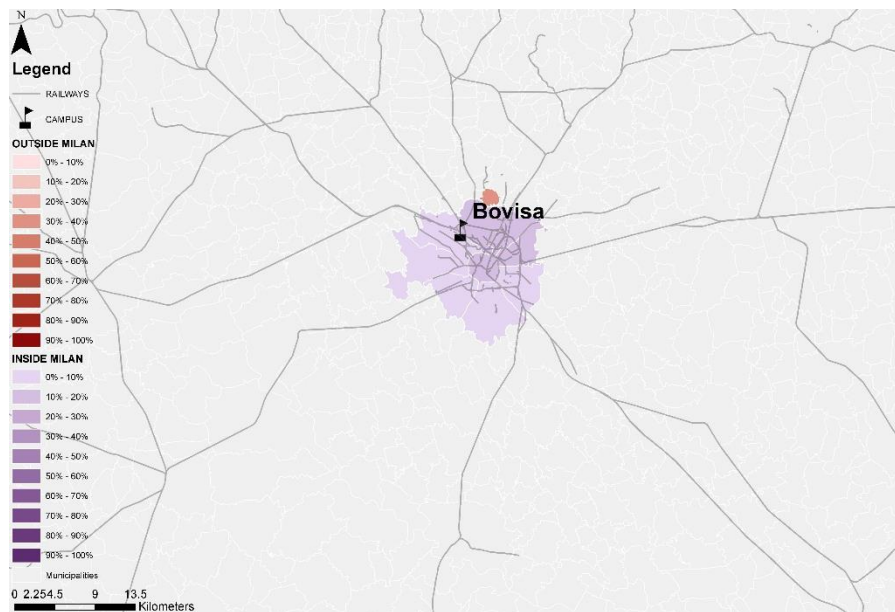
STUDENTS (393)

- Students using PuT is low despite being located in a large number.
- Students using public transportation inside Milan are mainly located in the north part.



WORKERS (41)

- Workers are not so likely to use PuT like the students.
- PuT is more used by workers living inside Milan.



7. Conclusions of the territorial interpretation – Primary Journey

- **Leonardo and Bovisa campuses attract the higher amount** of students and workers making the data of the other campuses not really significant. More than 91% of the journeys represented in the survey.
- Students and workers going to campuses outside Milan inhabit in municipalities close to them.
- **Workers** are more likely to choose the **private transportation** means than students.
- Trips with **train** as a **prevailing mode** are more common along workers and students in Politecnico di Milano.

8. Secondary Journey

- Could consider **different origin and different Politecnico campus destination** to the one considered in the first part with **different modal share**.
- The amount attracted by Leonardo and Bovisa Campuses generated by students represent in both cases almost **19%** of the primary trips.
- In the case of journeys generated by Politecnico di Milano staff the percentages are lower, **17%** for trips attracted by Leonardo and **12%** by Bovisa.
- The main difference between primary and secondary journeys is related with the most used transportation mean which in the first case is **train** and in the second one is the **car**.

8. Secondary Journey

Secondary journey							
Campus	Location	Students					
		Train	PuT	PiT	No Motorized	Other	Total
Leonardo	Outside Milan	8	297	230	3	5	543
	Inside Milan	12	321	83	122	19	557
	Total	16	379	506	7	9	917
Bovisa	Outside Milan	8	82	276	4	4	374
	Inside Milan	17	204	79	40	6	346
	Total	25	286	355	44	10	720
Grand total		41	665	861	51	19	1637

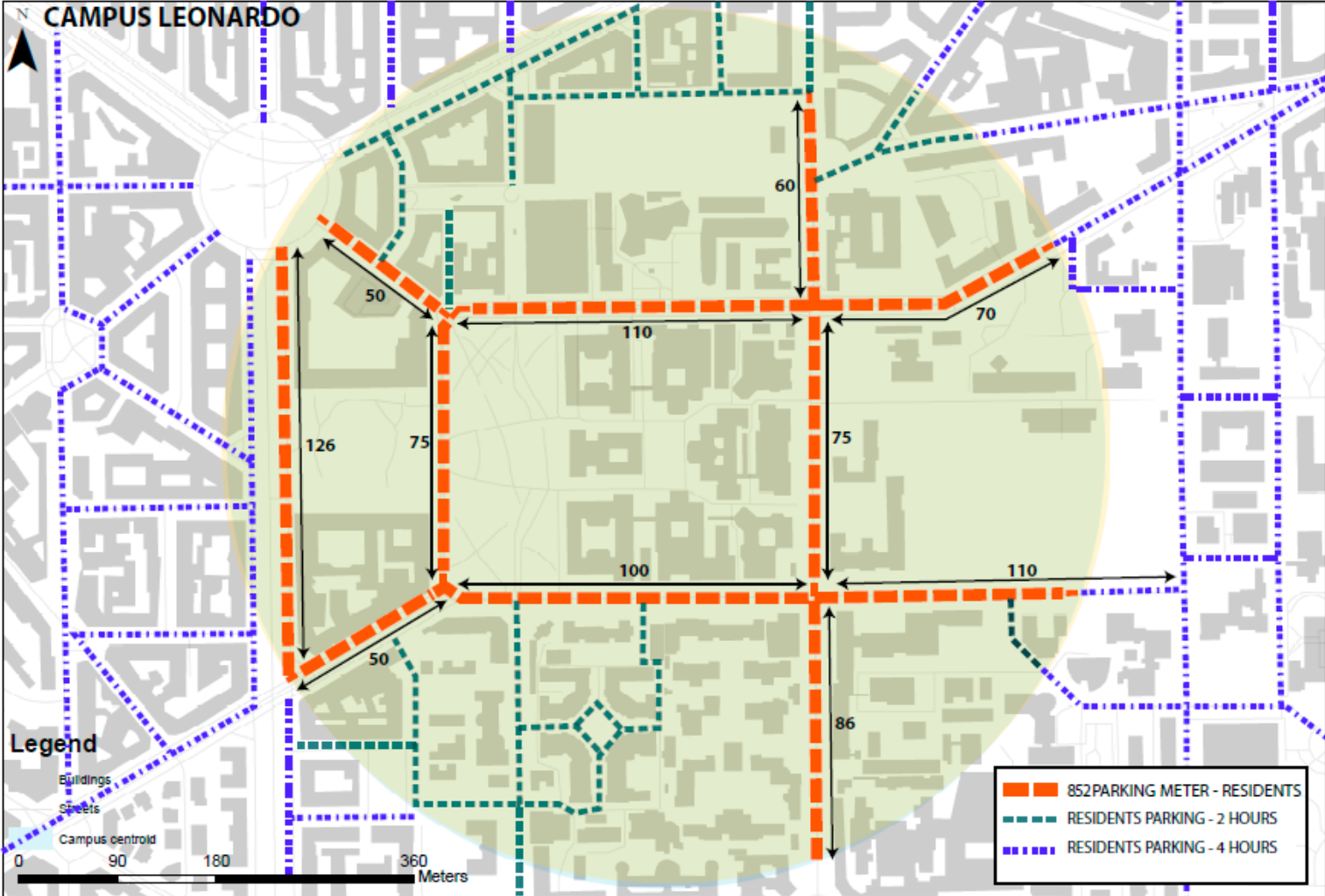
Secondary journey							
Campus	Location	Workers					
		Train	PuT	PiT	No Motorized	Other	Total
Leonardo	Outside Milan	0	0	0	0	0	0
	Inside Milan	1	92	59	87	0	239
	Total	1	92	59	87	0	239
Bovisa	Outside Milan	20	3	44	6	1	74
	Inside Milan	1	0	1	0	0	2
	Total	21	3	45	6	1	76
Grand total		22	95	104	6	1	315

9. Policies proposed to increase the use of public transportation

- **Parking meters**
- **Transit pass program**
- **Transit pass discount**
- **Bus lines**
- **Car pooling**

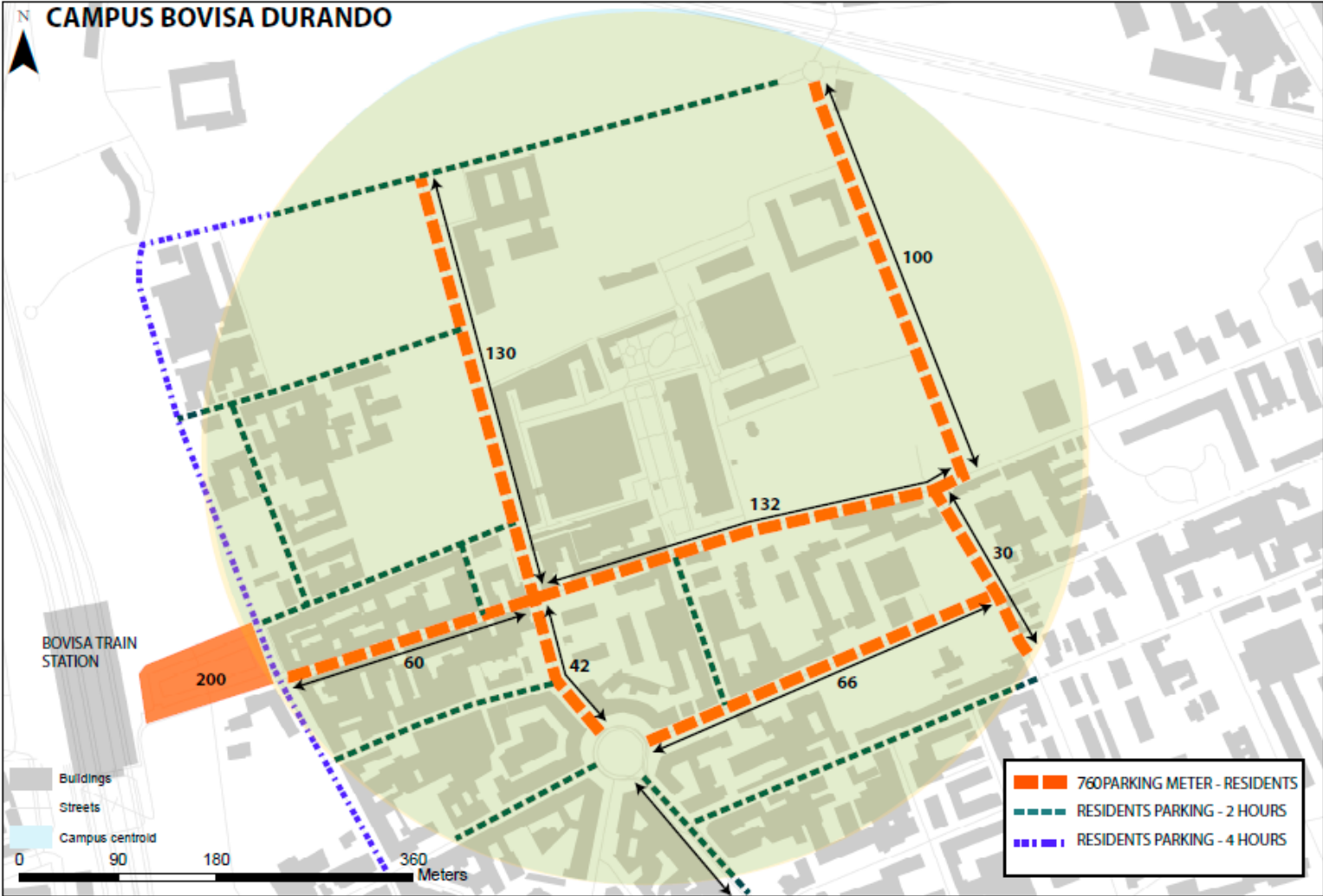
9. Policies proposed to increase the use of public transportation

- Installation of parking meters in the surrounding streets
Leonardo Campus.



9. Policies proposed to increase the use of public transportation

- Installation of parking meters in the surrounding streets
Bovisa Campus Durando.



9. Policies proposed to increase the use of public transportation

- Installation of parking meters in the surrounding streets

Bovisa Campus La Masa



9. Policies proposed to increase the use of public transportation

- Transit pass program.

The aim of the transit pass program is to provide the public transport service inside Milan and the train service outside Milan for students that attend Leonardo and Bovisa campuses

Campus	Population outside Milan extrapolated	Policy cost extrapolated outside Milan	Population inside Milan extrapolated	Policy cost extrapolated Inside Milan	Total cost policy
Leonardo	12.116	€ 4,520,091	10.609	€ 1,112,678	€ 5,632,770
Bovisa	8.734	€ 3,243,103	7.559	€ 792,803	€ 4,035,906
Totals	20850	€ 7,762,284	18.169	€ 1,905,481	€ 9,667,765

This policy appears to be the most efficient encouraging the university population to shift their means of transportation to a public.

However it is not financially sustainable.

9. Policies proposed to increase the use of public transportation

- Transit pass discount.

The principal aim of this policy is to give a discount on the train transportation for those municipalities that generate the higher quantity of main journeys with private car which means trips with a frequency equal or above 60% of the academic year.

<u>% representative trips</u>	Employees	Students	Total
Population with benefit	1251	6413	7664
Polimi Cost (50%)/year	€ 201,204	€ 1,151,807	€ 1,353,011
Polimi Cost (70%)/year	€ 120,722	€ 691,084	€ 811,806

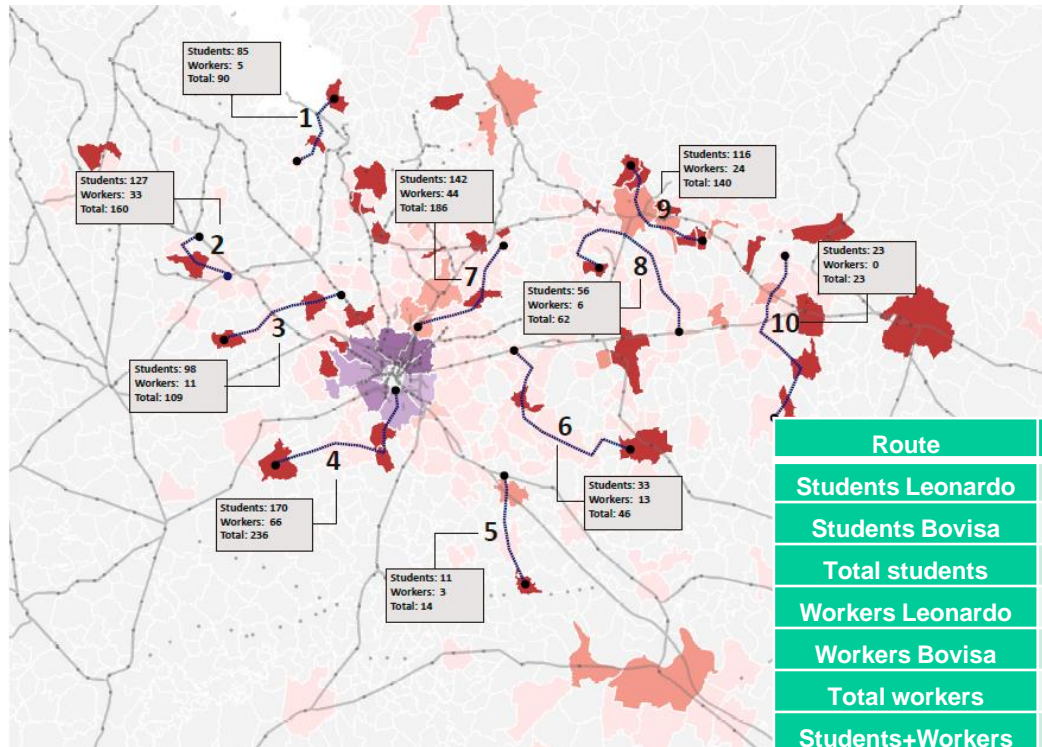
<u>% trips with car</u>	Employees	Students	Total
Population with benefit	1268	9567	10835
Polimi Cost (100%)/year	€ 456,564	€ 3,618,187	€ 4,074,751

At first sight this policy could be considered unfair because the benefit is given to those who use their car but **IT TACKLES DIRECTLY THE PROBLEM OF CAR DEPENDANCE**

9. Policies proposed to increase the use of public transportation

- Bus Lines

The main goal of this policy is to offer an effective connection between train network and those municipalities that are not good enough served by this network.



Route	1	2	3	4	5	6	7	8	9	10
Students Leonardo	47	74	51	85	5	12	88	41	71	17
Students Bovisa	38	53	47	85	6	21	54	15	45	6
Total students	85	127	98	170	11	33	142	56	116	23
Workers Leonardo	1	18	7	44	3	8	34	6	20	0
Workers Bovisa	4	15	4	22	0	5	10	0	4	0
Total workers	5	33	11	66	3	13	44	6	24	0
Students+Workers	90	160	109	236	14	46	186	62	140	23

Everyone of the 10 different bus routes proposed allow us to evidence that the demand will be sufficient and could legitimize the creation of this special routes.

9. Policies proposed to increase the use of public transportation

- Carpooling

Some universities around the world have a platform in the internet to facilitate car sharing in an exclusive way just for members of the community. As driver or passenger these platforms allows save routes and locations to offer and search a fast, safe and easy trip from or to the university



Carpooling. Los Andes University, 2016.

10. Final considerations

- The proposals are made in order to have the possibility to put all of them together.
- The present proposal could give the mobility managers inputs for decision making in terms of sustainable mobility.
- Computations about impact of policies are not developed yet.