Session: La Neutralité Climatique Des Transports Individuels : Quelles Organisations Territoriales ?

The Combination of Collective and Individual Modes in the Hauts-de-France Region:

A Quantitative Observation of On-board Small Vehicles

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1. Background

Emerging Micromobility

Active travel and **micromobility** [1]
- Transportation system diversity

"***New Mobilities Paradigm***" [2]
- Multimodality and accessibility
- "First- and last-mile" solution [3]

Economic, social and environmental **benefits** [1]
- Efficient, affordable, and healthy mobility
- Improve access to public transport

Fig. 1: Extract from a Ride-Along Interview by E-Scooter

Illustration: Moinse (Lille, 2022)

[1] **Litman, T.** (2021). *New Mobilities : Smart Planning for Emerging Transportation Technologies*. Island Press. ISBN: 978-1-64283-145-0
[2] **Sheller, M., & Urry, J.** (2006). *The New Mobilities Paradigm*. Environment and Planning A: Economy and Space, 38(2), 207-226. https://doi.org/10/brd7rf
[3] **Holm Møller, T., Simlett, J., & Mugnier, E.** (2020). "Micromobility : Moving cities into a sustainable future" (p. 36) [*EY Report*].

1. Background

Towards Transit Metropolises

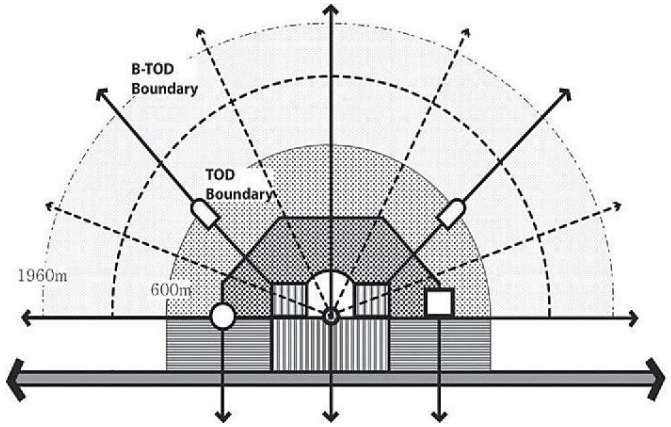
Intermodality can bridge the gap left by public transport [4; 5; 6]

- Practices expected to be enhanced in the future
- Increasing patronage by up to 9% by 2030 [7]

Transit Metropolises [8; 9]

- Balance between hybrid urban forms and mobility systems
- Bicycle-based Transit-Oriented Development [10]

Fig. 2: Spatial Context and Configuration of Bicycle-based Transit-Oriented Development [9]



[4] **Wiel, M.** (1998). *Comment gérer la transition urbaine*. Recherche - Transports - Sécurité, 58, 3-20. https://doi.org/10/bgdbhw
[5] **Oostendorp, R., & Gebhardt, L.** (2018). *Combining means of transport as a users' strategy to optimize traveling in an urban context: Empirical results on intermodal travel behavior from a survey in Berlin*. Journal of Transport Geography, 71, 72-83. https://doi.org/10/gfhf3j
[6] **Amar, G.** (2016). Homo *mobilis: Une civilisation du mouvement* (2e édition). FYP EDITIONS. ISBN: 978-2-36405-133-1
[7] **Ensor, M., Maxwell, O., & Bruce, O.** (2021). "Mode shift to micromobility" (N° 674; p. 110). *Waka Kotahi NZ Transport Agency research*.
[8] **Cervero, R.** (1998). *The Transit Metropolis: A Global Inquiry* (Island Press). ISBN: 1-55963-591-6
[9] **Cervero, R.** (2019). Chapter 7 - *The transit metropolis: A 21st century perspective*. Transportation, Land Use, and Environmental Planning, 131-149. https://doi.org/10/ghdkt4
[10] **Lee, J., Choi, K., & Leem, Y.** (2016). *Bicycle-based transit-oriented development as an alternative to overcome the criticisms of the conventional transit-oriented development*. International Journal of Sustainable Transportation, 10(10), 975-984. https://doi.org/10.1080/15568318.2014.923547

1. Background

Contributions of the Academic Literature

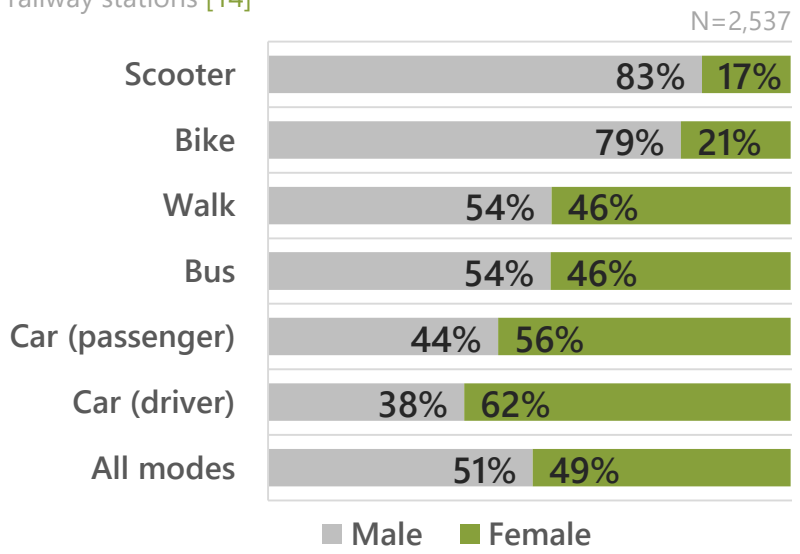
Similarities and differences between e-scooter and bicycle users? [11]

- E-scooters appeal to a **broader demographic group** than cycling: Young and males [12]

≠

- E-scooter modal split as **young** (45-60%) **and male** (80-85%) as cycling [13; 14; 15]

Fig. 3: Gender Distribution by Feeder Mode in the 12 surveyed railway stations [14]



[11] McKenzie, G. (2019). *Spatiotemporal comparative analysis of scooter-share and bike-share usage patterns in Washington, D.C.* Journal of Transport Geography, 78, 19-28. https://doi.org/10/ggxxcf

[12] Curl, A., & Fitt, H. (2020). *Same same, but different? Cycling and e-scootering in a rapidly changing urban transport landscape*. New Zealand Geographer, 76. https://doi.org/10/gjj3sf

[13] Pages, T., Lammoglia, A., & Josselin, D. (2021). *Les nouveaux modes de déplacement individuel doux basés sur l'électrique. Attractivité et insertion modale.* Territoire en mouvement Revue de géographie et aménagement. Territory in movement Journal of geography and planning.

[14] Moinse, D., Goudeau, M., L'Hostis, A., & Leysens, T. (2022). *An Analysis of Intermodal Use of Electric and Human-powered Scooters with Train in the Provence-Alpes-Côte d'Azur Region, in France: Towards Extended Train Station Areas?* https://halshs.archives-ouvertes.fr/halshs-03523112

[15] Nel·lo Deakin, S., Bach Coma, X., & Pérez Sans, N. (2022). *Noves mobilitats quotidianes a la metròpoli de Barcelona. La irrupció del patinet elèctric: Tendències recents i oportunitats.* In CAP A LA METRÒPOLI 2030. REPTES EMERGENTS, CONEIXEMENTS INNOVADORS (Anuari Metropolità de Barcelona 2021, p. 133-154)., ISBN: 972-84-92940-50-9

1. Background

Limits of the Academic Literature

Lack of knowledge regarding light electric mode users [16]

To what extent does the modal share of intermodal users relying on emerging micromobility can be characterized?

Specific methods for data collection and analysis of users combining micromobility and transit [17]

- **No standardised method** of capturing data from privately owned micromobility devices [18]

- Survey Analysis
- Interviews
- Meta-Analysis
- Big Data
- Automatic Counting
- **Direct Observation**

[16] **Richer, C.** (2021, mars 16). [Dossier Mobilités] #11 - *Micromobilités et intermodalités : L'enjeu des engins de déplacement personnels*. construction21.org.
[17] **Oeschger, G., Carroll, P., & Caulfield, B.** (2020). Micromobility and public transport integration : The current state of knowledge. Transportation Research Part D: Transport and Environment, 89, 102628. https://doi.org/10/gkzn9h
[18] **Ensor, M., Maxwell, O., & Bruce, O.** (2021). "Mode shift to micromobility" (N° 674; p. 110). *Waka Kotahi NZ Transport Agency research*.

2. Methods

Definition of the Quantitative Observation

Ethnographic Observation

Building **sample questions** [19]
Collecting data by **action** [19]

On-site Counting

Counting the **occurrences** [20]
Detachment and **objectification** [21]

Quantitative Observation

Data collection tool for **systematicity** [21]**:**

1. Massification
2. Descriptive Statistics
3. Visual Recording Technology
4. Desynchronisation
5. Time Reversibility
6. Proof Logic

[19] **Peneff, J.** (1995). *Mesure et contrôle des observations dans le travail de terrain. L'exemple des professions de service*. Sociétés Contemporaines, 21(1), 119-138. https://doi.org/10/cjk8q5
[20] **Michiels-Philippe, M.-P.** (1984). *L'Observation* (Delachaux Et Niestlé édition). Delachaux et Niestlé. ISBN: 2603005324
[21] **Filion, N.** (2011). *Compter le réel*. Terrains travaux, 19(2), 37-55. https://doi.org/10/gn382z

2. Methods

Main Objectives

Identifying the **weight** and **specifying** micromobility users combined with public transport, at a regional scale:

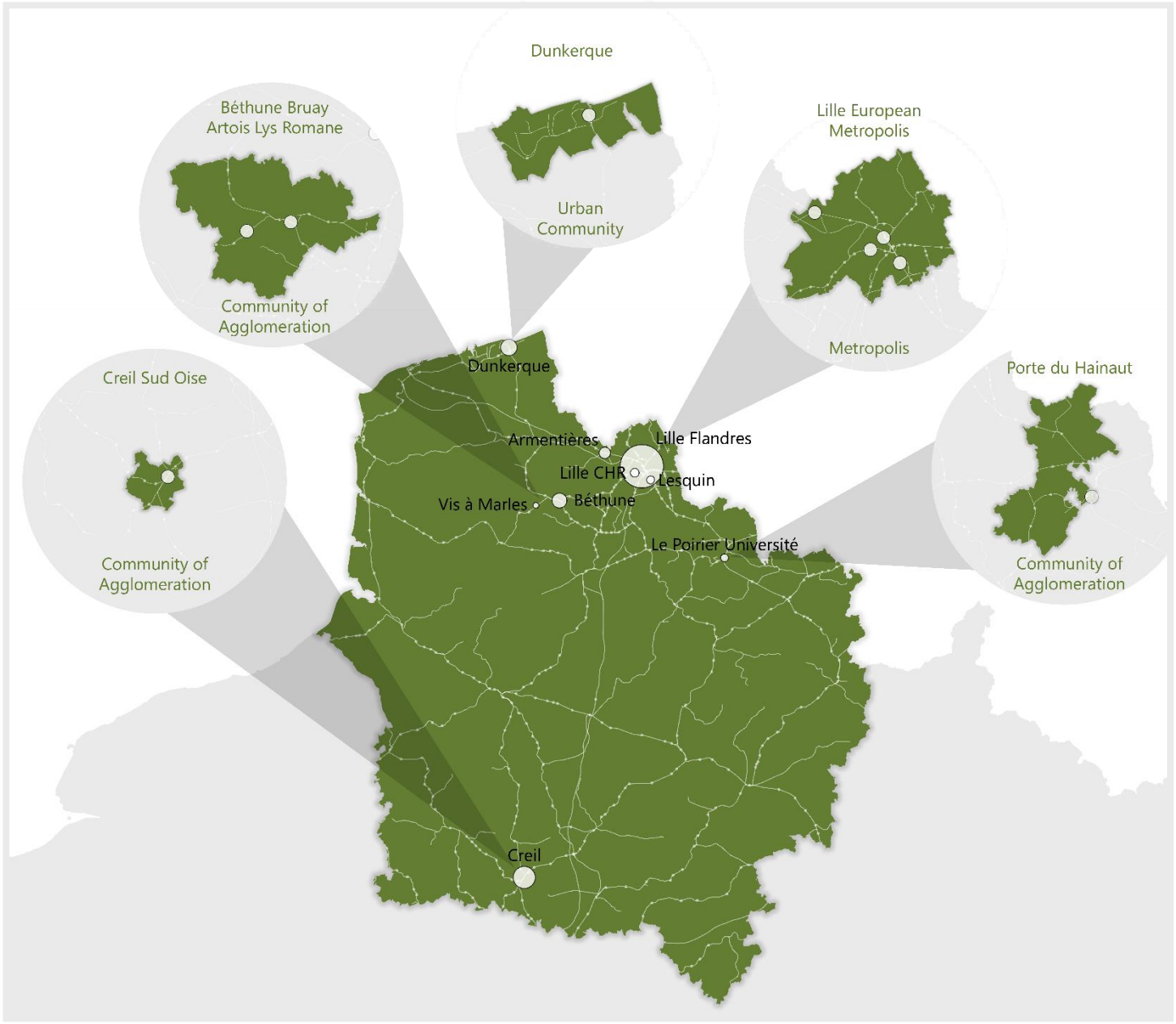
1. Measuring the **modal share** of micro-modes [22]
2. Determining the **age and gender gap** among users [23]
3. Comparing **various areas** according to their urban features [22]

[22] **Paugam, S., & Collectif.** (2012). *L'enquête sociologique*. Presses Universitaires de France - PUF., ISBN: 978-2-13-060873-8
[23] **Corbillé, M.-A., & Huet, M.** (2020). "Espace public : Méthodes pour observer et écouter les usagers" (C16TV0249).

2. Methods

Observation Sites

Fig. 4: Map of the Five Intermunicipalities Surveyed in the Hauts-de-France Region



Realisation: Moinse and L'Hostis, 2022

2. Methods

Protocol

Railway Stations	Lille Flandres (1), Lille CHR (2), Lesquin (3), Béthune (4), Armentières (5), Le Poirier-Université (6), Dunkerque (7), Vis-à-Marles (8), and Creil (9)
Period	**April**, **May**, and **June** 2022
Time Range	For each station: **Tuesday** and **Thursday** at peak hours (from **7 A.M. to 9:30 A.M.** and from **4:30 P.M. to 7 P.M.)**
Material	Mobile **camera** with tripod, poster, research logbook, high-visibility jacket, name badge, and administrative documents
Subjects	**On-board modes** with regional (**TER**) and high-speed trains (**TGV**)

Fig. 5: Video Recording Material for Quantitative Observation at Lille Flandres Train Station

Illustration: Moinse (Lille, 2022)

2. Methods

Protocol

On-Board Mode

PI	Walking
VC	Conventional Bike
VP	Folding Bike
VE	Electric-powered Bike
TM	Kick Scooter
TE	Electric-powered Scooter
AU	Other personal mobility device

Gender

F	Female
H	Male
Inc	Unknown

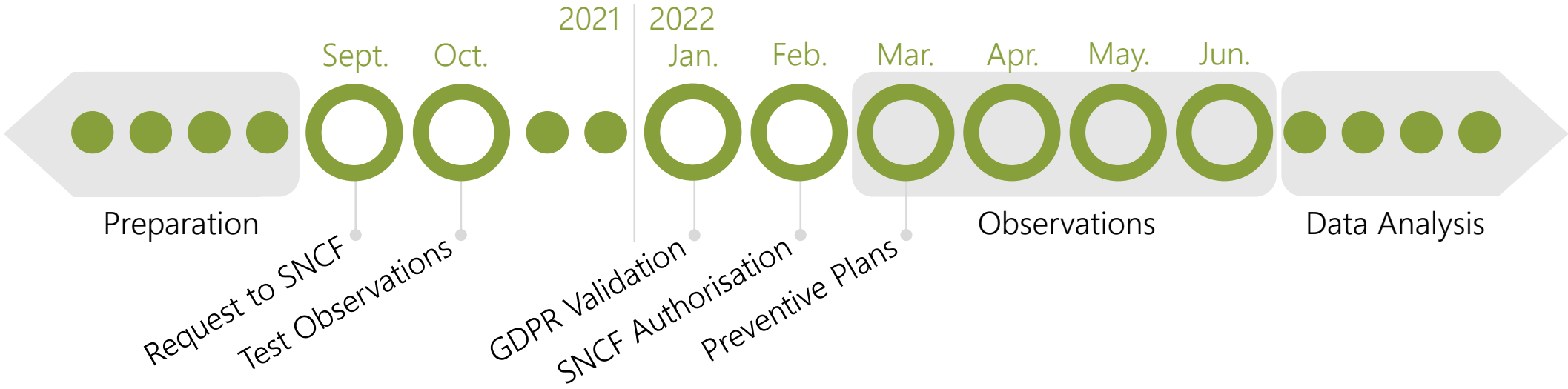
Age Groups

1	Youth (<18)
2	Young Adult (18 to 35)
3	Adult (36 to 55)
4	Senior (>56)
Inc	Unknown

Linked encoding: **Mode_Gender_Age**

2. Methods

Calendar



- **General Data Protection Regulation** (GDPR) compliance
- **SNCF Gares & Connexions** investigation permission
- **Test** observations (N=4,924)
- **Recorded** observations (N=15,435)

2. Methods

Data Analysis

Fig. 5: Manual Detection of Queried Variables

Illustration: Moinse (Dunkerque, 2022)

Information for each observed line:
Departure / Terminal Train Stations
Access / Egress
Train Type
Line Identification
Day / Hour
Weather / Temperature
Disruptions
Video Recoding ID
Statistical File ID

3. Results and Discussion

Passengers and Micromobility Sample

N°	Station	Period	Observed Passengers	Passengers with Micromobility	Sampled Lines
1	Lille Flandres	5 / 7 April	5,836	287 (4.92%)	40
2	Lille CHR	12 / 14 April	1,025	122 (11.90%)	42
3	Lesquin	19 / 21 April	309	53 (17.15%)	27
4	Béthune	26 / 28 April	1,281	96 (7.49%)	13
5	Armentières	3 / 5 May	2,324	145 (6.24%)	31
6	Le Poirier Université	10 / 12 May	280	45 (16.07%)	43
7	Dunkerque	17 / 19 May	2,221	187 (8.42%)	28
8	Vis à Marles	31 / 2 June	3	0 (0%)	6
9	Creil	7 / 9 June	2,159	100 (4.63%)	28
TOTAL			15,435	1,035 (6,71%)	258

3. Results and Discussion

An Underestimated Micromobility Modal Share?

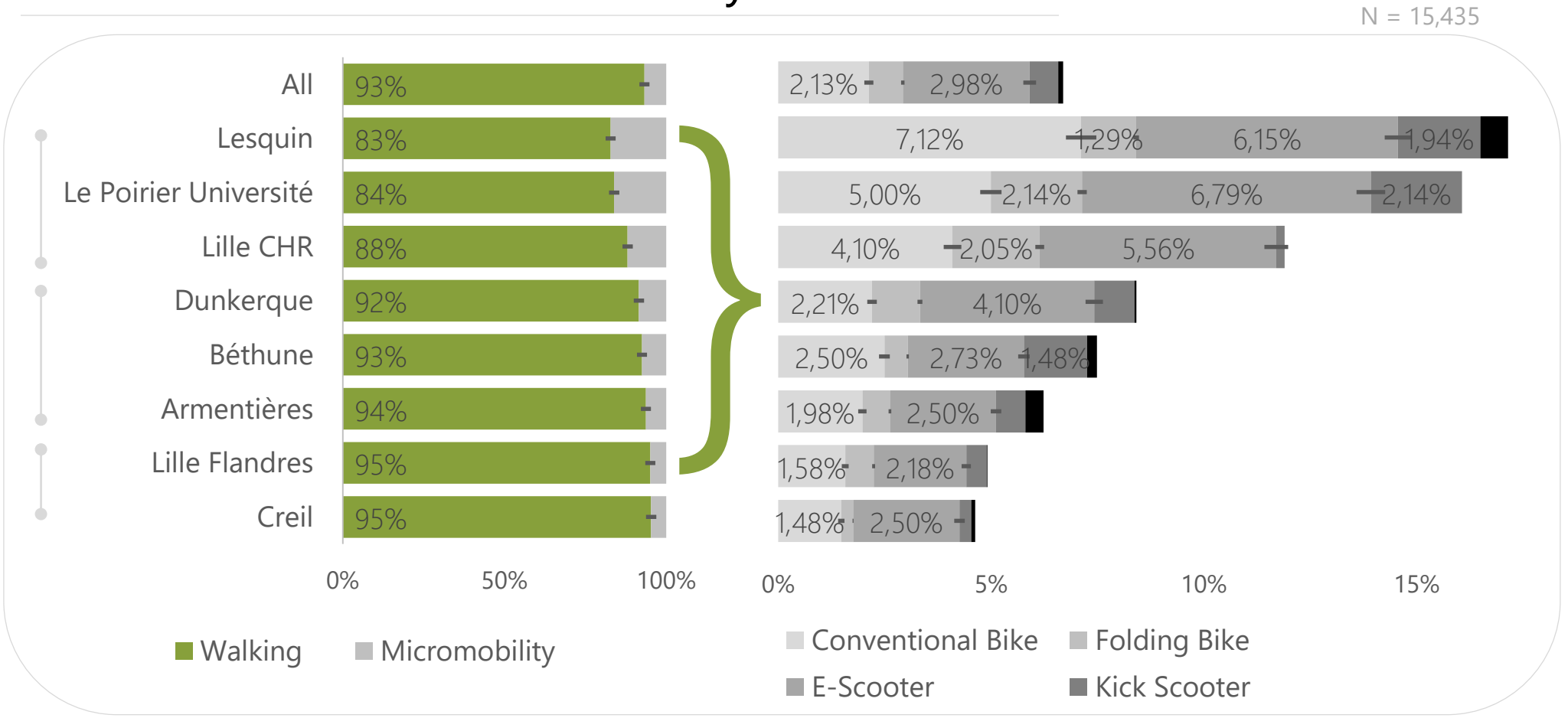


Fig. 6: Estimated Modal Share for Each Surveyed Rail Station

Realisation: Moinse and L'Hostis, 2022

3. Results and Discussion

Age Distribution

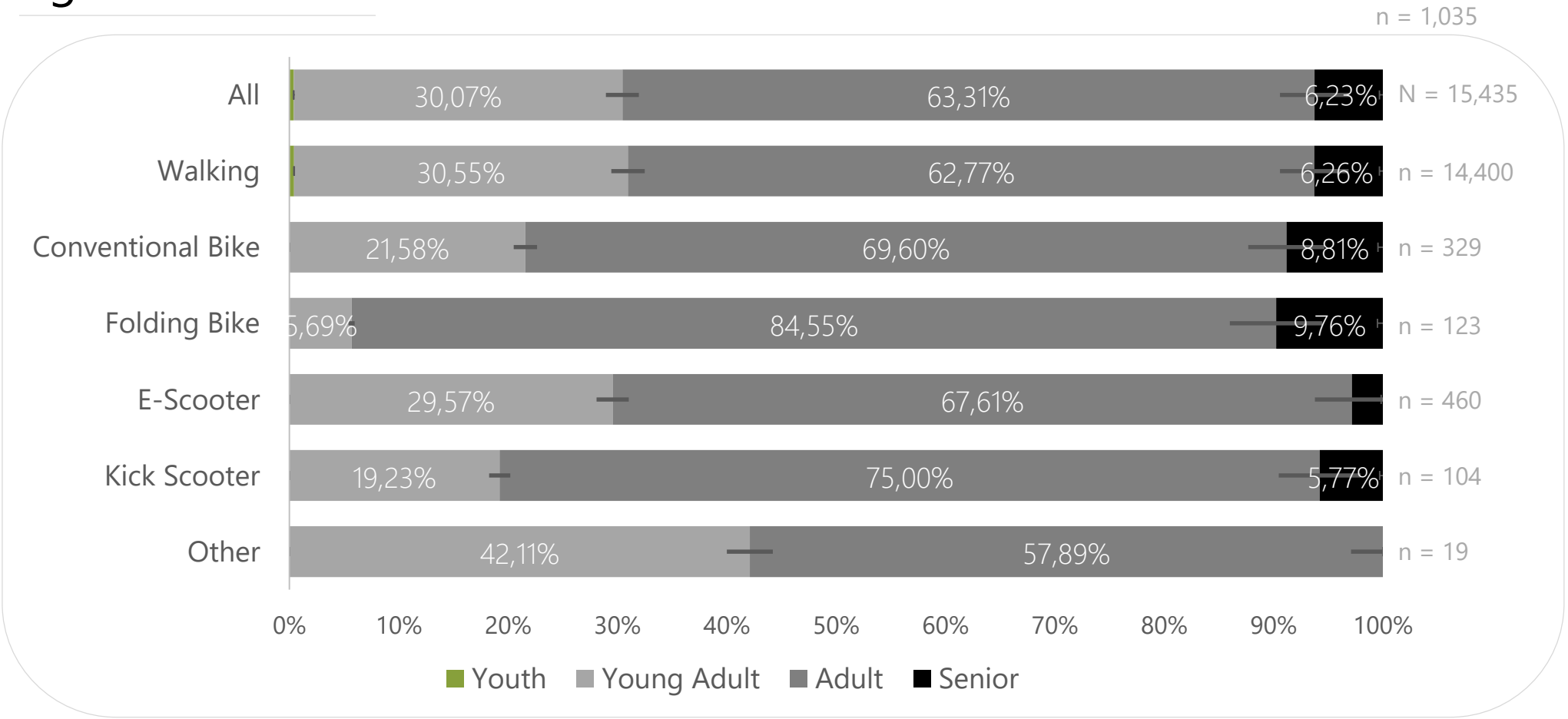


Fig. 7: Distribution of Passengers by Mode and by Age Categories

Realisation: Moinse and L'Hostis, 2022

3. Results and Discussion

Gender Distribution

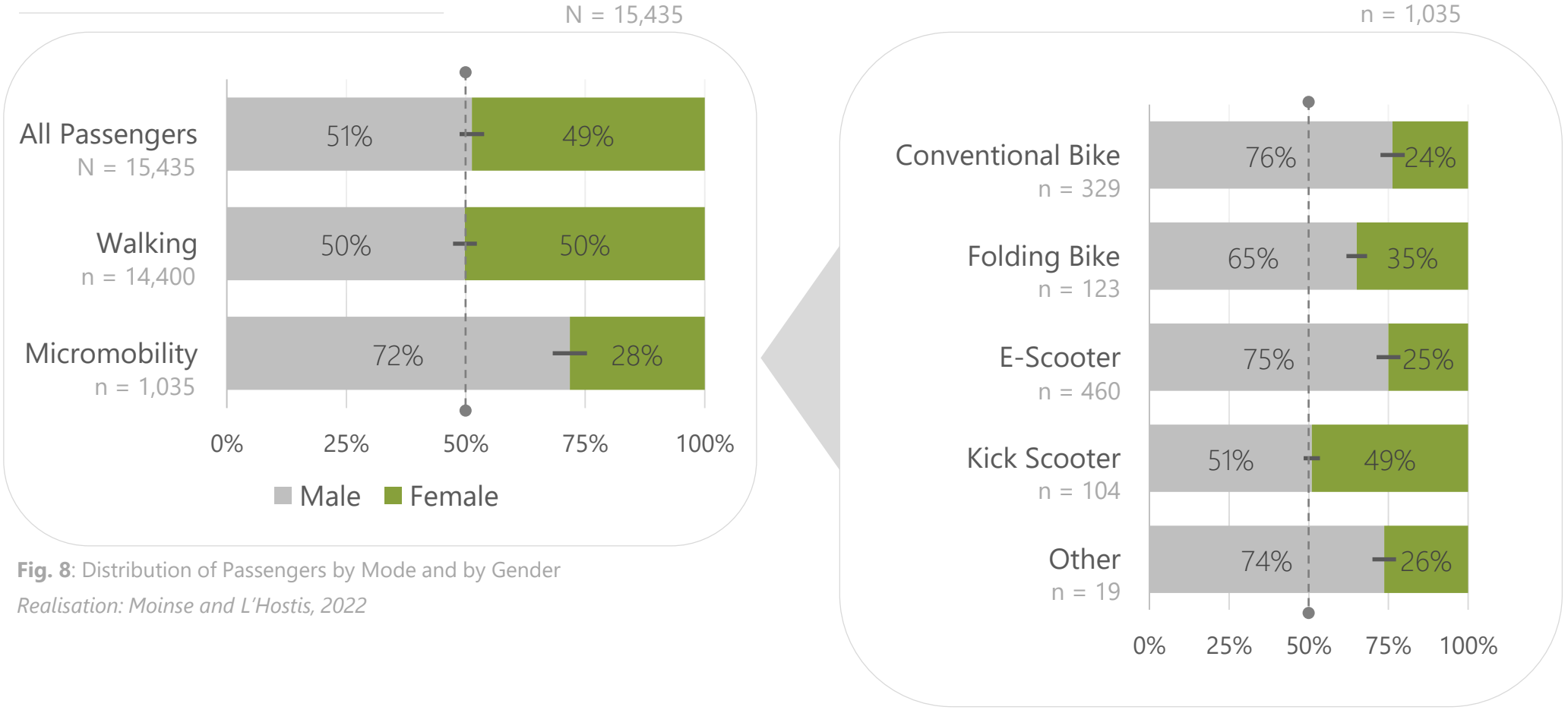


Fig. 8: Distribution of Passengers by Mode and by Gender

Realisation: Moinse and L'Hostis, 2022

3. Results and Discussion

Overview

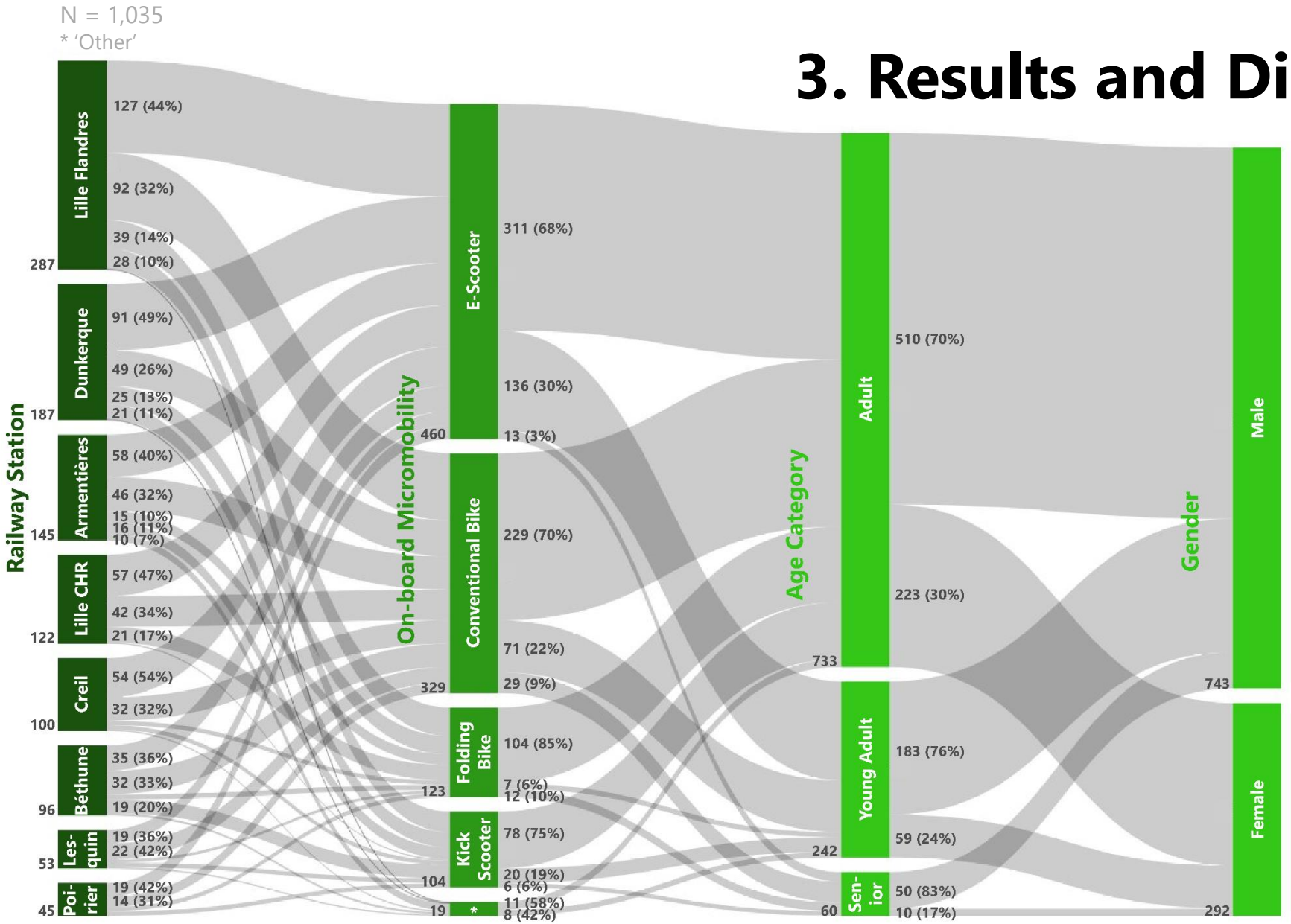


Fig. 9: Overview of Passenger Distribution by Railway Station, Micro-mode, Gender, and Perceived Age Categories

Realisation: Moinse and L'Hostis, 2022

3. Results and Discussion

Overcoming Gender Biases

Hypothesis: Women's modal shares by bicycle are partly explained by the territory's cyclability, and parity could be achieved from a given threshold.

Bikeability

'[…] An assessment of an entire **bikeway network** for perceived comfort and convenience and access to important destinations' [26]

Two additional French Databases:

Insee Population Census - Commuting Mobility Flows (2018) [24]	Modal share and Socio-demographic variables for 7,932,895 individuals
Fédération des Usagers de la Bicyclette's Cycling City Barometer (2021) [25]	Bikeability Ratings by 277,000 users

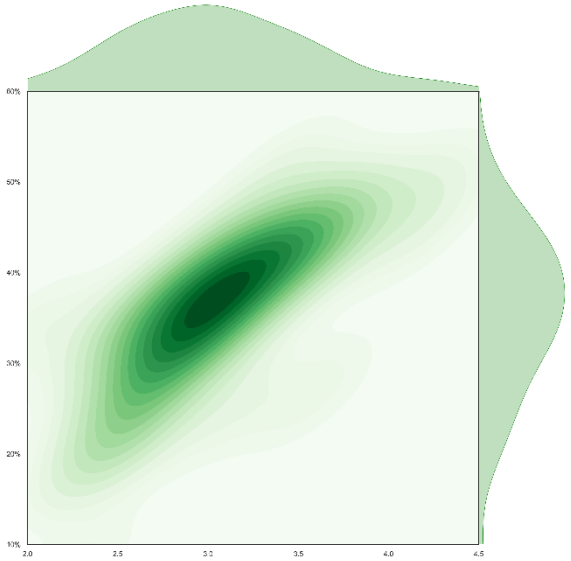
[24] **Fédération des Usagers de la Bicyclette**. (n. d.). *Parlons-Vélo : Baromètre des Villes Cyclables*. Parlons-Vélo : Baromètre des Villes Cyclables. Consulted on 27th June 2022, https://barometre.parlons-velo.fr
[25] **Institut National de la Statistique et des Études Économiques (Insee)** (n. d.). *Mobilités professionnelles en 2018 : déplacements domicile - lieu de travail. Recensement de la population - Base flux de mobilité*. Consulted on 27th June 2022, https://www.insee.fr/fr/statistiques/5393835
[26] **Lowry, M. B., Callister, D., Gresham, M., & Moore, B.** (2012). *Assessment of Communitywide Bikeability with Bicycle Level of Service*. Transportation Research Record: Journal of the Transportation Research Board, 2314(1), 41. https://doi.org/10/gqgtzj

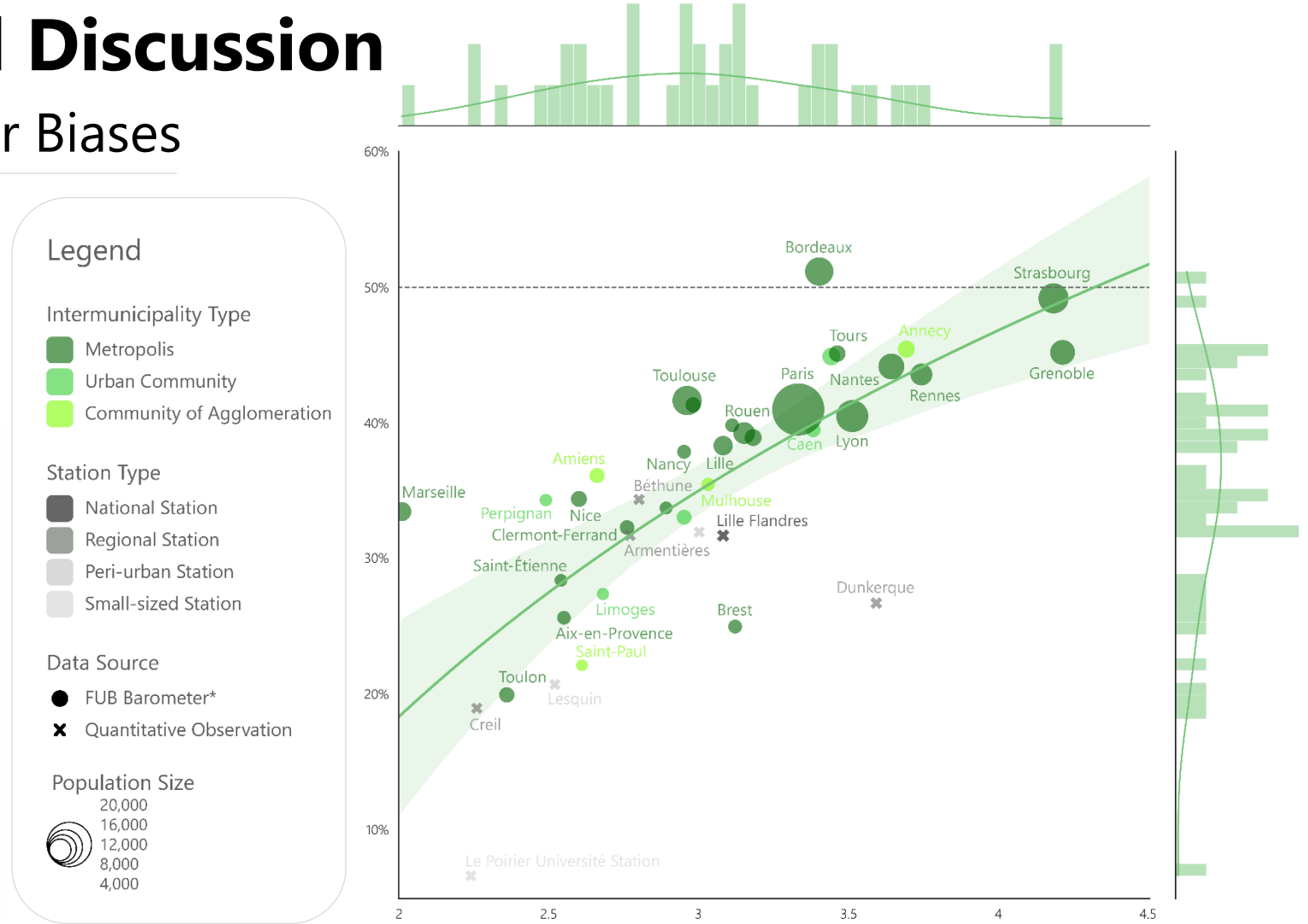
3. Results and Discussion

Overcoming Gender Biases

Fig. 10: Logarithmic Association between Gender Cycling and City Bikeability Rating (/6) around 32 Cities and 6 Train Stations

N=38 / Total Sample = 7,948,330 / Sub-sample = 220,098
y = 0,4112ln(x) - 0,1014
R^2 = 0,5522 (R^2 = 0,577, n=32)





** Source: 275,000 cyclists and non-cyclists expressed their feelings in 1,625 municipalities to constitute a French Cycle City Barometer in the 2021 edition, carried out by the Fédération des Usagers de la Bicyclette. (https://barometre.parlons-velo.fr/)*
*** Source: Commuting flows database from the 2018 French population census (https://www.insee.fr/fr/statistiques/5393835#documentation)*
Realisation: Moinse and L'Hostis, 2022

3. Results and Discussion

Overcoming Gender Biases

Walkability related to gender-balanced proportions [27]

Cycling gender gap:
- More protected bike lanes = more women cyclists [28]
- Require **whole street/suburb changes** [29]
- May not support cycling among **diverse populations** [30]

[27] **Jensen, W. A., Stump, T. K., Brown, B. B., Werner, C. M., & Smith, K. R.** (2017). *Walkability, complete streets, and gender: Who benefits most?* Health & Place, 48, 80-89. https://doi.org/10/ghd94g

[28] **Kuntzman, G.** (2022, mai 25). *More Protected Bike Lanes = More Women Cyclists, New Study Shows*. Streetsblog New York City. https://nyc.streetsblog.org/2022/05/25/protected-bike-lanes-are-an-equity-issue-new-study-shows/

[29] **Shaw, C., Russell, M., Keall, M., MacBride-Stewart, S., Wild, K., Reeves, D., Bentley, R., & Woodward, A.** (2020). *Beyond the bicycle: Seeing the context of the gender gap in cycling*. Journal of Transport & Health, 18, 100871. https://doi.org/10/gqgst9

[30] **Braun, L. M.** (2021). *Disparities in Bicycle Commuting: Could Bike Lane Investment Widen the Gap?* Journal of Planning Education and Research, 0739456X21993905. https://doi.org/10.1177/0739456X21993905

4. Conclusions

Main Findings and Perspectives

1. A **greater proportion** of rail passengers by micromobility than estimated, particularly with regard to the rise of **e-scooter**.
2. Highly **disparate patterns** of intermodal micromobility use.
3. Making cities **more cycling-friendly** moves towards more **inclusive** use of micromobility.
4. Completes the **questionnaire** (sample adjustment)

Methodological **limitations**:

- Subjectivity and human biaises
- Selection of train stations and lines
- Marginalisation of parking and shared services
- No knowledge of passenger trip origins and destinations

Combination of observation and interview methods [31]

[31] Corbillé, M.-A., & Huet, M. (2020). *Espace public : Méthodes pour observer et écouter les usagers* (C16TV0249).

4. Conclusions

Contact

Illustration: Moinse, 2021

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Grateful to:

SNCF Gares & Connexions
- Hauts-de-France - Normandie Regional Management
- Train Station Managers and Operators

Gustave Eiffel University
- Data Protection Officers (DPO)

Supporting volunteer investigators
- Iñigo AGUAS ARDAIZ
- Jordan BASSETTI
- Romain LABESSE

Appendices

Quantitative Observation Approach

Focused Observation ≠ Floating Observation

- Observation framework on a specific object
- Hypothesis

Qualitative counting can be adapted by modern techniques

*Source: **Corbillé, M.-A., & Huet, M.** (2020). Espace public : Méthodes pour observer et écouter les usagers (C16TV0249).*

Appendices

Ridership on Surveyed Train Stations

Train Stations (Municipality)	Passengers (2019)	Passengers (2020)	Department	City's Population (2019)	Agglomeration
Lille Flandres (Lille)	21,809,569	13,906,563	Nord	234,475	Métropole Européenne de Lille
Creil (Creil)	5,096,215	3,384,293	Oise	36,169	CA Creil Sud Oise
Dunkerque (Dunkerque)	1,931,759	1,241,973	Nord	86,279	CU de Dunkerque
Béthune (Béthune)	1,838,636	1,134,785	Pas-de-Calais	25,039	CA de Béthune-Bruay, Artois-Lys Romane
Armentières (Armentières)	793,833	613,551	Nord	24,909	Métropole Européenne de Lille
Lille CHR (Lille)	287,018	192,628	Nord	234,475	Métropole Européenne de Lille
Lesquin (Lesquin)	181,001	102,760	Nord	9,012	Métropole Européenne de Lille
Le Poirier Université (Trith-Saint-Léger)	176,451	74,327	Nord	6,292	CA Valenciennes Métropole
Vis à Marles (Marles-les-Mines)	35,853	8,560	Pas-de-Calais	5,542	CA de Béthune-Bruay, Artois-Lys Romane

*Source: **SNCF Open Data**, 2022*

Appendices

Methods

1. Lille Flandres

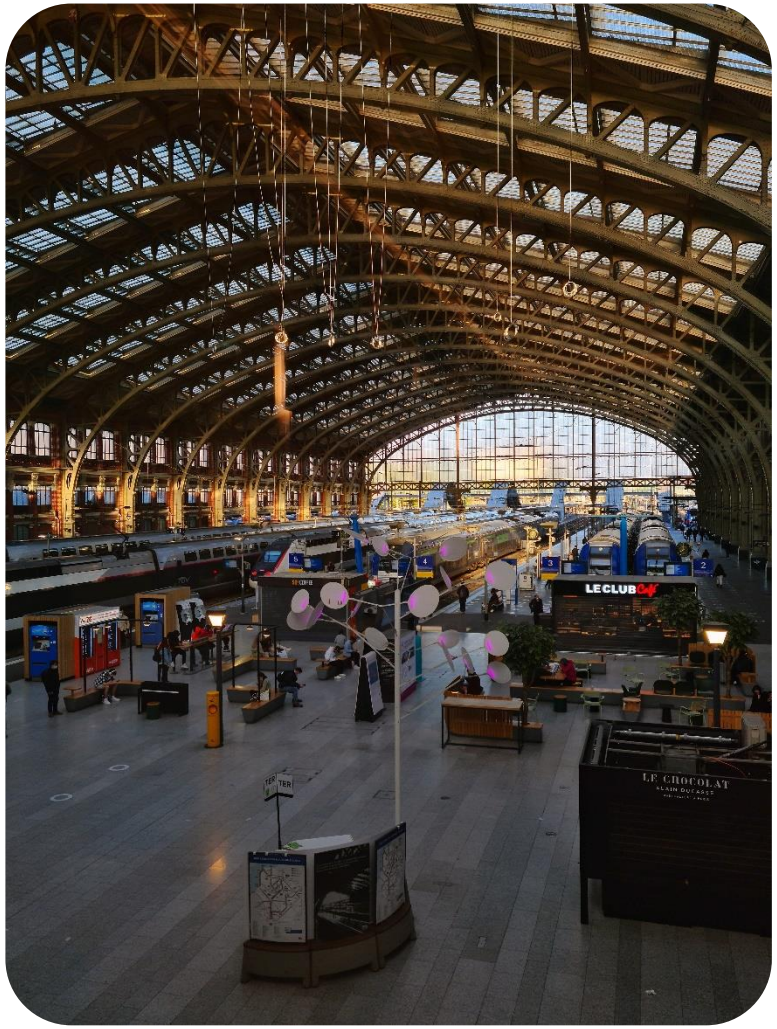


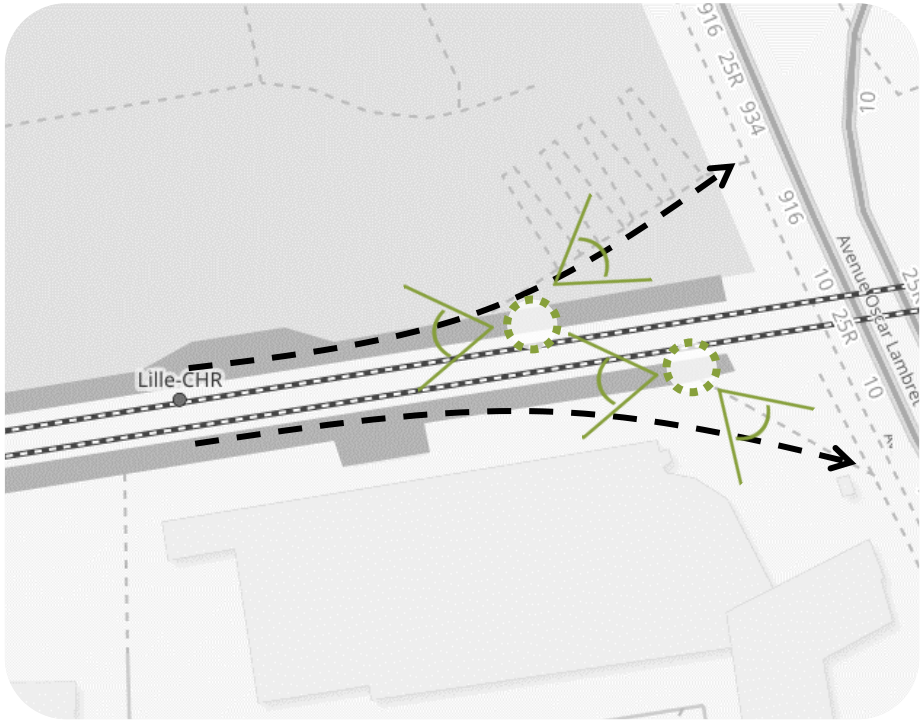
Illustration: Moinse, 2022

*Source: **OpenStreetMap**, 03/07/2022*

Appendices

Methods

2. Lille CHR



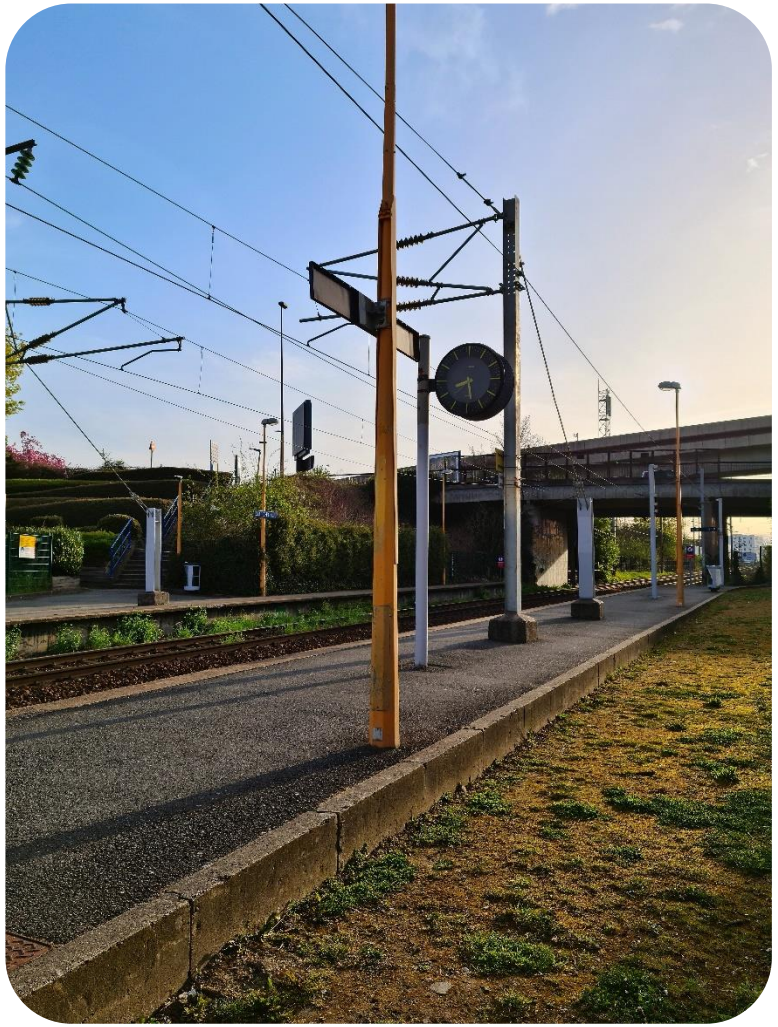


Illustration: Moinse, 2022

Source: ***OpenStreetMap****, 03/07/2022*

Appendices

Methods

3. Lesquin

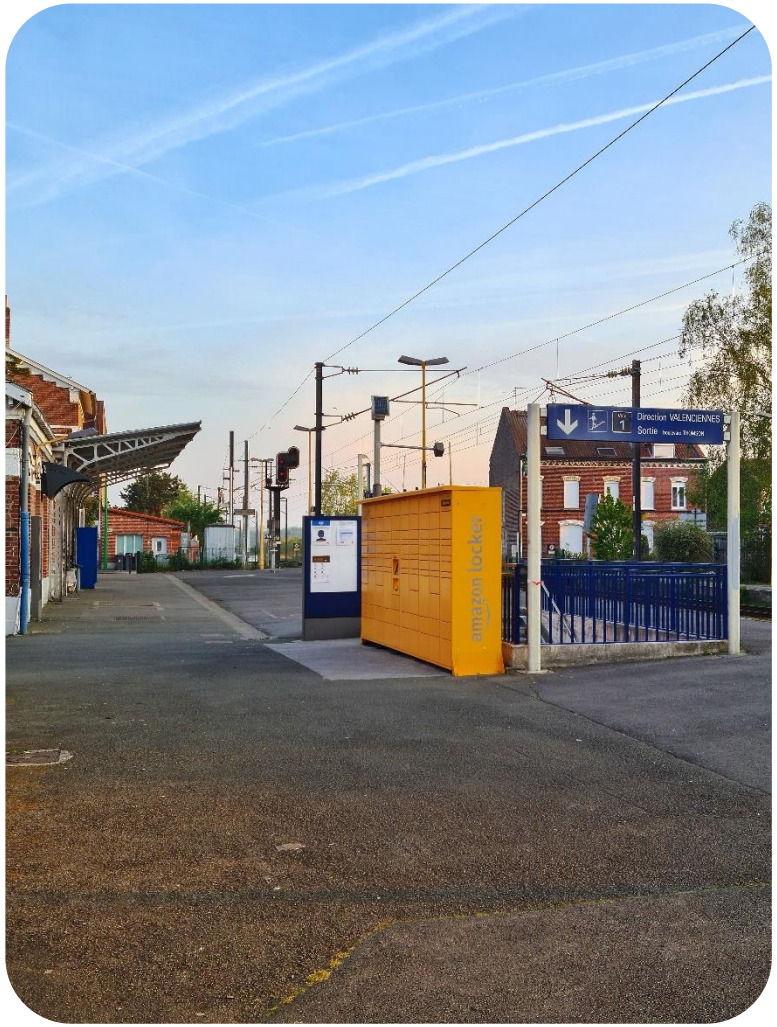


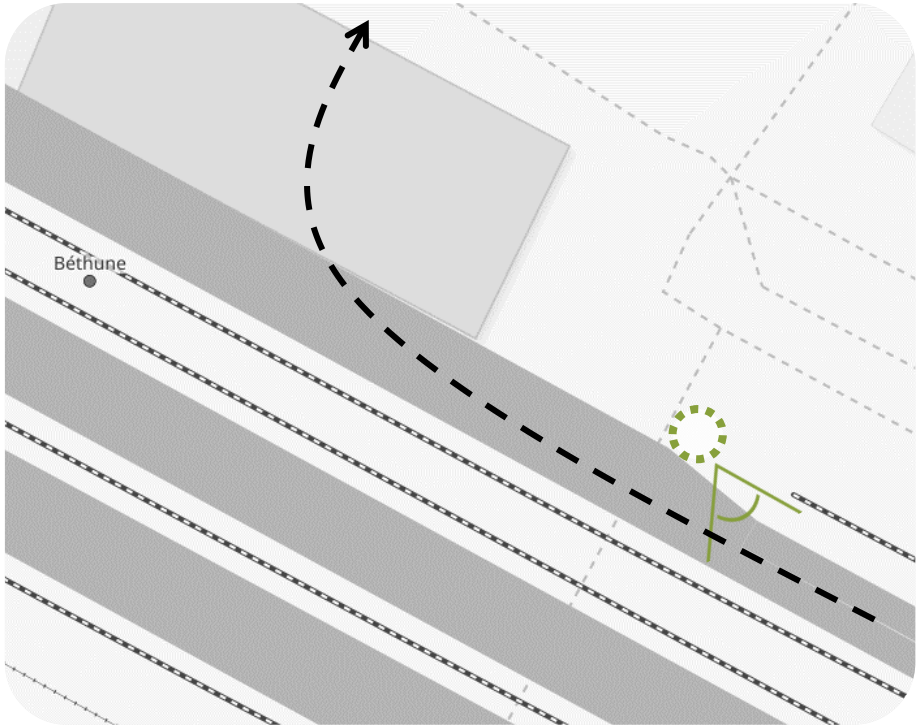
Illustration: Moinse, 2022

Source: ***OpenStreetMap****, 03/07/2022*

Appendices

Methods

4. Béthune



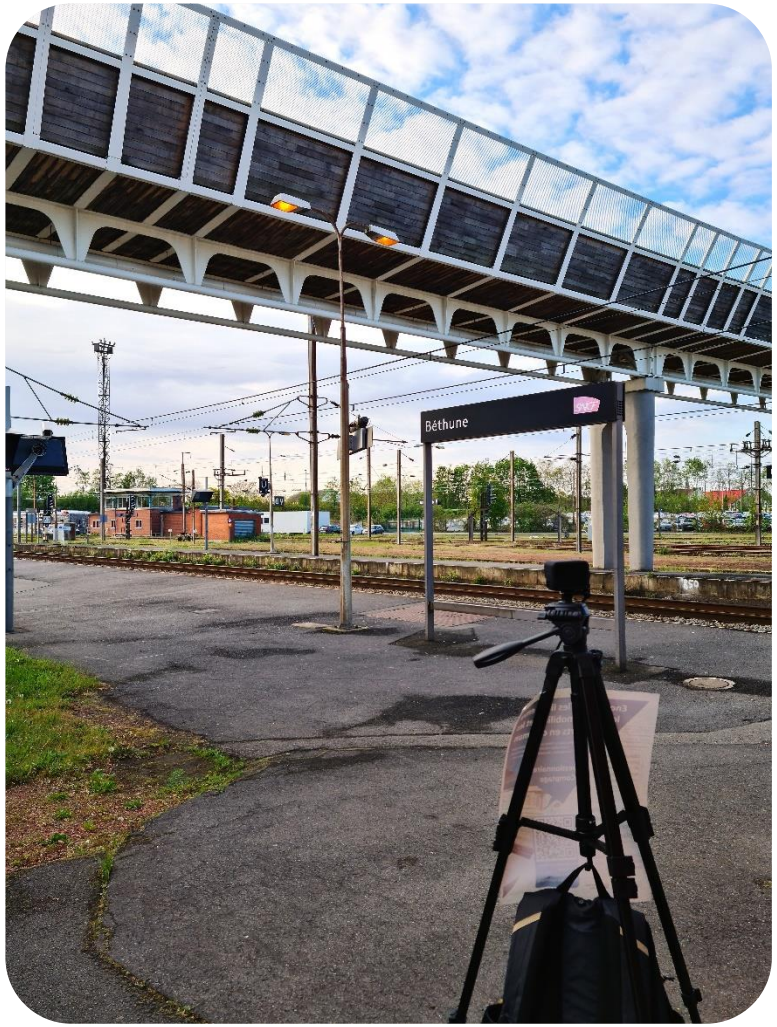


Illustration: Moinse, 2022

*Source: **OpenStreetMap**, 03/07/2022*

Appendices

Methods

5. Armentières

Illustration: Moinse, 2022

Source: ***OpenStreetMap****, 03/07/2022*

Appendices

Methods

6. Le Poirier Université

Source: ***OpenStreetMap***, *03/07/2022*

Illustration: Moinse, 2022

Appendices

Methods

7. Dunkerque

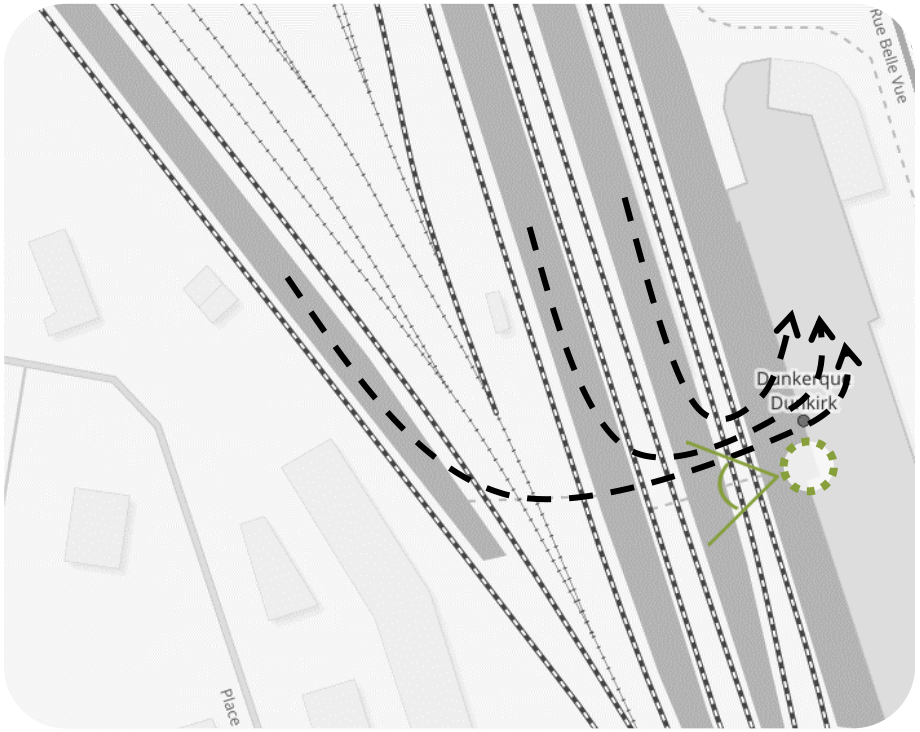


Illustration: Moinse, 2022

Source: ***OpenStreetMap****, 03/07/2022*

Appendices

Methods

8. Vis à Marles (Marles-les-Mines)

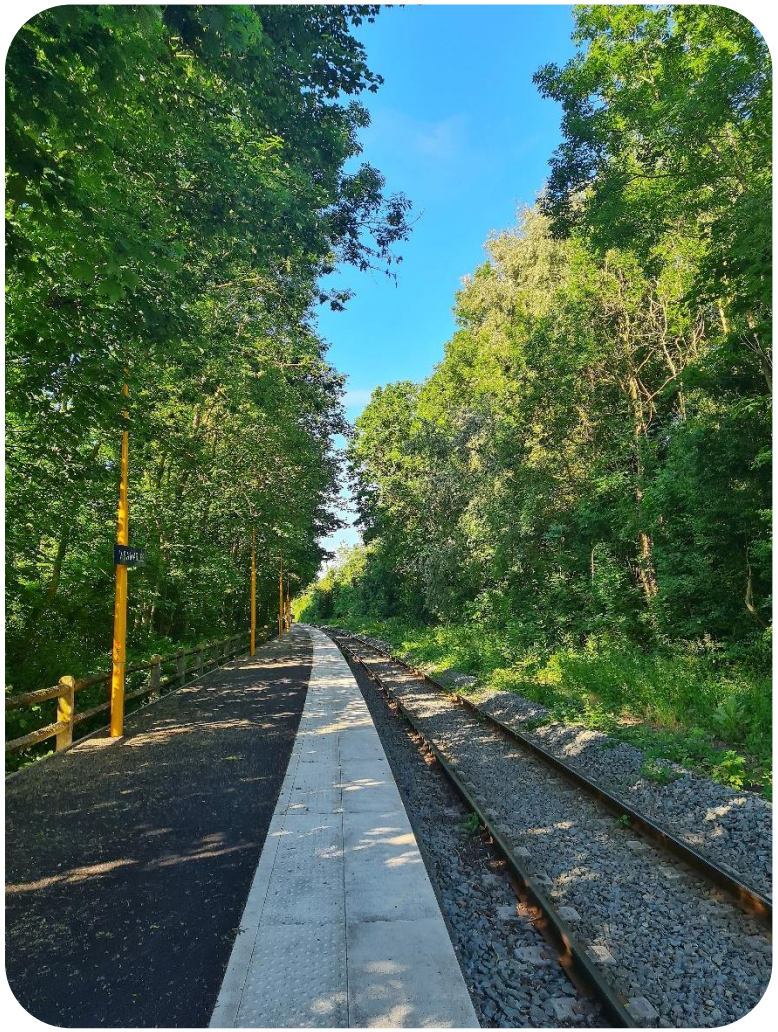


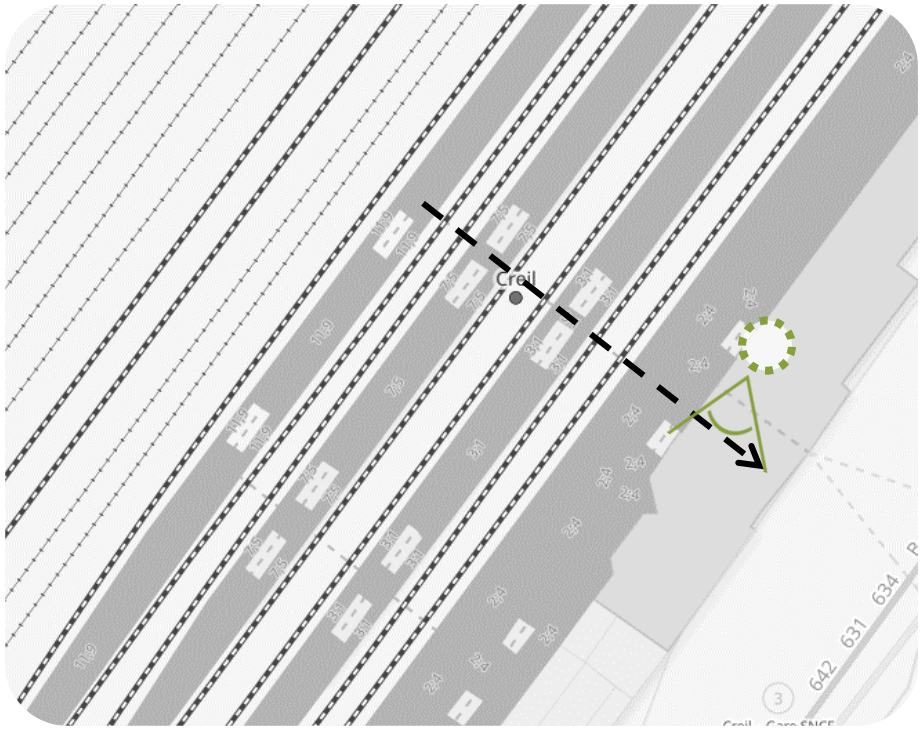
Illustration: Moinse, 2022

Source: ***OpenStreetMap****, 03/07/2022*

Appendices

Methods

9. Creil



Source: ***OpenStreetMap****, 03/07/2022*

Illustration: Moinse, 2022

Appendices

FUB's 2021 Cycling Cities Barometer

In 2021, the **French Federation of Bicycle Users (FUB)** surveyed a quarter of a million bike riders about the cycling climate in their town or city.
Cyclists were asked to rate their municipality based on 5 different categories:

1. **General Feeling**
2. **Safety**
3. **Comfort**
4. **Efforts of the Municipality**
5. **Parking and Bicycle Services**

Outcomes: 277,000 contributions and 1 million points ; in 1,625 ranked municipalities
Conditions: A minimum of 50 responses / municipality, in the survey

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N	**/6 Notation**	C	/6 Comfort
A	/6 General Feeling	D	/6 Efforts of the City
B	/6 Safety	E	/6 Parking & Services

Municipality	N	A	B	C	D	E
Grenoble (3,009)	4.21	4.18	4.04	4.37	4.44	4.04
Strasbourg (2,060)	4.18	4.17	4.11	4.27	4.33	4.01
Rennes (2,060)	3.74	3.83	3.40	3.67	3.88	3.91
Annecy (1,471)	3.69	3.54	3.24	3.76	4.03	3.90
Nantes (3,300)	3.64	3.68	3.35	3.61	3.70	3.86
Lyon (4,439)	3.51	3.51	3.20	3.54	3.64	3.67
Tours (1,296)	3.46	3.45	3.15	3.34	3.67	3.69
Bordeaux (1,916)	3.40	3.42	3.20	3.29	3.49	3.60
Angers (1,193)	3.44	3.47	3.10	3.42	3.39	3.81
Caen (1,264)	3.38	3.36	3.08	3.39	3.34	3.75
Paris (9,116)	3.33	3.27	3.06	3.31	3.61	3.40
Dijon (1,060)	3.18	3.18	2.84	3.01	2.94	3.92
Montpellier (3,461)	3.16	3.19	2.86	2.80	3.58	3.95
Brest (1,578)	3.12	3.07	2.74	3.06	2.97	3.76
Rouen (777)	3.11	3.10	2.78	2.95	3.22	3.52
Lille (1,819)	3.08	3.12	2.85	3.04	2.86	3.56
Mulhouse (358)	3.03	2.89	2.73	3.03	2.80	3.69
Orléans (849)	2.98	2.88	2.65	2.95	2.78	3.65
Toulouse (4,304)	2.96	2.96	2.65	3.05	2.66	3.47
Nancy (975)	2.95	2.78	2.63	2.88	2.82	3.64
Reims (907)	2.96	2.95	2.53	2.92	3.02	3.35
Metz (685)	2.89	2.91	2.64	2.93	2.57	3.42
Clermont Ferrand (970)	2.76	2.60	2.25	2.61	2.69	3.65
Limoges (316)	2.68	2.70	2.33	2.29	2.66	3.41
Amiens (835)	2.66	2.61	2.30	2.55	2.44	3.38
Saint Paul (200)	2.61	2.86	2.40	2.41	2.62	2.74
Nice (591)	2.60	2.58	2.37	2.36	2.54	3.15
Aix en Provence (681)	2.55	2.50	2.23	2.50	2.47	3.04
Saint Étienne (765)	2.54	2.43	2.13	2.39	2.36	3.38
Perpignan (276)	2.49	2.49	2.21	.272	2.27	2.78
Toulon (340)	2.36	2.41	2.23	2.40	2.24	2.53
Marseille (2,745)	2.01	1.85	1.72	1.82	1.95	2.71
TOTAL (53,700)	3.07	3.05	2.77	2.93	3.05	3.51

Source: ***Fédération des Usagers de la Bicyclette. (n. d.).*** *Parlons-Vélo: Baromètre des Villes Cyclables. Parlons-Vélo: Baromètre des Villes Cyclables. Consulted on 27th June 2022, https://barometre.parlons-velo.fr*

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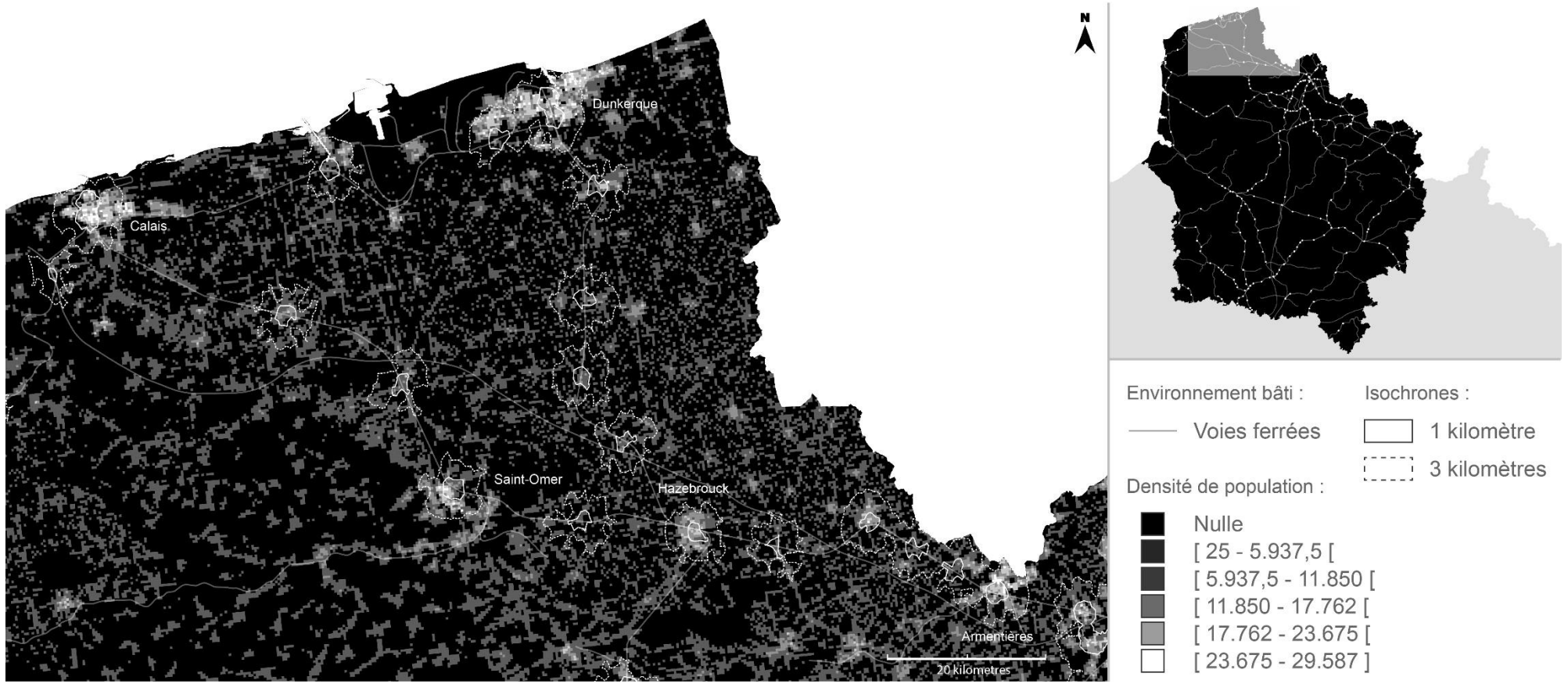
Population Density around Rail Stations



Realisation: ***Moinse and L'Hostis****, 2022*

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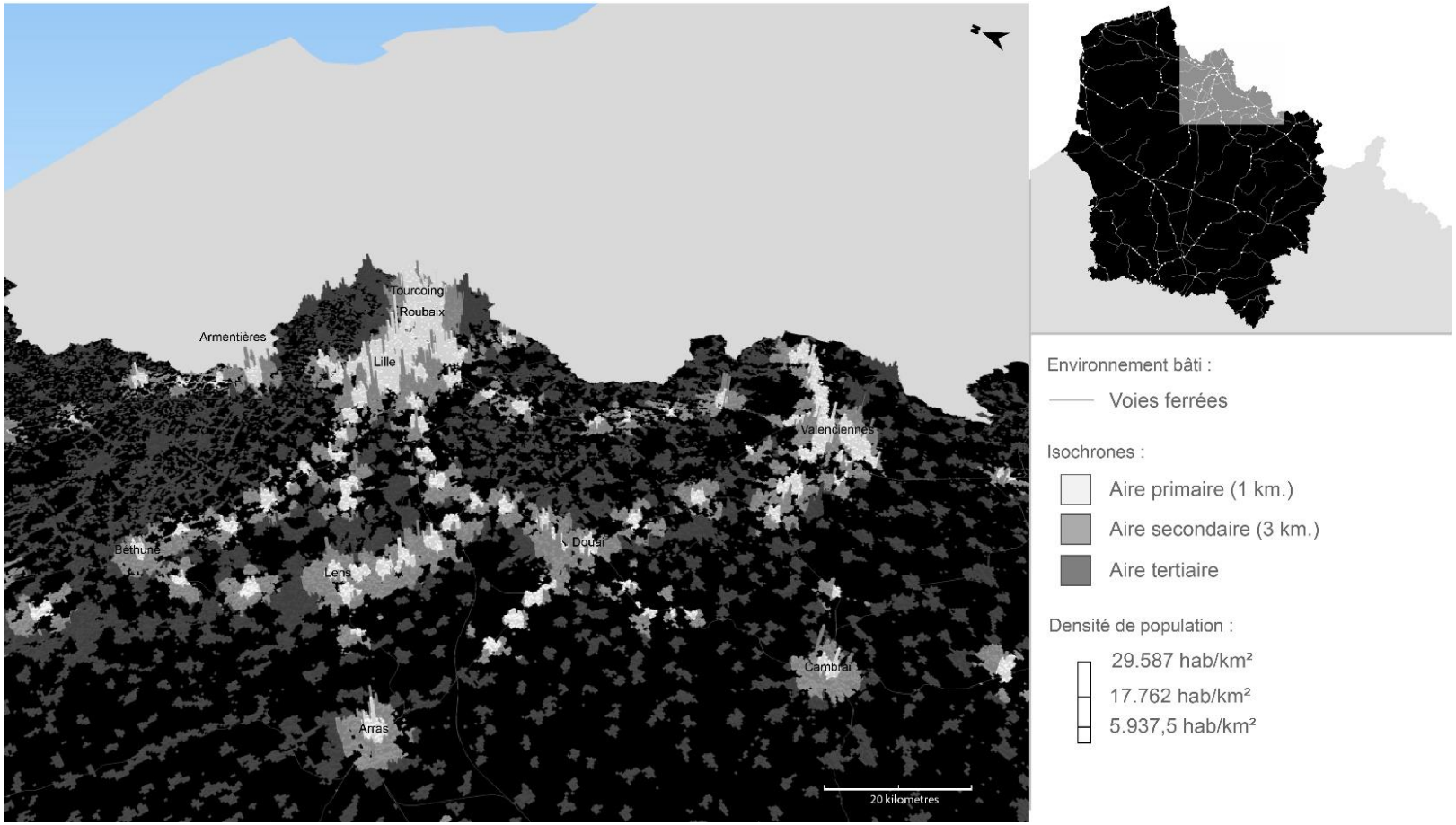
3D Population Density around Rail Stations



Realisation: ***Moinse and L'Hostis****, 2022*

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Characterisation of Catchment Areas around Rail Stations

Perimeter	Coverage	Population Reached	Density (km²)		Average Annual Salary (euros)
			Mean	Median	
Primary Area: ≤ 1 km	1,66%	22,80%	2.979,73	1.925	19.827
Secondary Area:]1 ; 3]	8,62%	34,61%	1.761,60	825	19.581
Sub-total: [0 ; 3]	10,28%	57,40%	2.102,94	1.075	19.678
Tertiary Area: >3 km	89,72%	42,60%	639,22	275	21.196
Région	100%	100%	1.064,57	375	20.325

Sources: Database from Insee (2022) and rail network from the SNCF Open Data (2022)

Realisation: ***Moinse and L'Hostis****, 2022*

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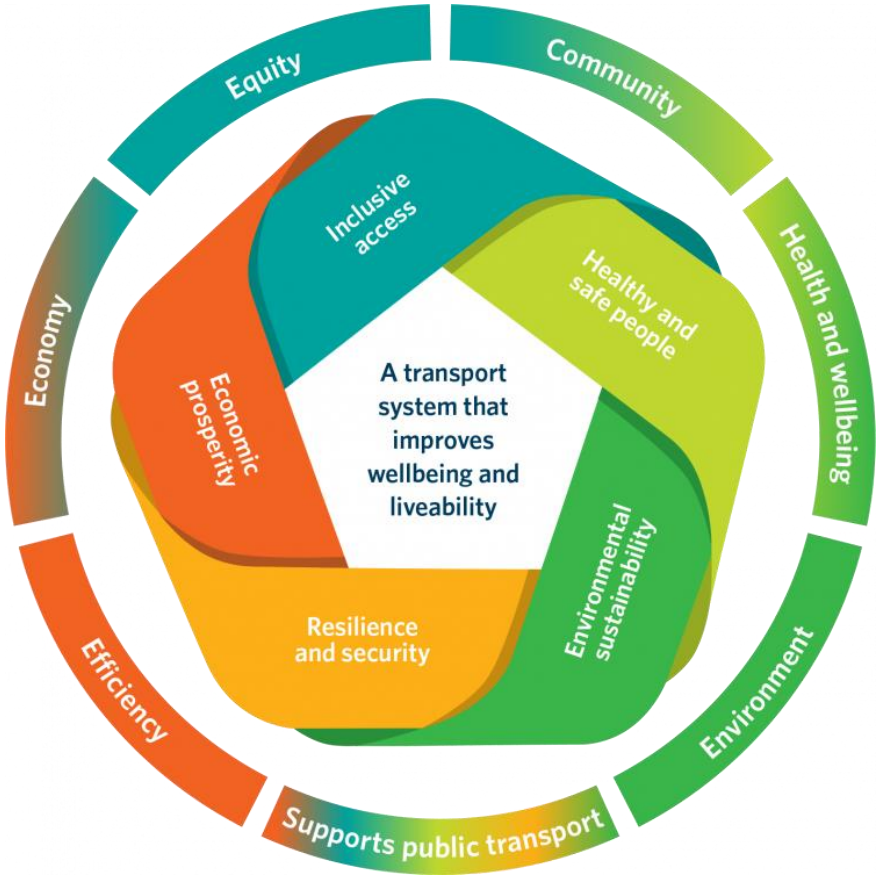
Transport Outcomes Framework



*Source: **New Zealand Ministry of Transport**, 2018*
https://www.transport.govt.nz/area-of-interest/strategy-and-direction/transport-outcomes-framework/

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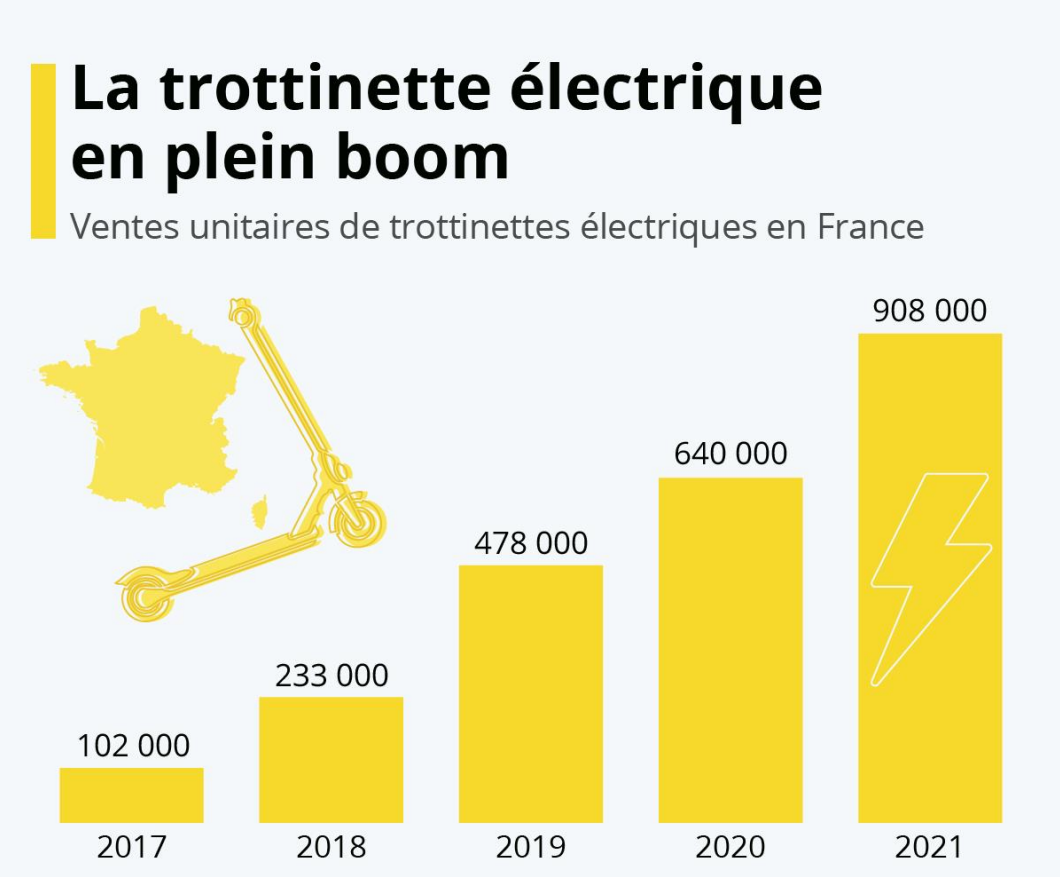
Evolution of E-Scooter Sales in France



Source: ***Baromètre du marché de la micro-mobilité FP2M / Smart Mobility Lab****, 2021*
https://fpmm.fr/?cat=-1