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HIT THE ROAD

VOLUME 3

EV CHARGING IN AREAS TO BE FILLED

SUMMARY

With the support of:

AFRY ÅF PÖYRY

Avere FRANCE

BANQUE des TERRITOIRES GROUPE CAISSE DES DÉPÔTS

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HIT THE ROAD STUDY

In the context of the 'Hit the Road' project for Avere-France, AFRY has conducted the present study on public charging needs by 2035. It consists of **Volume 1 - State of Charging in France**, as well as two analyses based on modeling needs and proposing key measures to address two specific challenges: **Volume 2 - EV Charging on major roadways** and **Volume 3 - EV Charging in areas to be filled**. These documents are intended to be complementary and offer transversal measures.

The deployment of the public electric vehicle charging infrastructure by 2035 must not forget what the ecosystem commonly refers to as "white zones" where this study has preferred to use the term "areas to be filled". Indeed, to succeed in the electrification of mobility, the entire French territory must be adequately equipped with charging infrastructure, and motorists reassured.

The workshops and interviews organized as part of the study have identified diverse definitions of the concept of "action areas". Two main aspects have emerged:

- **A "usage" aspect**, corresponding to areas insufficiently equipped with EV charging stations compared to needs at different geographical scales.
- **An economic aspect**, corresponding to charge points that do not have a viable profitability model due to a too low utilization rate.

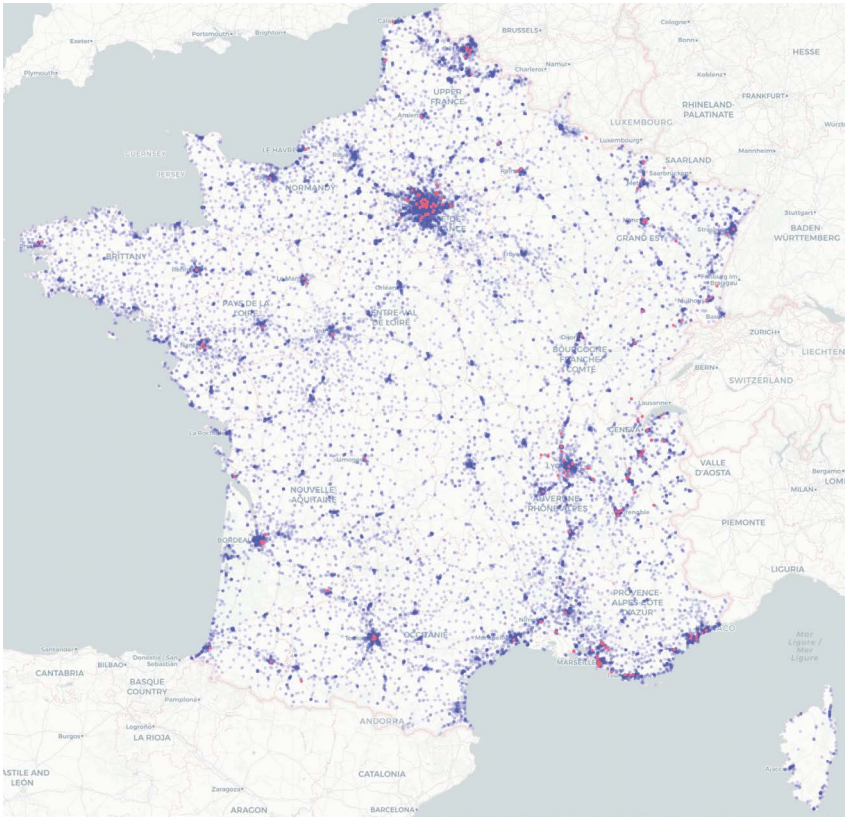
These two aspects often intersect: areas with low EV charging station coverage are also often those with the least traffic and thus the lowest utilization rate.

- **The scale of "small itinerancy"**, which mainly corresponds to so-called "destination charging" for short trips (e.g., weekend excursions); the network must be dense enough at a more departmental scale to reduce user charging anxiety.
- **The local scale or "proximity charging"**, corresponding to a situation in which users own a vehicle but do not have a private parking solution; they do not have easy access to charging or cannot charge at a reasonable price, resulting in lower adoption of electric vehicles.

National Coverage and Small Itinerancy

In May 2023, France surpassed the milestone of 100,000 charge points, but the distribution remains uneven – with regions like Brittany or central France being less well-equipped. Analyzing the number of electric vehicles per charging point reveals that Ile-de-France (10.6), Pays de la Loire (9.6), Auvergne-Rhône-Alpes (9.6), Brittany (9.4), and Hauts-de-France (9.3) are characterized by the highest ratios, exceeding the national average of approximately 7. This reflects disparities between the charging infrastructure and the stock of electric vehicles that may still exist in the territory despite a now tightly woven network.

Figure 1: Mapping of Charge Points Across Metropolitan France[1]



Sources: Eco-Movement data (April 2023), AFRY Analysis

The modeling of needs for the period 2030-2035 should be used to better target the deployment efforts of EV charging infrastructure across the French territory, especially in the "areas to be filled", and thereby gain a better understanding of the key success factors. The public charging need is estimated at the level of each municipality through a set of structuring assumptions. Various scenarios introduce sensitivity to the results.

The different steps of the modeling process are as follows:

- **Step #1:** Consideration of the vehicle fleet by municipality and application of 3 electrification scenarios for light vehicles and heavy trucks. Projections of electric vehicles from RTE[2,3] and BNEF[4] were used.
  - This results in scenarios:
    - **High**, Central and Low for light vehicles, with electrification rates of 31%, 27%, and 16% respectively by 2035;
    - **For heavy vehicles**, the **High** scenario represents a manufacturer's vision with an electrification rate of nearly 40%, and rates of 18% and 3% for the other two scenarios.
- **Step #2:** behavior based grouping depending on different vehicle categories (annual mileage, local road usage, availability of home charging, public charging usage, etc.).
- **Step #3:** Consideration of the average vehicle consumption to deduce the energy requirement for public charging.

[1] *The map illustrates all existing charge points (in blue) as well as the charge points that will be deployed by the first 7 winners of the France 2030 call for projects (in red)*

[2] *Enjeux du développement de l'électromobilité pour le système électrique, 2019 (Challenges of the development of electric mobility for the grid)*

[3] *Bilan prévisionnel 2023 : point d'étape (Projected Balance 2023: Progress Report)*

[4] *Forecast of Electric Light Vehicle Fleet*

- **Step #4:** Translating the energy requirement into the number of charge points through 3 scenarios on utilization rates and a distribution of charging technologies according to the use case.

The results of the modeling **(Figure 2)** show a total need for over 300,000 charge points by 2035 for more than 12 million electric vehicles (Central electrification scenario) in the utilization rate scenario [6%-12.5%].

The electrification of the vehicle fleet will hence require growth in the charging infrastructure network, with a need ranging between approximately 300,000 to 400,000 points when considering the Central and **High** scenarios. These estimates in terms of the number of points assume that home charging will be predominant when possible.

The topic of utilization rate is also central to the planning of EV charging infrastructure deployment projects, with direct impacts on profitability. In line with decarbonization goals in transportation, deploying charging infrastructure ahead of demand is necessary to kickstart the market. As a consequence, there is currently a low average utilization rate throughout the year, around 2%. However, the growth in electric vehicle sales will gradually increase this value. In a context where utilization rate is crucial in estimating the need for the number of charge points, AFRY has decided to consider three different evolutions of the utilization rate between 2023 and 2035 to cover various possible strategic deployment choices:

- Modeling with a lower utilization rate is associated with challenging or even impossible profitability without subsidies for Charging Point Operators (CPOs), but it provides users with increased comfort due to a higher density of charge points.
- Modeling with a higher utilization rate reflects a deployment strategy where operator profitability is easier, and the network of charge points is more optimized in terms of numbers and costs.

Figure 2: Number of Charge Points needed for Public Charging[5]

	Utilization rate [4%-8%]	Utilization rate [6%-12,5%]	Utilization rate [8%-17%]
High	**Total: # 544 900 (14,7 TWh)** Outside major roadways: # 477 200 Of which 1 690 points for heavy vehicles	**Total : # 385 800 (14,7 TWh)** Outside major roadways: # 318 100 Of which 1 130 points for heavy vehicles	**Total : # 306 300 (14,7 TWh)** Outside major roadways: # 238 600 Of which 840 points for heavy vehicles
Central	**Total: # 434 200 (10,2 TWh)** Outside major roadways: # 390 900 Of which 770 points for heavy vehicles	**Total : # 303 900 (10,2 TWh)** Outside major roadways: # 260 600 Of which 520 points for heavy vehicles	**Total : # 238 800 (10,2 TWh)** Outside major roadways: # 195 400 Of which 390 points for heavy vehicles
Low	**Total: # 276 500 (5,2 TWh)** Outside major roadways: # 257 600 Of which 140 points for heavy vehicles	**Total: # 190 600 (5,2 TWh)** Outside major roadways: # 171 700 Of which 90 points for heavy vehicles	**Total: # 147 700 (5,2 TWh)** Outside major roadways: # 128 800 Of which 70 points for heavy vehicles

[5] *The modeled numbers of charge points are rounded to the nearest hundred (and nearest ten for heavy-duty charge points)*

The maps below illustrate, on one hand, to understand, on one hand, the needs for charge points **(Figure 3)** to cover the requirements of the vehicle fleet, and on the other hand, the varying deployment efforts required to achieve these objectives by department **(Figure 4)**. Departments with significant major urban areas are characterized by the highest values in terms of the number of necessary charge points. Thus, locations like the Nord, the Paris region, or the Bouches-du-Rhône, already characterized by a higher adoption of electric vehicles, will need to continue expanding their charging infrastructure.

Figure 3: Mapping of estimated number needed of DC (left) and AC (right) Charge Points by 2035 for the Central Scenario (excluding major highways)

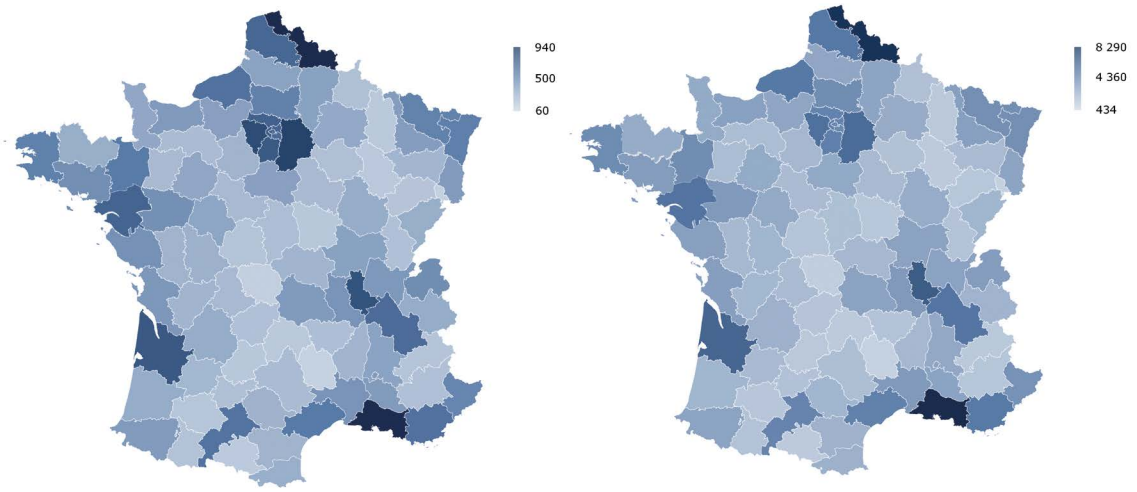
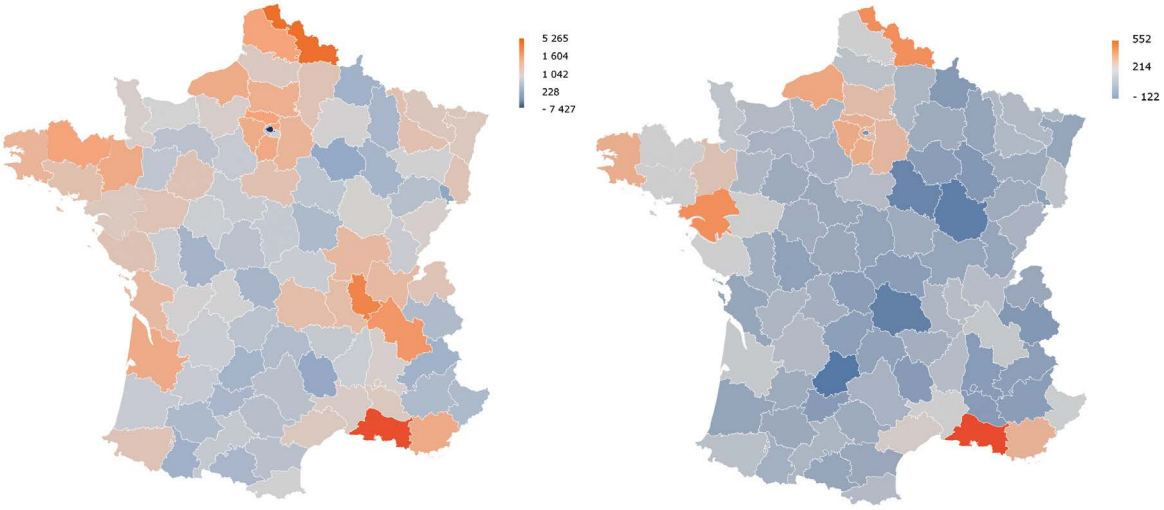


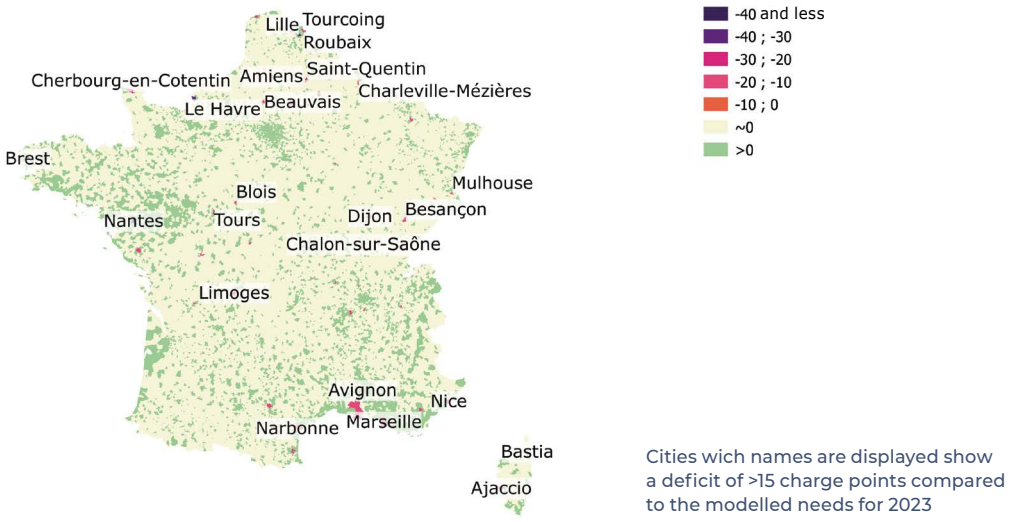
Figure 4: Mapping of estimated number needed of DC (left) and AC (right) Charge Points by 2035 compared to the current situation



Proximity charging

Presently, for proximity charging and compared to the overall modeled need for 2023, at present, compared to the overall modeled need for 2023, France appears to be sufficiently equipped: approximately 22,700 7kW AC public charge points are installed nationwide, compared to an estimated need of 11,700 7 kW AC charge points for 2023 (AFRY modeling, 4% utilization rate corresponding to the 2022 value in the Central Scenario [4%-8%]). However, at the local level, 55 municipalities have a deficit of at least 10 charge points, and 24 (whose names are indicated in the figure below) have a deficit of at least 15 charge points.

Figure 5: Mapping of Municipalities with a Deficit of AC 7 kW Charge points Compared to Modeled Needs for 2023 (Central Scenario [4%-8%])



Source: AFRY Model, Eco-Movement data (April 2023)

The modeling estimates the same need for proximity charging by 2035. In the Central scenario, depending on the utilization rate, a need ranging from 42,730 to 85,460 points is estimated, which represents approximately 20,000 to 63,000 AC 7 kW charge points to be installed across the territory. Considering an average CAPEX of €5,000 per charging point, the investment required would range from €100 million to €310 million by 2035.

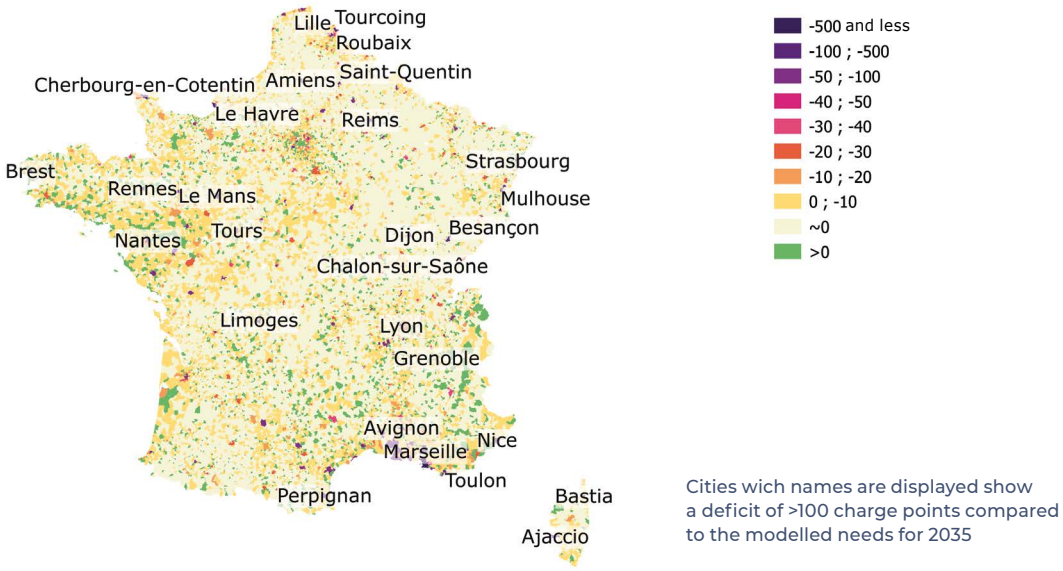
Figure 6: Need in "proximity" (AC 7 kW) charge points for 2035 in the Central scenario[6]

	Utilization rate [4%-8%]	Utilization rate [6%-12,5%]	Utilization rate [8%-17%]
Central	**# 85 460** (+ 62 790 slow AC points compared to 2023) ~310 M€ of investments	**# 56 980** (+ 34 310 slow AC points compared to 2023) ~170 M€ of investments	**# 42 730** (+ 20 060 slow AC points compared to 2023) ~100 M€ of investments

Source: AFRY Model, Eco-Movement data (April 2023)

At the local level, it appears that the need remains low in a significant number of sparsely populated municipalities. However, many medium-sized and large cities must invest in proximity AC 7 kW charging to avoid being in a deficit situation by 2035 compared to the current situation.

Figure 7: Mapping of Municipalities with a Deficit of AC 7 kW Charge points Compared to Modeled Needs for 2035 (Central Scenario [4%-8%])



Source: AFRY Model, Eco-Movement data (April 2023)

Specifically, the cities whose names appear on the **Figure 7** need to install at least 100 AC 7 kW charge points by 2035 to meet the demand in the Central Scenario [6%-12.5%].

Obstacles and key measures

Interviews and workshops with stakeholders from the electric mobility ecosystem made it possible to identify obstacles at every stage of EV charging infrastructure deployment throughout the territory:

- Obstacles to optimal EV charging infrastructure planning
- Obstacles to EV charging infrastructure installation
- Obstacles to EV charging infrastructure operation
- Obstacles related to electric vehicle purchases linked to charging.

[6] *The modeled numbers of charge points are rounded to the nearest ten*

Figure 8: Obstacles to the deployment of EVCI

OBSTACLES TO OPTIMAL PLANNING OF EV CHARGING INFRASTRUCTURE

- **1.1** Grid connection
- **1.2** Insufficient visibility for proper SDIRVE development
- **1.3** Uncertainties regarding alternative technologies for heavy electric mobility

OBSTACLES TO THE INSTALLATION OF EV CHARGING

- **2.1** Limited land availability (major roadways)
- **2.2** Limited land availability (dense urban areas)
- **2.3** Significant investments required (DC charging)
- **2.4** Delivery time for stations and other supply chain challenges

OBSTACLES TO THE OPERATION OF EV CHARGING STATIONS

- **3.1** Insufficient profitability
- **3.2** Legal duration of highway sub-concession contracts
- **3.3** Maintenance challenges and availability rate
- **3.4** Energy price volatility

OBSTACLES TO ELECTRIC VEHICLE PURCHASE RELATED TO CHARGING

- **4.1** Complex charging process
- **4.2** Opaque pricing and charging costs
- **4.3** Charging anxiety
- **4.4** Unavailability of affordable nearby charging

To address these challenges, the study has identified "key measures", which are also based on discussions with the ecosystem during workshops, as well as the results of the modeling. These measures have been distributed between **Volumes 2** and **3**. Here, we will only include the measures related to "areas to be filled", as well as the transversal measures identified.

Figure 9: Key-measures related to the “areas to be filled”

“ACTION AREAS” - SMALL ITINERANCY		ADDRESSED OBSTACLES
Tender based on “Profitability Clusters”		1.2 | 2.3 | 3.1 | 4.3
	Stakeholders	Government, Local Authorities, Operators
	Levers	Political decision, investments to be made (study, implementation of a monitoring tool, and launch of tenders)
Support for OPEX based on utilization rates		3.1 | 3.3 | 3.4 | 4.3
	Stakeholders	Government, operators
	Levers	Tax Incentives for Operators in Underserved Areas
"ACTION AREAS” - PROXIMITY CHARGING		**ADDRESSED OBSTACLES**
Deployment of AC 7 kW Charging Points		4.4
	Stakeholders	Government, operators
	Levers	Investments to be made, Public-Private Partnerships
Moderated Pricing for Proximity Charging		4.2 | 4.2
	Stakeholders	Government, Local Authorities, CRE (French Energy Regulatory Commission)
	Levers	Political decision, regulatory changes
Innovative Solutions for Proximity Charging		2.2| 4.4
	Stakeholders	Operator
	Levers	Analyses to be conducted

Figure 10: Transversal key measures

TRANSVERSAL		ADDRESSED OBSTACLES
Creation of a public authority responsible for EV charging infrastructure and planning		1.1 | 1.2 | 1.3
	Stakeholders	State
	Levers	Political decision, regulatory changes
Smart connection offers (ORI)		1.1 | 2.3
	Stakeholders	State, local authorities, SCA, DSO
	Levers	Communication and change management, regulatory changes

Completeness and Reliability of Open-Data — **1.2 | 4.1 | 4.3**

Stakeholders	State, local authorities, operators
Levers	Administrative resources

Progressive standardization of 800 V — **4.1**

Stakeholders	Manufacturers
Levers	Regulatory changes or specification modifications

Support for the acquisition of electric heavy vehicles — *Launch of heavy electric vehicles' adoption*

Stakeholders	Manufacturers, users
Levers	Political decision

Following the modeling and various iterations with the ecosystem, this study draws four essential conclusions:

1) Users should be able to travel along all routes in the country without making significant detours for charging: therefore, the "areas to be filled" should receive special attention from the authorities to increase the attractiveness of electrification and reduce charging anxiety.

2) Tenders opening up to CAPEX subsidies and based on 'profitability clusters' would balance profitable charge points with others located in underserved, low-profitability areas. In return, a moderated tariff would be imposed on the charging stations.

3) Affordable proximity charging is a social challenge in the transition to electric mobility, allowing users without private parking to access moderate charging prices.

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ABOUT AVERE-FRANCE

Avere-France is the national association for the development of electric mobility. Created in 1978 to represent the entire electro-mobility ecosystem in the industrial, commercial, institutional or associative fields, its objective is to promote the use of electric and rechargeable hybrid vehicles.

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ABOUT ECF

The European Climate Foundation (ECF) is a major philanthropic initiative working to help tackle the climate crisis by fostering the development of a net-zero emission society at the national, European, and global level. The ECF supports over 700 partner organisations to carry out activities that drive urgent and ambitious policy in support of the objectives of the Paris Agreement, contribute to the public debate on climate action, and help deliver a socially responsible transition to a net-zero economy and sustainable society in Europe and around the world.

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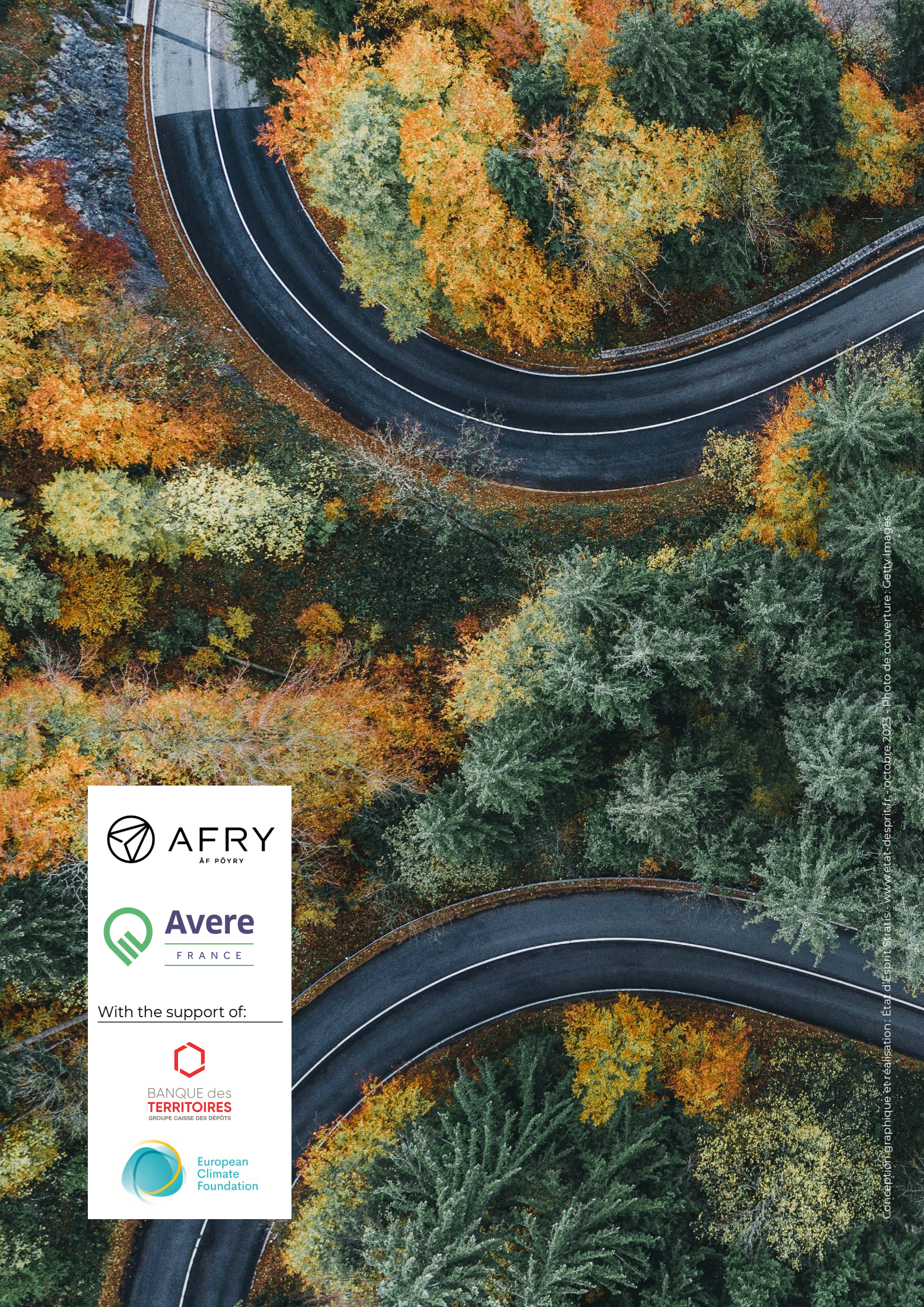

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