

Connecting the Riviera Western Liguria in Europe

Master's Degree: Transport Planning

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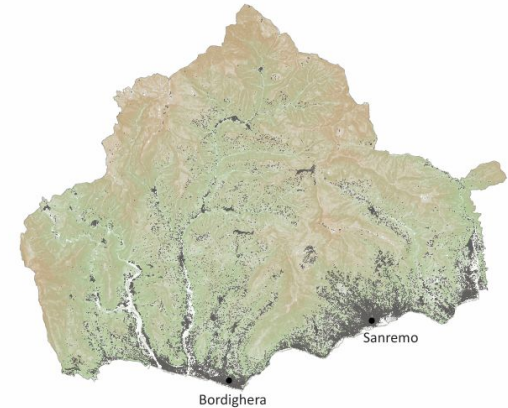
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TERRITORIAL FRAMEWORK



Liguria is a region in the north-west of Italy. It covers an area of 5,420 kmq, and its population is approximately 1.5 million inhabitants. Its territory is divided into the provinces of Savona, La Spezia, Imperia, and Genoa. The study area consists of 22 municipalities and is located within the province of Imperia. The province covers approximately 1.155 kmq and borders the province of Savona to the northeast, the Piedmont province of Cuneo to the north, the Provence - Cote Azur Department in France to the east, and the Ligurian Sea to the south. The coast is indented, and the hinterland mainly mountainous. Due to the morphology of the territory, urban development has occurred mainly in coastal areas and along the valleys.

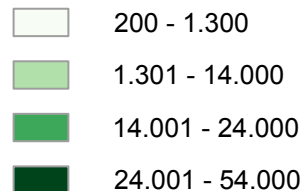
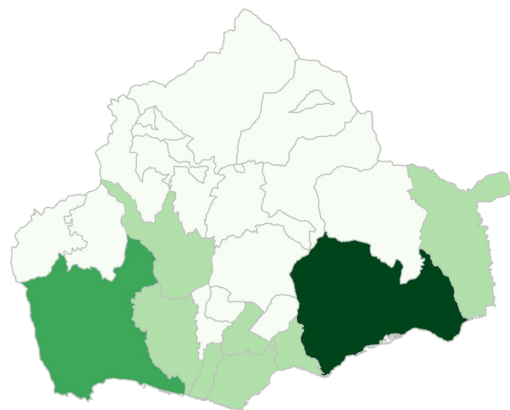


DEMOGRAPHIC ANALYSIS

Total resident population

Within the study area there is a total of 130,217 inhabitants. The resident population is concentrated more on the coastal areas. This is due to the morphological conformation of the area, which is predominantly mountainous.

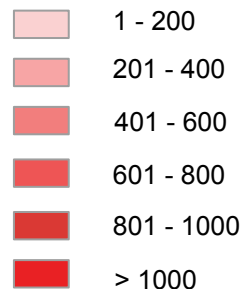
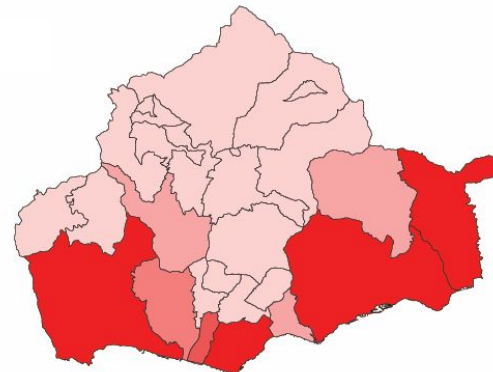
Airole	461
Apricale	625
Baiardo	312
Bordighera	10416
Camporosso	5419
Castel Vittorio	329
Ceriana	1253
Dolceacqua	1990
Isolabona	678
Olivetta San Michele	225
Ospedaletti	3386
Perinaldo	912
Pigna	894
Rocchetta Nervina	272
San Biagio della Cima	1278
Sanremo	54137
Seborga	323
Soldano	985
Taggia	14032
Vallebona	1332
Vallecrosia	7032
Ventimiglia	23926



Foreign resident population

An analysis of the foreign resident population shows that the municipalities with the most foreigners are Taggia, Sanremo, Bordighera and Ventimiglia. In general, most foreign citizens come from other European countries.

Airole	115
Apricale	145
Bajardo	135
Bordighera	1158
Camporosso	554
Castel Vittorio	35
Ceriana	224
Dolceacqua	247
Isolabona	107
Olivetta San Michele	12
Ospedaletti	372
Perinaldo	159
Pigna	100
Rocchetta Nervina	63
San Biagio della Cima	70
Sanremo	7710
Seborga	32
Soldano	106
Taggia	1617
Vallebona	91
Vallecrosia	601
Ventimiglia	3000

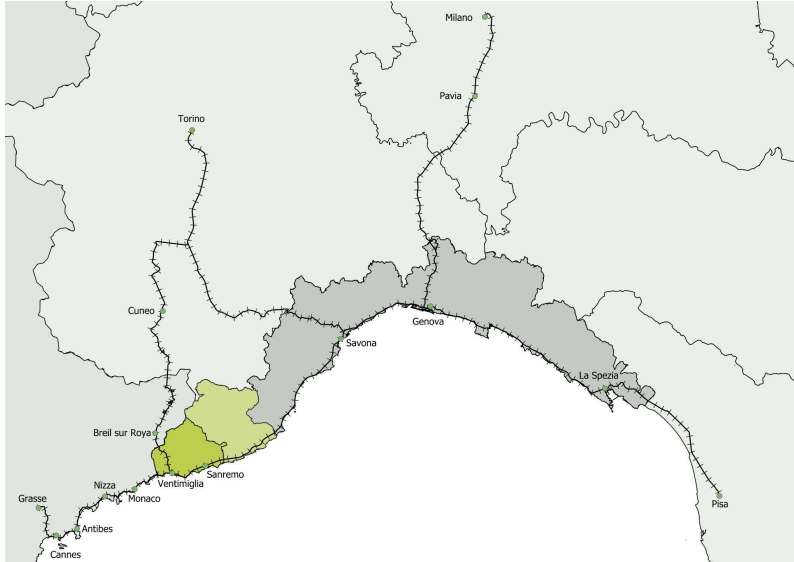


SUPPLY AND DEMAND

PASSENGER

Rail connections

The province of Imperia is connected to France via the Genoa-Ventimiglia railway line, with a change in Ventimiglia on French regional trains (TER). Services between Italy and France are regular, every 20-30 minutes, less frequent in the evening. Ventimiglia is also connected to Italian cities with regional and long-distance trains, but the Trenitalia-SNCF timetables do not always match. The line to Breil-sur-Roya, already little frequented, has suffered a reduction in traffic after the Alex storm in 2020.



Road connections

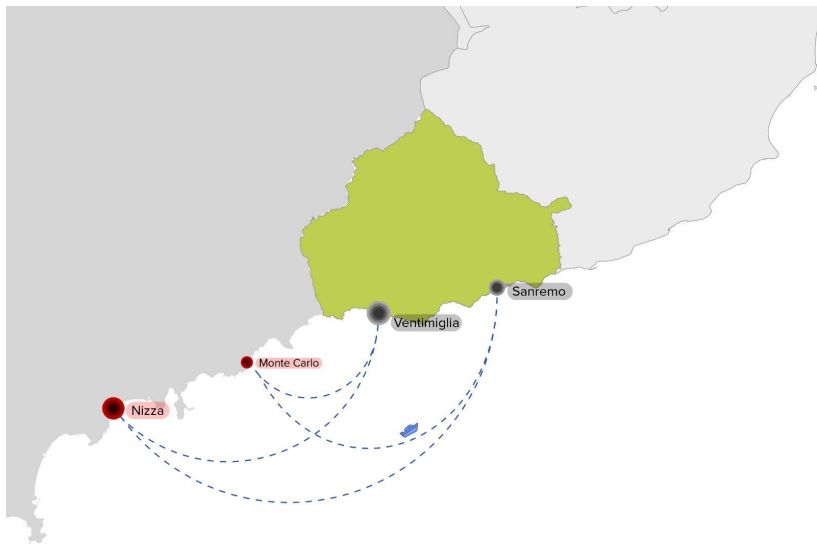
The province of Imperia is connected to France with the A10 **highway**, which becomes the A8 after Ventimiglia, allowing you to quickly reach the main cities on the French coast. **Buses** are less frequent than other means of transport. Riviera Trasporti serves the province of Imperia, while connections beyond Ventimiglia require the use of Zest buses to France cities. While FlixBus and Eurolines connect Liguria to large French cities (Marseille, Lyon) but not to smaller towns.



PASSENGER

Maritime connections

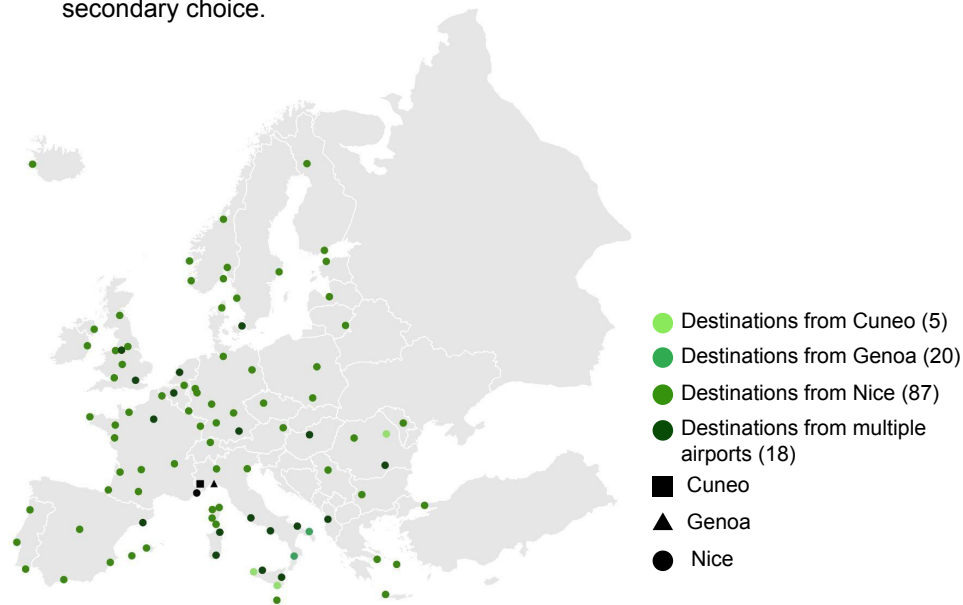
Maritime transport between Liguria and France is limited to tourist and private services, mainly seasonal. During the summer, some companies offer ferries and connections from Ligurian cities, especially from **Sanremo** and **Ventimiglia** to destinations on the French Riviera, such as **Monte Carlo** and **Nice**. Boat or yacht rental is also common, with well-equipped marinas in Sanremo and Ventimiglia, which make it easy to reach French coastal cities.



Airport connections

The province of Imperia does not have its own commercial airport, but is served by three nearby airports:

- **Nice-Côte d'Azur** (50 km from Ventimiglia): the main one, with international and Italian connections, easily reachable by car or train.
- **Genoa Cristoforo Colombo** (150 km from Ventimiglia): less used due to the greater distance and less convenient connections.
- **Cuneo** (100 km from Ventimiglia): offers few national flights and is a secondary choice.



FREIGHT TRANSPORT

TEN-T system

The TEN-T system is crucial for freight transport between Italy and Europe, but the province of Imperia, including Ventimiglia, is not directly part of the main route of the **Mediterranean Corridor**, which links south-west Europe with northern Italy and eastern Europe. This corridor mainly involves the port of Genoa, a major hub for international maritime transport, and rail links to Milan, Turin and the Alpine crossings. The **Rhine-Alpine Corridor** also plays a key role, connecting Liguria's ports to the economic heart of Europe, integrating Liguria into global logistics chains.

- Mediterranean Corridor
- Rhine-Alpine Corridor

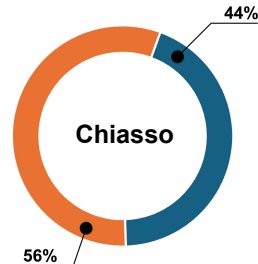
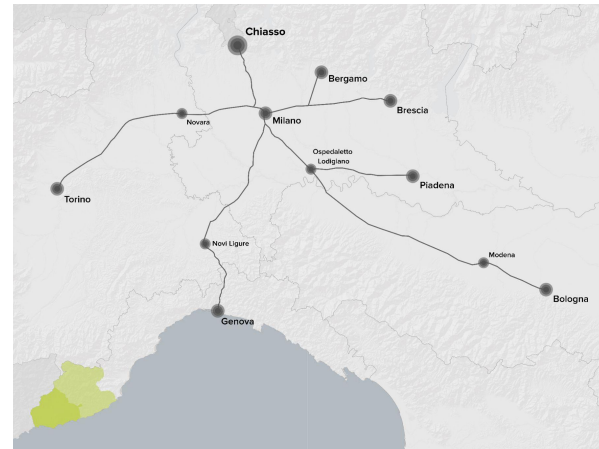
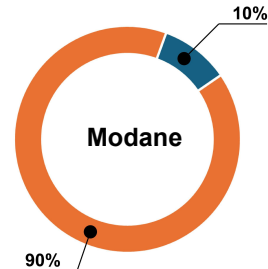
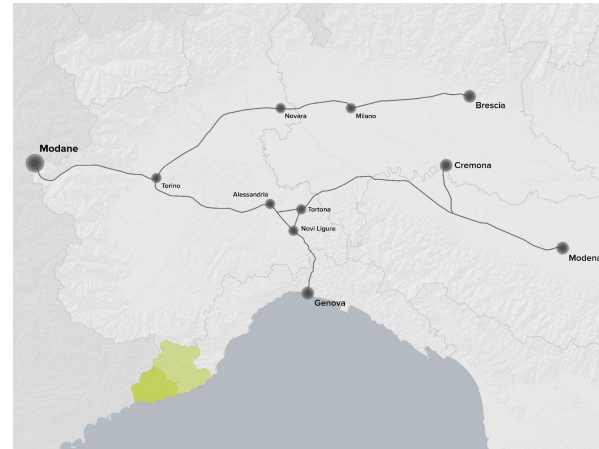
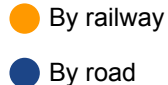


FREIGHT TRANSPORT

European border crossings

The Ventimiglia, Modane and Chiasso border crossings are essential for freight transport between Liguria and Europe:

- **Ventimiglia**: main access to France, integrated into the TEN-T Mediterranean Corridor. In 2021 it handled 458 tonnes of freight by rail and 21.588 tonnes by road.
- **Modane**: connects Liguria to the French market and the Mediterranean Corridor via the port of Genoa. In 2021 it transported 1.367 tonnes by rail and 12.484 tonnes by road.
- **Chiasso**: crucial for connections with central-northern Europe via the Rhine-Alpine Corridor and the Swiss rail networks. In 2021 it handled 5.476 tonnes by rail and 6.976 tonnes by road.

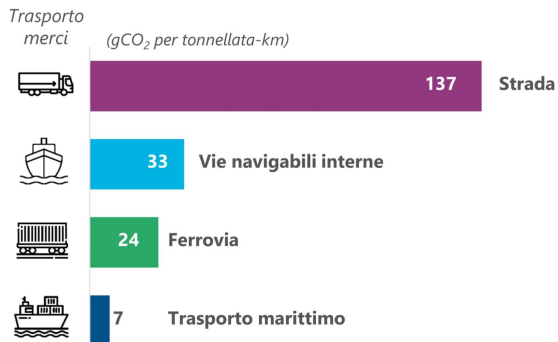


FREIGHT TRANSPORT

Road links

Road transport is predominant for freight movement through Ventimiglia, thanks to the A10 motorway that connects Ligurian logistics centres to the French border and the A8 towards Nice and Marseille. It is particularly used for perishable goods and just-in-time deliveries, thanks to its flexibility and speed. It is also 56% cheaper than intermodal alternatives.

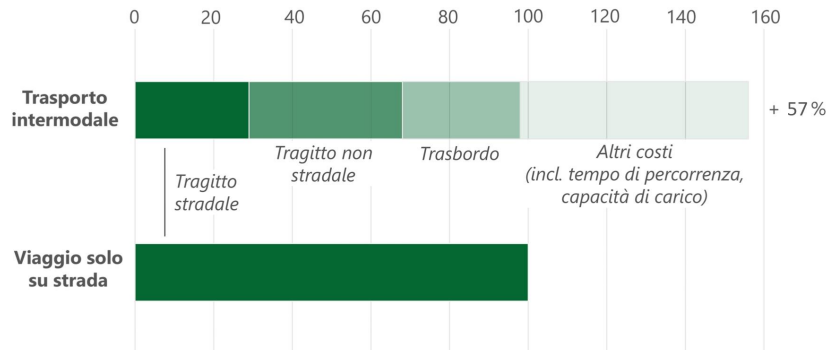
However, it has significant limitations: Ligurian motorways are congested, the mountainous terrain hinders expansion, and the Ventimiglia border represents a bottleneck during peak periods. Road transport is also responsible for almost 25% of greenhouse gas emissions from the road sector in Europe, with a significant environmental and infrastructural impact.



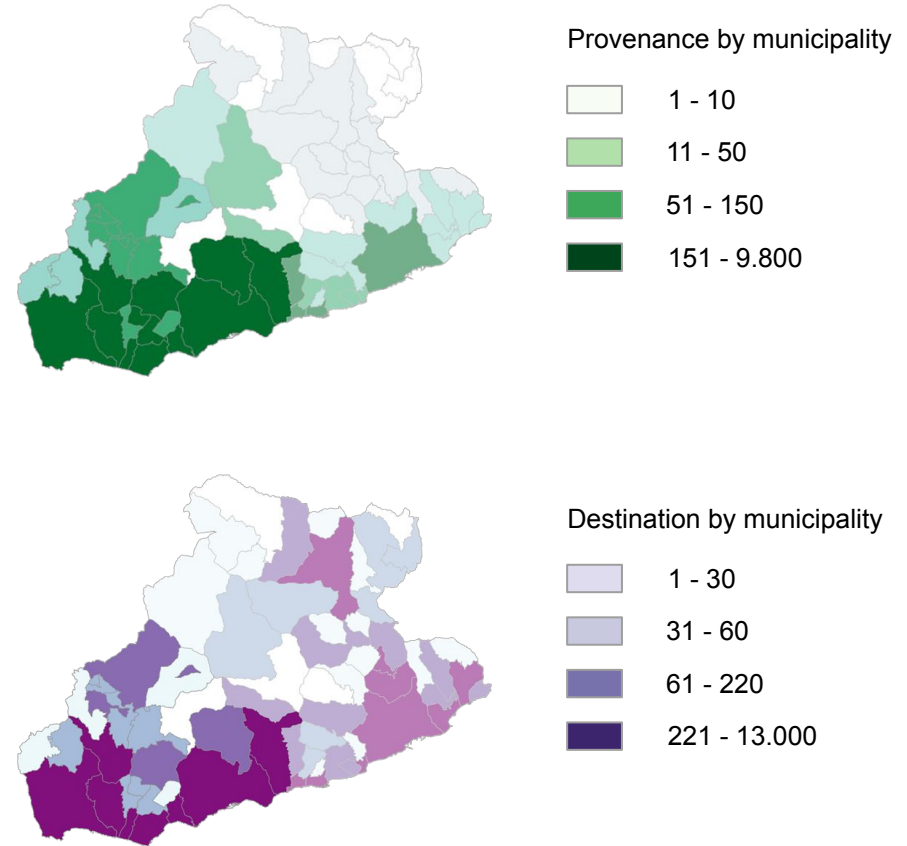
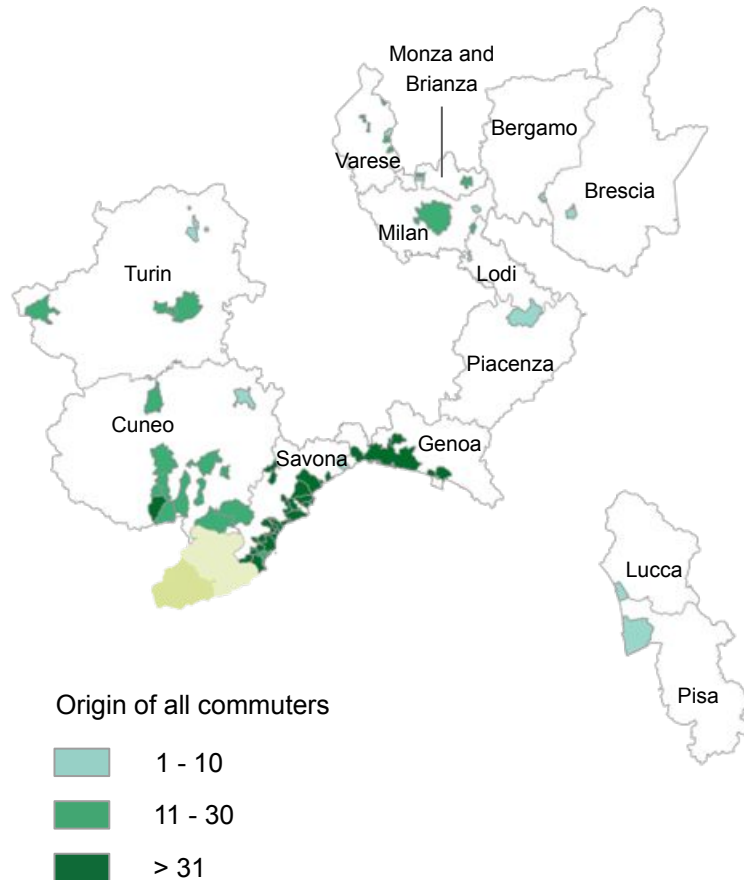
Rail links

Rail transport along the Genoa-Ventimiglia-Nice line, part of the Mediterranean Corridor, is essential to improve sustainability and reduce road congestion. However, it has some limitations:

- **Single-track sections**, which reduce capacity and efficiency.
- **Technical differences** between the Italian and French networks (electrical power systems and train specifications), which require locomotive changes or technical adaptations in Ventimiglia, causing delays.
- **Poor availability of dedicated freight terminals**, which hinders smooth transfer between road and rail transport.



COMMUTING

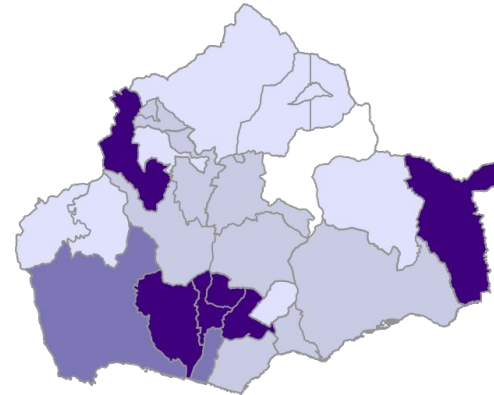
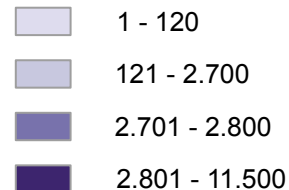


COMMUTING

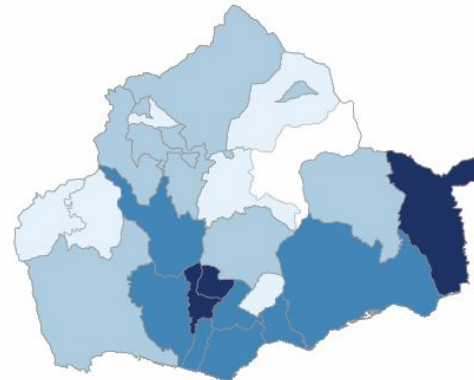
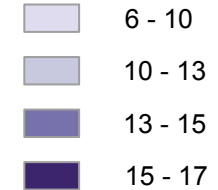
Focusing on the analysis of commuting within the study area, it can be observed that the coastal municipalities are simultaneously those from which there are the most departures and at the same time those to which there are the most arrivals, suggesting that the population commutes mostly between or within these municipalities. This is due to the concentration of services within the coastal municipalities, regarding school and work activities.



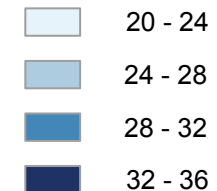
Destination by municipality



Study commuting (%)

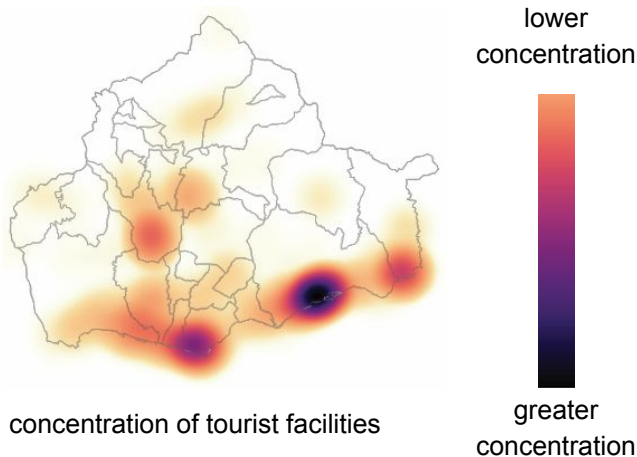


Work commuting (%)



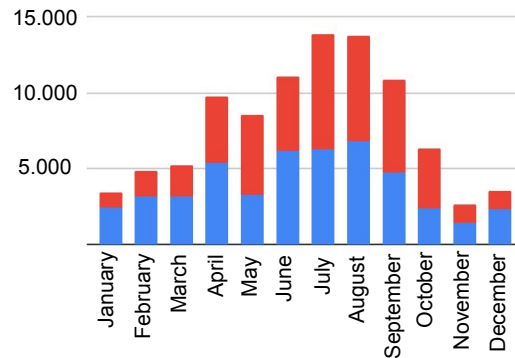
TOURISM

The period analysed is 2023, and we focused the analysis on the municipalities of Sanremo, Ventimiglia and Bordighera, which are the most popular destinations within the study area, as well as on the entire Province of Imperia. Tourists were divided between Italians and foreigners. For all four cases analysed, it can be seen that the concentration of tourists is higher in July and August, meaning that tourism is more summery. The distribution of foreign and Italian tourists shows that in the first months of the year there is a majority of Italian tourists, while from April until October, the majority of tourists are foreigners.

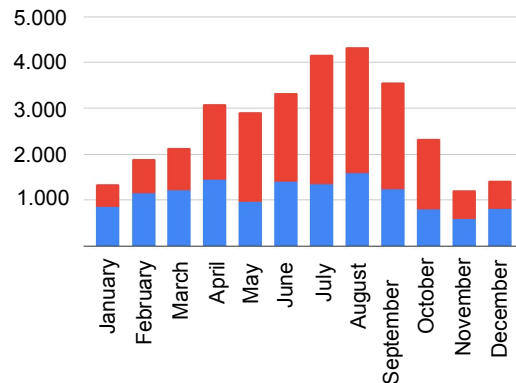


Stranieri Italiani

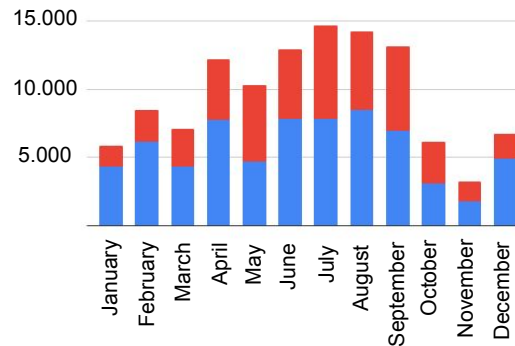
Province of Imperia



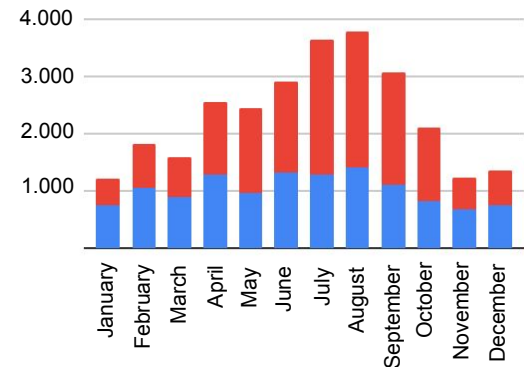
Sanremo



Bordighera



Ventimiglia



DIAGNOSIS PHASE

Strengths, weaknesses, necessary interventions

	STRENGTHS	WEAKNESSES	NECESSARY INTERVENTIONS
Transport by road	<ul style="list-style-type: none"> - Highways A10 and A8 important for tourism and freight transport. 	<ul style="list-style-type: none"> - Highways often congested due to infrastructure limitations and traffic; 	<ul style="list-style-type: none"> - Widening certain highways sections - Enhancing rest areas for heavy vehicles - Restriction of heavy vehicle circulation
Rail transport	<ul style="list-style-type: none"> - Presence of TEN-T corridors 3 and 6. - Ventimiglia's role in freight transit. - Presence of the Frejus and Gotthard tunnels for connections to Northern Europe. 	<ul style="list-style-type: none"> - Difficult connection with TEN-T corridor 3. - Presence of single-track rail sections. - Limited use of the Genoa-Marseille line for freight transport. - Lack of freight transport train services. - Absence of intermodal exchange infrastructure near Imperia, which is excluded from large-scale flows 	<ul style="list-style-type: none"> - Doubling tracks on the Genoa-Marseille line where single tracks still exist. - Modernizing Italian railway infrastructure. - Enhancing regional rail services with faster and more frequent trains toward Genoa.
Transport by ship	<ul style="list-style-type: none"> - The Port of Genoa is a key hub for international maritime connections. - The Savona-Vado Port is closely linked to the Port of Genoa. 	<ul style="list-style-type: none"> - Rail connections for freight transport to the Port of Genoa and the Imperia province are inadequate. 	<ul style="list-style-type: none"> - Improving railway connections for freight transport to the Port of Genoa and the Imperia province.

DESIGN PHASE

Project proposal

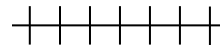
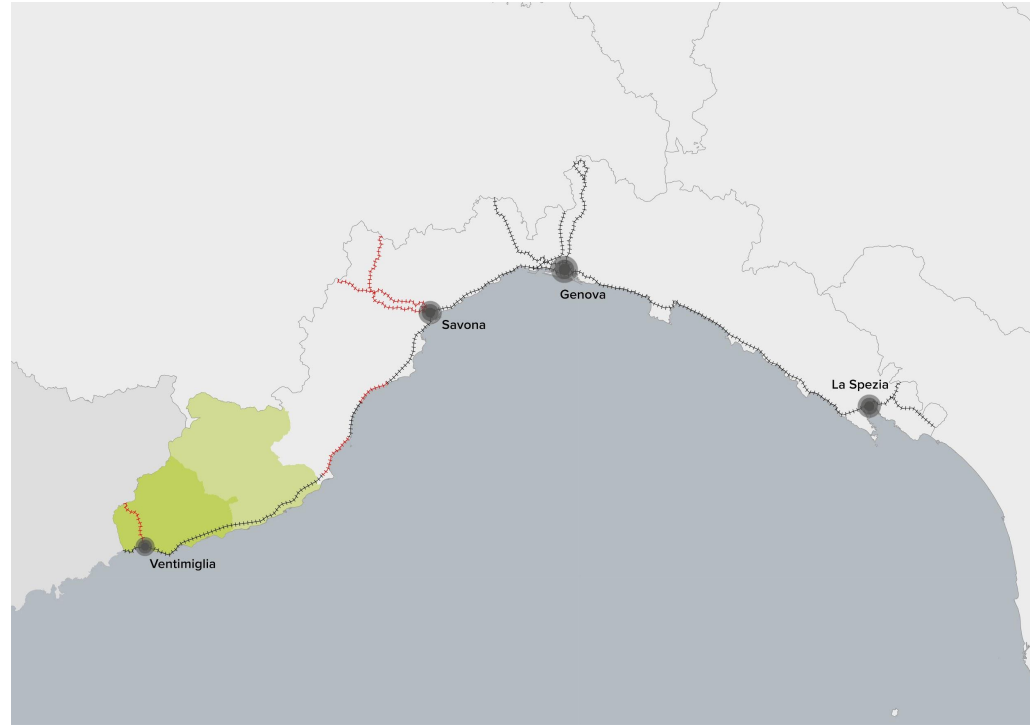
Since our focus is on connecting the Riviera di Ponente with Europe, the main idea is to link our study area to Europe through the Port of Genoa, one of the most important ports in the Mediterranean Sea. We have tailored our theme specifically to freight transport.

As highlighted by the analysis, the study area experiences significant freight transport flows, often destined for the port system of Genoa. The most commonly chosen method to reach this port is road transport, which further overloads the motorway network in the province of Imperia. This network is already congested due to infrastructure limitations stemming from the area's complex terrain and the aging of its infrastructure.

At the same time, the railway line between Ventimiglia and Genoa faces infrastructure limitations that hinder efficient connections to the Port of Genoa. These include the insufficient power of Italian railway lines and sections of single-track railway caused by the area's challenging terrain. These issues make rail freight transport less competitive, with road transport being the preferred option.

To address this problem, one potential solution is the introduction of rolling highways, which would shift a significant portion of heavy traffic from motorways to railways. The creation of a rolling highway capable of transporting trucks from Ventimiglia to Genoa (the main destination for heavy vehicles traveling on the A10 motorway) with a direct connection to the port would make rail transport an efficient option for freight. This would help decongest the road network while providing economic and environmental benefits.

To achieve this, it is necessary to identify a location near Ventimiglia where freight can be transferred from road to rail.



Double track



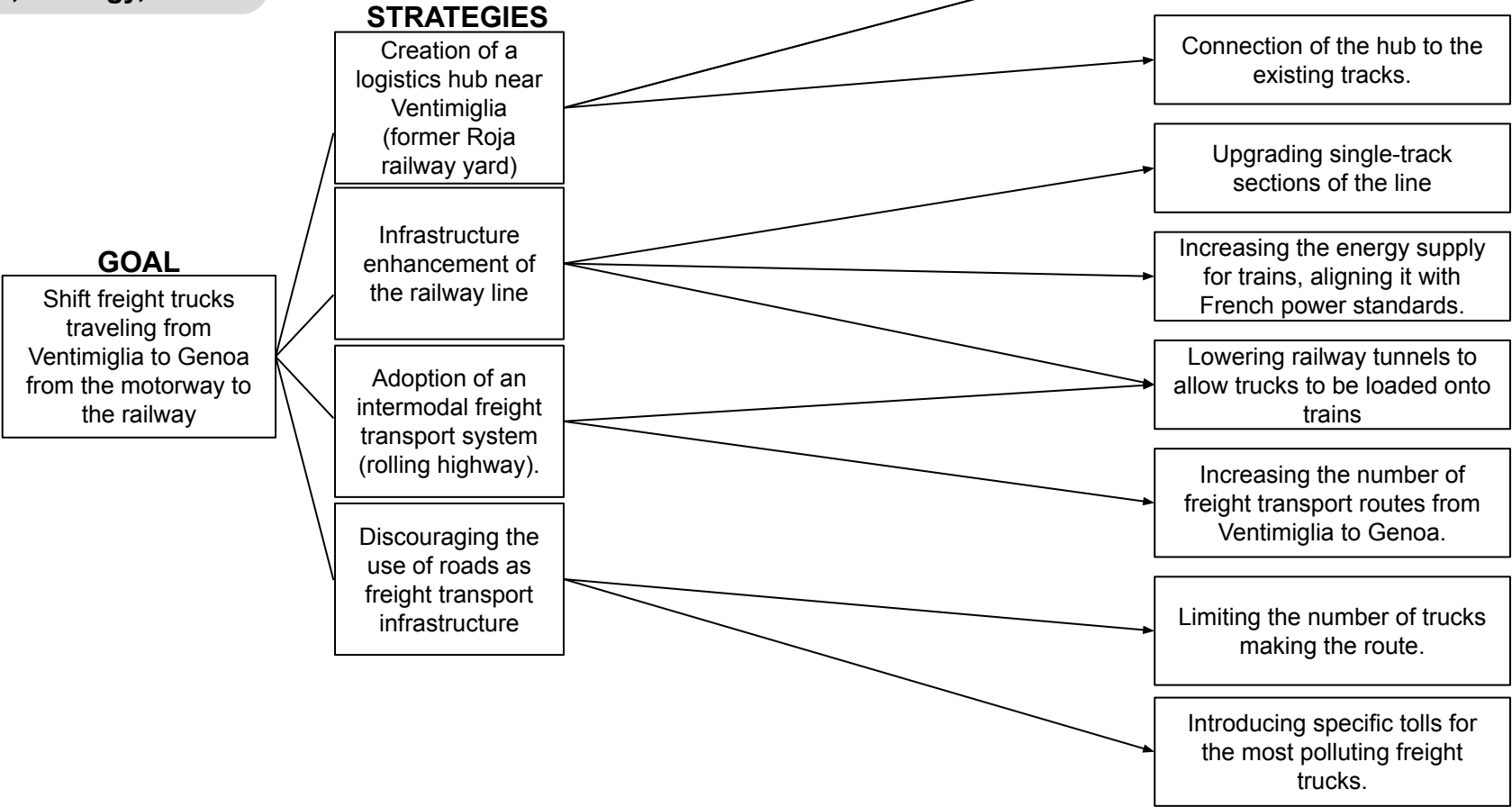
Single track

Additionally, the existing railway infrastructure must be upgraded, as it is currently unsuitable for such a function.

DESIGN PHASE

ACTIONS

Objective, strategy, actions



DESIGN PHASE

Project proposal

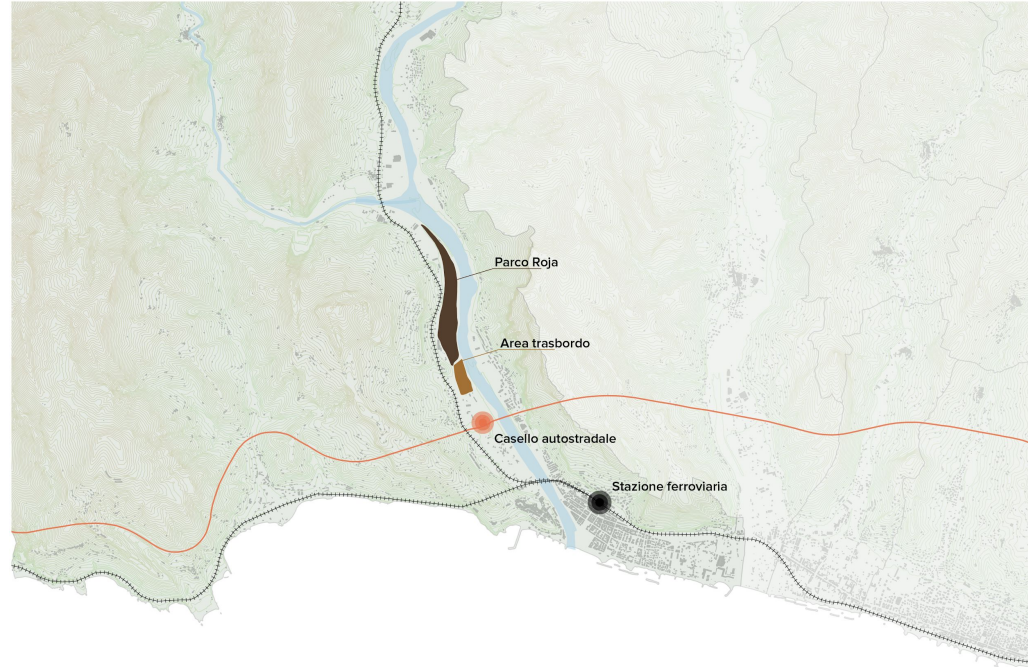
The project involves the creation of a logistics hub where the former Roja railway yard currently stands, now decommissioned and unused. The area is being prepared for new use, as it was previously connected to the railway line, a connection that would simply need to be restored and adapted to meet the project's objectives.

Additionally, the large available space and proximity to the A10 motorway ensure practicality and convenience for the use of the infrastructure. The modernization and enhancement of the railway line will allow faster travel times to Genoa compared to the present, simultaneously avoiding the risks of traffic jams and congestion on roads and motorways. Doubling the tracks in sections where there is currently only one will further ensure extensive service coverage and reduce travel times, making the infrastructure suitable for transporting perishable goods or just-in-time deliveries.

To encourage the use of the rolling highway, policies such as restrictions on heavy vehicle traffic on motorways and the introduction of tolls for the most polluting vehicles will be implemented.

The establishment of the rolling highway between Ventimiglia and Genoa will therefore enable the use of the railway infrastructure to shift a significant portion of heavy traffic from roads to the railway. This will help decongest the motorway network and ensure fewer accidents and shorter travel times for both users who continue to use the motorway and those who opt for rail transport. The latter will also benefit from savings on fuel and motorway tolls and can relax during the journey, resting before reaching their destination.

Another crucial aspect is the environmental impact, as the use of the rolling highway allows for a reduction in emissions caused by heavy vehicles, contributing to a shift toward a greener future.



DESIGN PHASE

Costs-benefits analysis

Finally, we evaluated the economic feasibility of the potential project through a cost-benefit analysis.

The cost-benefit analysis is a single-objective methodology where the comparison occurs exclusively at the economic level. The main limitation of cost-benefit analysis lies in its inability to account for factors that cannot be assessed in quantitative and monetary terms, particularly those benefits produced by a project whose value is impossible to estimate. Additionally, cost-benefit analysis cannot consider the distribution of benefits among the different components of society.

We focused on three types of benefits:

- Economic benefit from distances: Shorter distances traveled by rail compared to road.
- Economic benefit from time: Shorter travel time by rail compared to road.
- Economic benefit from emissions: Lower emissions from rail compared to road.

Due to the high initial investment, particularly for lowering the railway tunnels, the Net Present Value (NPV) turned out to be negative. From a purely economic perspective, our project idea would not be sustainable within a 30-year timeframe.

This analysis excluded certain currently negative externalities that the project would reduce, which are difficult to quantify economically but would make the project beneficial for the community and road travelers:

- Reduced congestion on the motorway.
- Lower probability of accidents due to reduced heavy vehicle traffic on the motorway, increasing safety for travelers.
- Decrease in noise pollution.
- Contribution to mitigating climate change.
- Improved physical and mental well-being for truck drivers, who can rest while their vehicles are transported by train.

Discount rate	5%
Day/year	365 days
Total analysis time	30 years
Current total heavy vehicles	3000
Total vehicles by train	25
Number of daily routes	50
Total vehicles on trains	1250
Total vehicles on street	1750
Total distance on street	163 km
Total distance on trains	150 km

THANKS FOR ATTENTION
