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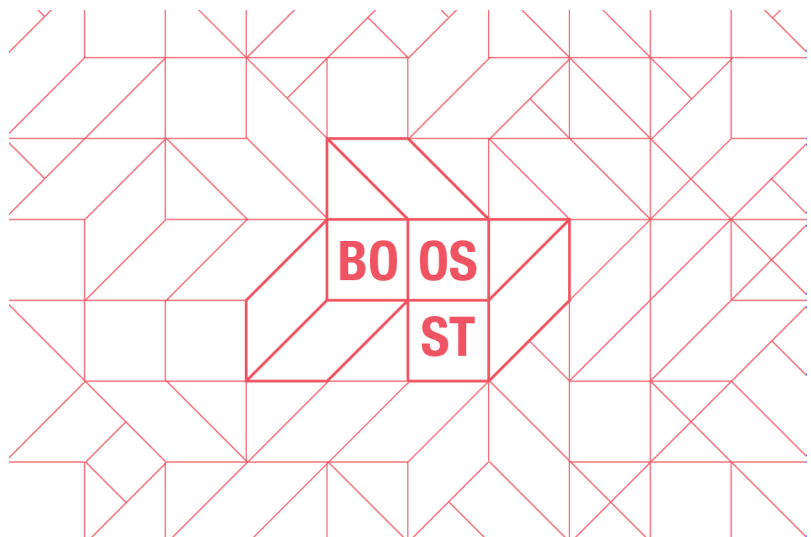
# Boosting a Smart and Sustainable Transition towards Carbon Neutral Cities

## Executive Summary

Most of the train stations in Italy are not currently aligned with the objective of a sustainable development, both under an environmental and social perspective, constituting an issue for municipalities who would like to improve citizens quality of life. Indeed, the objective of BooSST's project is to develop a method to improve railway stations to make them well-served, interactive, accessible, safe, secure and sustainable for all citizens. This method would be a tool for municipalities to help them assess the needs and requirements that each station within the city possess, to this scope we presented as case studies a renovating project for the station Rogoredo of Milan and the station Rebaudendo of Turin. The main underlying drivers that pushes stakeholders to implement structural changes to infrastructure have to be referred to the willingness of countries and supranational institutions to create a sustainable and socially inclusive future, driven by SDGs' route. We expect that thanks to our proposed solution administrations can make informed decisions on proper strategies for railway stations and their surroundings without wasting massive time and resources.

## Key words

Railway station, multi-service, user centricity, sustainable transition



Boosst representative logo

## Milano Rogoredo

### commercial & social services

FOOD HUB  
11k sqm

new functions  
22

### urban quality & safety

new green areas  
24k sqm

tree species  
20 up to

### space & infrastructure network

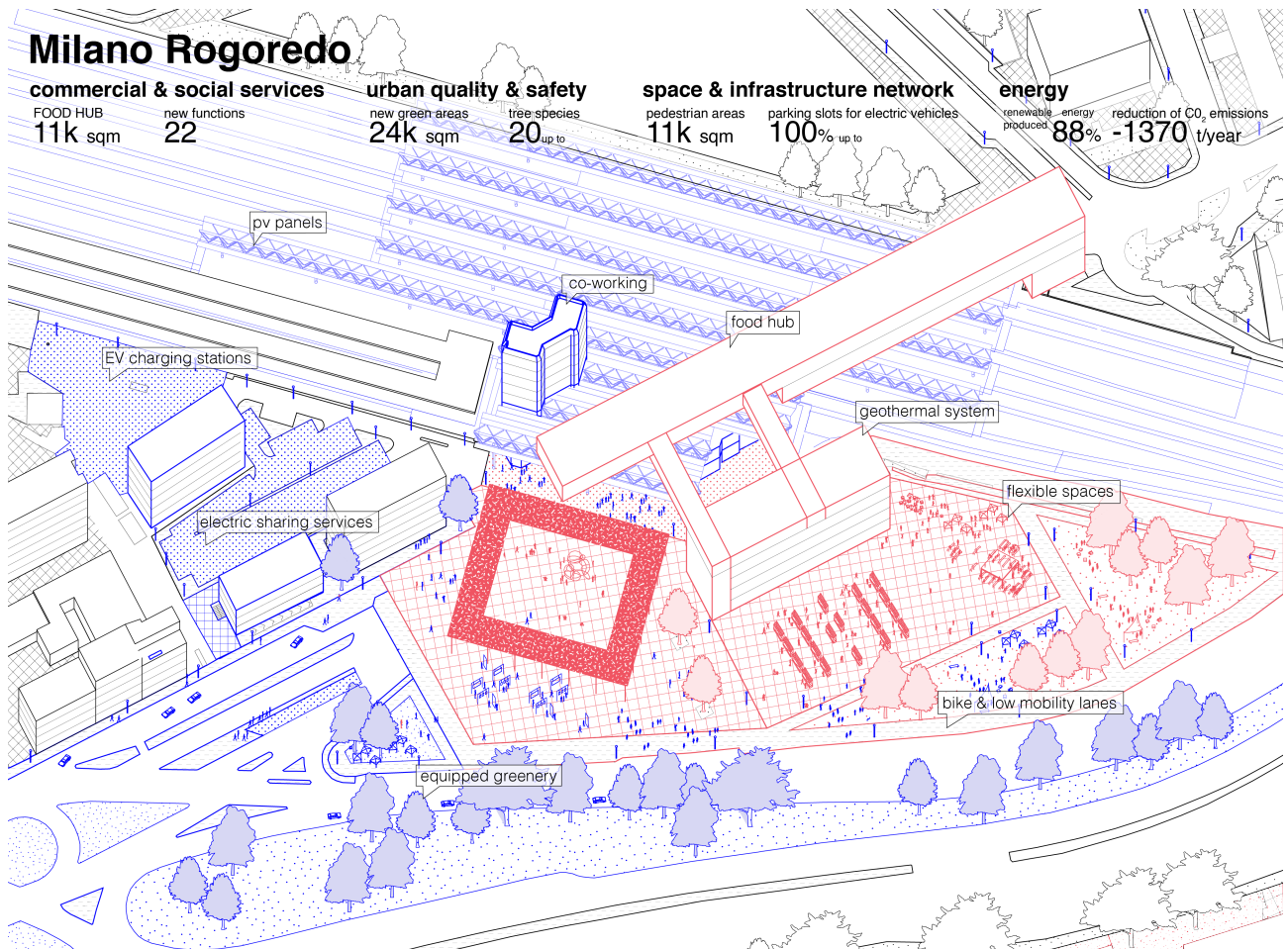
pedestrian areas  
11k sqm

parking slots for electric vehicles  
100% up to

### energy

renewable energy produced  
88%

reduction of CO<sub>2</sub> emissions  
-1370 t/year



## Torino Rebaudengo Fossata

### commercial & social services

refunctionalized building  
1350 sqm

new functions  
19

### urban quality & safety

new green areas  
60k sqm

tree species  
30 up to

### space & infrastructure network

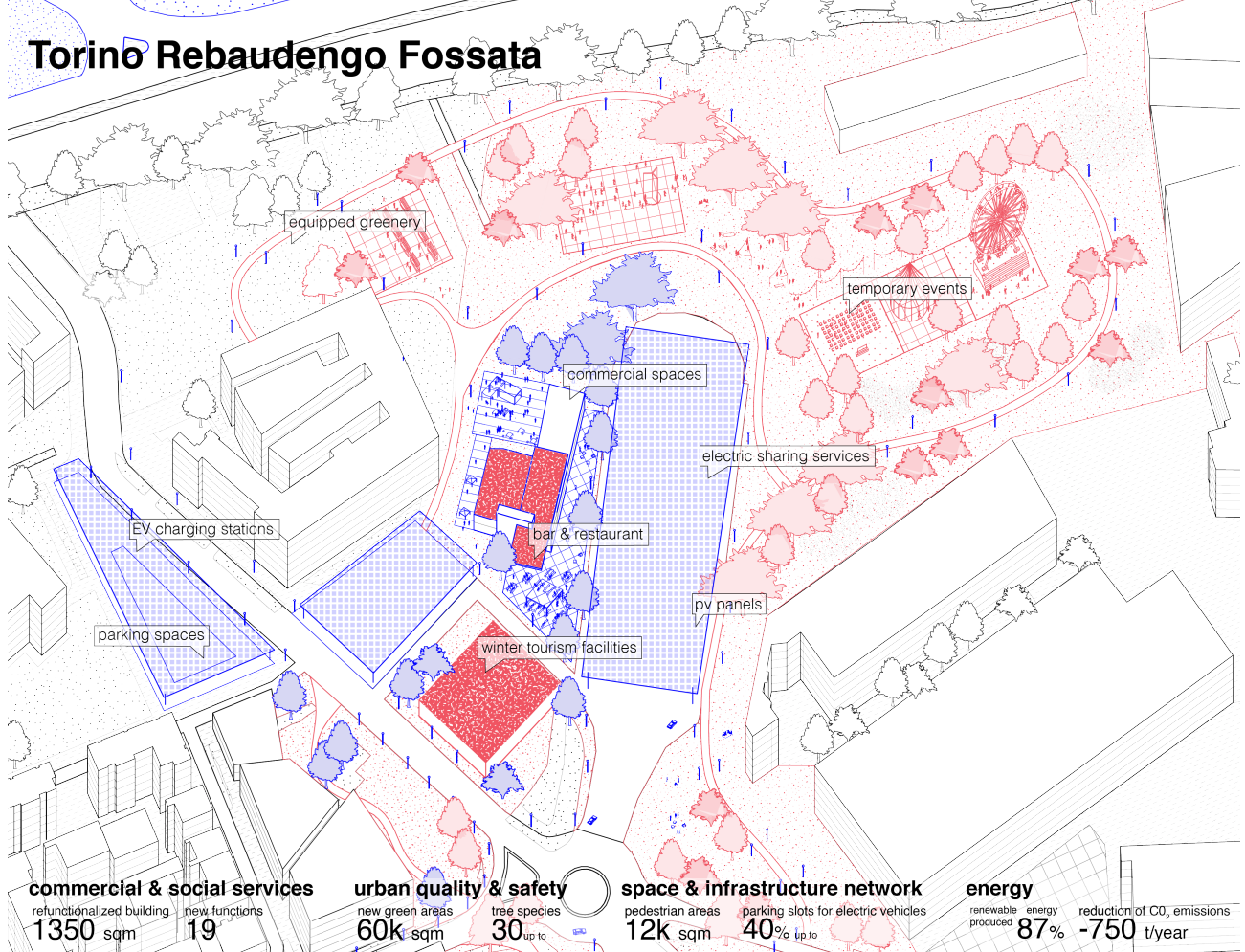
pedestrian areas  
12k sqm

parking slots for electric vehicles  
40% up to

### energy

renewable energy produced  
87%

reduction of CO<sub>2</sub> emissions  
-750 t/year





**Project description  
written by the  
Principal Academic  
Tutor**

Boosting a Smart and Sustainable Transition towards carbon-neutral cities aims at developing services for cities, enabling carbon neutrality in the long run. To this end, the project focuses on railway stations in order to define upgraded criteria for designing them as a multiservice hub.

By working on two railway stations - Milano Rogoredo and Torino Rebaudengo – the project develops tools for addressing stations revamping projects towards energy efficiency and carbon neutrality, taking into account the variety of factors that influence decision making beyond merely technical aspects (financial, spatial, social, policy dimensions related to transition).

The project identifies a road-map for developing integrated solutions within two strategies (short and long-term), envisaging the following impacts:

*-social impact:* addressing solutions for improving the supply of services in the stations and increasing quality, liveability, the safety of the spaces of the stations and the surrounding.

*-environmental impact:* verifying the feasibility of interventions for reducing the heat island effect in and around the stations; supporting solutions for electric mobility (bikes and cars) through the use of already existing electrical infrastructures (railways, subway, trams).

*-spatial impact:* optimizing indoor and outdoor spaces distribution to promote intermodality, new services and boost an upgraded use of the station for different profiles of users (personas).

*-energy impact:* implementing solutions to achieve a nearly zero-energy hub, through the enhancement of energy efficiency, maximisation of renewable energy production on-site, and use of sustainable material and innovative construction techniques.

The methodology used are different and complementary, related to the profiles of students involved in the project: interviews and workshops with actors involved in the topics, survey on users' habits and preferences, personas profile, S.W.O.T. and P.E.E.S.T. analysis, urban investigations and scenario construction, cost effectiveness analysis, energy assessment.

The project has been supported by the skills developed within EDF Group on urban energy planning and energy efficiency.

**Team description  
by skill**

The team is composed by six Alta Scuola Politecnica students coming from the School of Industrial and Information Engineering, Architecture and Design of Politecnico di Milano and Politecnico di Torino.

**Gabriele Casella:** Energy Engineering student at Politecnico di Milano. His core competences are related to energy modelling and scenarios definition, with a focus on renewable sources and energy accessibility in developing countries. He previously studied at Politecnico di Torino and CentraleSupélec in Paris. Interested in all facets of sustainability and passionate about European politics.

**Kristina Fabrin Jakobsen:** MSc Integrated Product Design at Polimi. Her core competencies lie within UX, interaction design, the design process and methods that lie within. She likes to work in the crossover between digital and physical products, services or systems. To humanize and practice empathic user centered design that ultimately create pleasant and user friendly experiences. Previously she has studied at the IT University of Copenhagen and Georgia Tech in Atlanta.

**Filippo Mercuri:** Student of Building Architecture at Politecnico di Milano. He is specialized in technological solutions in architectural environment. He is interested in urban innovation, smart cities and interdisciplinary works in different fields. His passion is for the mobility and tech sectors.

**Alessandra Morici:** Student of Architecture Construction City at Politecnico di Torino. Her main skills are related to the theory, methodology and projects of architecture, understood in its constructive and urban components. She obtained her degree at the

Politecnico di Torino, participating in multidisciplinary projects and experiences. She considers very interesting the humanistic, social, environmental and economics.

**Francesca Moro:** Architecture Construction City student at Politecnico di Torino. Her core competences are related to the practical and theoretical understanding of projects deeply interwoven within the city network. She obtained her Bachelor at Politecnico di Torino. She is passionate about wide range projects that work towards the development of cities' spaces.

**Davide Muffolini:** Student of Management Engineering at Politecnico di Milano. His core competences are related to business modelling and financial evaluation. He previously studied at ETH in Zurich. Passionate about sustainability, technology, and economics.

## Goal

Starting from the broader focus of the BOOST project, we focused our work on one central element of cities and pivotal to their functioning and sustainability, namely train stations. The overall objective of the project was indeed to develop a methodology to improve railway stations to make them well-served, interactive, accessible, safe, secure and sustainable for all citizens. The results of our work would be a tool for municipalities to help them assess the needs and requirements that each station within the city possess as well as their potentialities that obviously differ from station to station. This way, the administrations can make informed decisions on proper strategies for railway stations and their surroundings without losing time, money and resources that would otherwise be wasted by analysing each time what the specific station and its surroundings require to become efficient, safe, and sustainable for their citizens.

## Understanding the problem

The team conducted a deep investigation through primary (interviews and seminars) and secondary research activities (literature review) on the main limitations and challenges that train stations and their surrounding context are facing nowadays. Thus we identified three main macro-classes of problems:

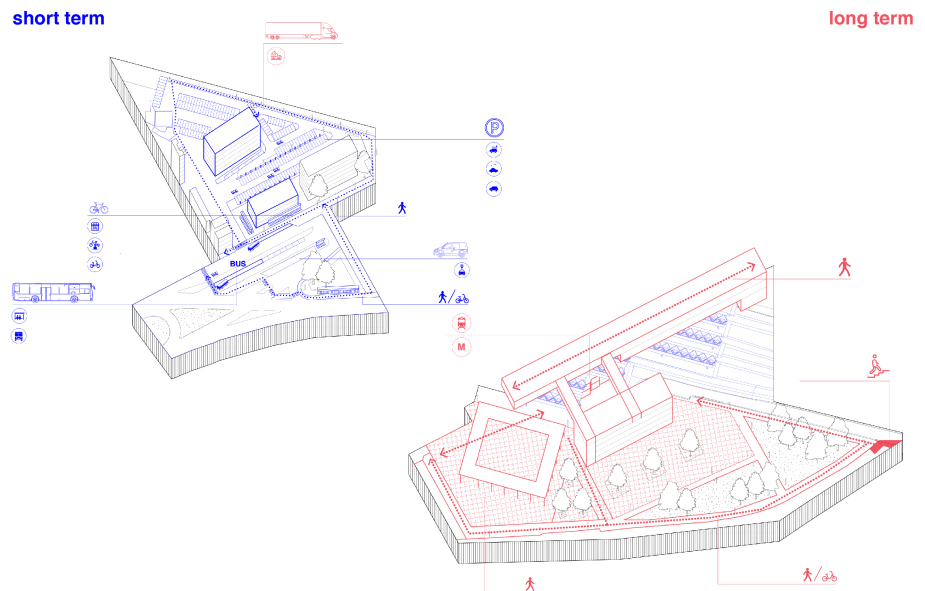
**-Untapped potential:** Railways stations are generally located in a strategic area of the city under the perspective of transportation requirements and habits of citizens. Nevertheless, looking at a railway station as a mere place where to take a train is really limiting. Whilst there are already signs, especially in most advanced countries, that governments and municipalities are looking at railway stations with a broader interest, the majority of Italian stations still remain focused on their original, and poor, role of mere transport hub. Indeed, our research identified a lack of tailored services within the boundaries of the station that otherwise would additionally integrate it with the surrounding environment, also under a social & economical perspective. More concretely, some of the main problems we identified are: *i)* a general disorganization between different transport modes and the unreliability of public transport services and traffic jams; *ii)* railway stations are usually overcrowded and lack an organized strategy to handle the flows; *iii)* they are obsolete and not appropriate compared with actual needs of our constantly changing society, especially when considering services provided for the surrounding ecosystem; *iv)* More often than not, railway stations are perceived as unsafe or dangerous places, especially in the evening hours. Moreover, lack of maintenance can cause distress to the users.

**-Urban decay and constituents:** Today, most railway stations represent areas of the cities with very low urban quality. Specifically, sometimes they represent a wound in the urban fabric, separating different neighbourhoods, an effect caused by the non-integration of the evolving surrounding environment with the (probably pre-existing) station. Additionally urban decay enhances problems of safety and

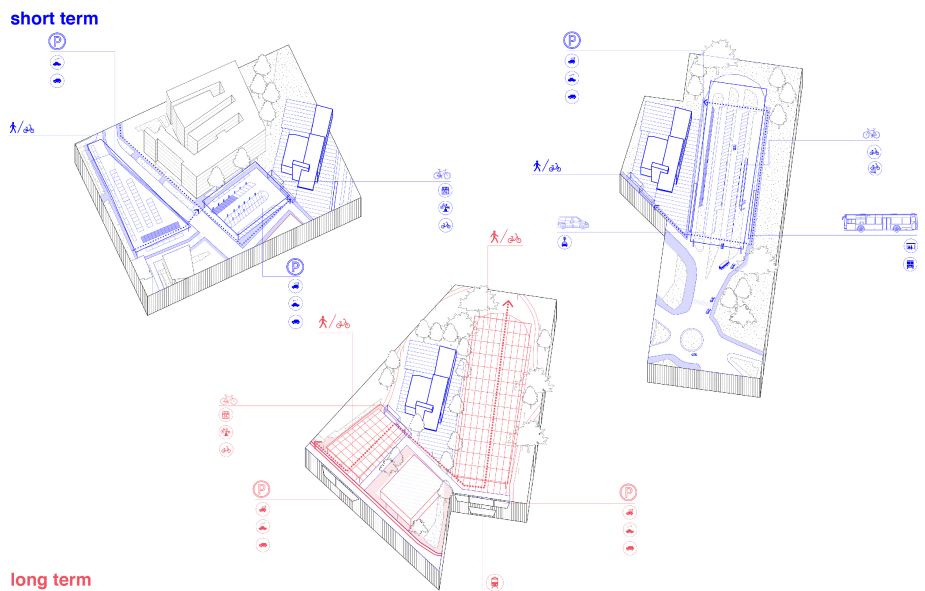


security.

**-Low sustainability and energy performance:** Railway stations are usually old buildings, edified before sustainable energy practises were such a relevant theme. As a result of that, their energy management is sometimes very poor, and round tables with experts have underlined the fact that there is usually no clear distinction between the energy consumed by railway stations buildings (heat and electricity) and the energy consumed for electric railway traction at level of station. Additionally stations still rely a lot on fossil fuel such as diesel and natural gas for daily operations and energy needs.



Intermodality strategy for Milano Rogoredo



Intermodality strategy for Torino Rebaudengo-Fossata

## Exploring the opportunities

In order to evolve the current railway station into a new, effective and energy efficient multi-service and multi-modal hub we sourced from the best of breed services organized in different categories.

**-Energy:** intervention to optimise energy consumption ranges from the less invasive retrofitting of the station buildings to the installation of renewable energy generators (mainly solar PV and geothermal systems) and energy storage systems.

**-Mobility:** Vertical and horizontal connection to make interchanges between different mean of transport easy, slow mobility route, “Città 30” (limiting speed at 30km/h in the adjoining areas), shared and zero emission mobility are just some of the application that would help railway station to serve their primordial role of mobility hubs.

**-Environmental sustainability:** A railway station might one day become a carbon neutral area, integrated with its surrounding through green areas, low emission zones and Nature Based Solutions (NBS) (e.g. green corridors for wildlife) and an example of a circular economy.

**-Connectivity:** organization of flows through designated lanes is required, together with accessibility for every person with the removal of artificial barriers and mechanism of social Proximity (reduction in travel time throughout the neighborhood with the 15 min city paradigm).

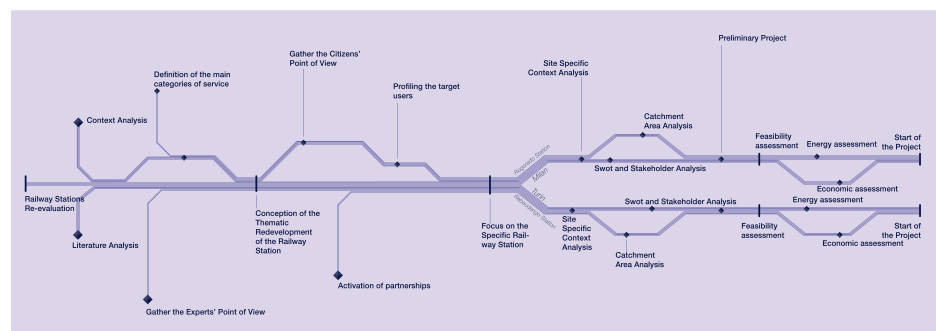
**-Social & Economic:** A variety of services might be useful to create a socially and economically flourishing ecosystem such as sport facilities, health centre, smart lockers, entertainment platforms, zen spaces, food hubs, local trade spaces.

**Safety & Security:** The adoption of the open station paradigm would create a more secure feeling, similarly the creation of reference points, safe storage and parking, boundaries for train platforms would contribute to the overall perception of security.

## Generating a solution

Each railway station serves different travellers and is inserted in different geographical and political contexts with specific characteristics and requirements. This requires a deep study and research on which of the previously described services would be more impactful and useful to reach the final goal. With this in mind, we developed, and directly tested on two case studies, a methodology that will help stakeholders to make informed decisions on how to proceed with the transformation of a station into a multi-modal and multi-service hub.

Specifically, the methodology comprises a re-evaluation of the railway stations with context and literature analysis to understand which generally are the main problems and challenges encountered with thorough discussion with main stakeholders and experts. A second step regards the conception of the thematic redevelopment of the railway station that enlarges the focus of the analysis by collecting the point of view of the citizens in order to understand their needs, and accordingly being able to develop valuable partnership with external stakeholders. Lastly, the focus on the station combined with the data previously collected allow the creation of the SWOT, stakeholder and catchment area analysis that brings to the creation and definition of a preliminary project. The work would be completed by an economic and energy assessment to test its feasibility.



Intervention roadmap to support decision-making processes in railway stations transformation



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