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Special Issue 1.2022

**New scenarios for safe mobility
in urban areas**

TeMA

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Land Use, Mobility and Environment

Special Issue 1.2022

NEW SCENARIOS FOR SAFE MOBILITY IN URBAN AREAS

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Well-being, greenery, and active mobility

Urban design proposals for a network of proximity hubs along the new M4 metro line in Milan

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Abstract

The paper summarizes the results obtained from the action research conducted at Politecnico di Milano (2018-2020) for Milan Municipality and MM4 SpA. It is a Masterplan for reorganizing areas and public spaces along the new M4 metro line route.

The paper aims to highlight the positive effects that planning at various scales brings to the city in terms of new green areas, new spaces for inhabitants and users, and new routes to get around the city. The three concerns are at the basis of a conscious process of improvement of living conditions in the major urban areas worldwide, which are increasingly characterized not only by climate, environmental and social inclusion problems but also by health problems. Without disturbing the pandemic issue, important urban matters must be addressed from an urban health perspective to support the prevention of chronic degenerative diseases. Policies for the re-greening of the city and the extension of slow mobility routes help in this task. The paper shows how these strategic actions can be adapted to the dense and stratified fabric of Milan city to achieve and boost a model of a healthy, active, and sustainable city.

Keywords

Masterplanning; Salutogenic-city; Green infrastructures.

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1. State of the art

1.1 From healthy cities to salutogenic cities

Historical analysis of epidemics evolution shows that the living environment determines people's health. Following a fire that broke out in London in the second half of the 17th Century, the replacement of London's settlements – made mainly of timber and thatched roofs – drastically reduced the spread of the plague, which at that time was diffused by rats and fleas. According to Mc Neill (1976), in that situation, quarantine and other public health measures were less essential in improving the citizens' health than measures taken to renovate the buildings and the city (Mc Neill, 1976).

The environment in which people live, act, and move has direct impacts (air quality, climate, noise, traffic, natural hazards) and indirect effects (living and social conditions, accessibility, enjoyment) on people's health (Barton & Grant, 2006). However, today the problem is no longer fighting infectious diseases but fighting chronic-degenerative diseases that the contemporary city environment feeds exponentially.

Chronic diseases are the leading cause of death almost worldwide. It is a broad group of diseases, including heart disease, stroke, cancer, diabetes, and chronic respiratory diseases. There are also mental illnesses, musculoskeletal and gastrointestinal disorders, visual and hearing defects, and genetic diseases (WHO, 2005). Since they cannot be aimed at recovery, the care in patients with chronicity seeks to improve the clinical and functional status, minimize symptoms, prevent disability, and enhance the quality of life, including the improvement of the environment in which people live (Buffoli, 2014; Ministero della Salute, 2016).

As Rydin and colleagues argue (2012), in-depth studies to analyze links between environment settings and peoples' health are not available at the local scale because the city, as a complex system, is challenging to split into independent variables. This diagnostic impossibility puts urban policies to the test, underlining the limits of their ability to predict, plan and control the behavior of social systems. However, Rydin et al. claim that adopting a heuristic approach to policy analysis and development can help understand the correlations between spatial and health-related elements. Among the issues specifically investigated are sanitation and the management of wastewater, building standards and indoor air quality, urban transportation and mobility, measures to deal with the urban heat island, and urban agriculture initiatives (Rydin et al., 2012).

In 2016, Sallis and colleagues showed a significant, positive, and linear correlation between four environmental characteristics and physical activity. These environmental characteristics are residential density, the density of public transport stops, intersections, and the number of green areas (Sallis et al., 2016). From the study, it is understood that it is no longer enough to contain health risks in the contemporary city, but health must be promoted in cities. The 'Healthy & Active City' concept is relatively recent since it is linked to increased interest in studies and research on the cause-effect relationship between cities and health. In particular, the new concept highlights the shift from treating pathologies (medical perspective essentially) to prevention through health policies that include actions in the urban sphere (Dorato, 2020).

The transition from 'healthy cities' to 'salutogenic cities' (Antonovsky, 1979) implies working on a behavioral, and therefore cultural, change that induces people to become primarily responsible for improving their living conditions. It is especially true in prevention, i.e., anticipating the onset or increase of chronic-degenerative diseases in contemporary societies. It means making cities, mainly outdoor and indoor spaces, true 'enabling platforms' for starting this process (Miano, 2020; Manzini, 2021). Without forgetting that a healthier city must be rooted in a new political agenda that supports feasible urban projects (Toppetti & Ferretti, 2020).

The topic meets with support and reference on an international scale. In particular, the well-being and people's health can be outlined in many of the 2030 Sustainable Development Goals. Among its actions, Goal 11 'Make cities and human settlements inclusive, safe, resilient and sustainable,' includes providing access to safe, accessible, and sustainable transport systems and providing universal access to equally safe and accessible public green spaces. Currently, these challenges persist in most regions and countries (Sachs et al., 2021).

1.2 Approaching the active mobility in urban design

In order to achieve the goals described above a transdisciplinary work is necessary. The cross-based work must identify priorities for intervention based on the urban contexts and must offer tangible solutions. The health/city pair is a complex issue of complex factors with highly complex relationships. Therefore, to identify more articulated and more effective design solutions, it is essential to integrate knowledge and expertise by adopting a systemic approach advocated by the World Health Organization in the 'Action Plan for Physical Activity' (WHO, 2018). The plan explains that it is not enough to build a cycle path for people to use it. Other determinants are: the density of buildings and functions (rich and varied urban environments are more chosen for getting around); the presence of well-kept green spaces (e.g., attracting children to play, older people to relax, and adults to play sports); the presence of intermodal public transport mobility (facilitating the use of the scattered and sprawled contemporary city); as well as the perception of safety, especially for older people, provided by well-lit and signposted open space devoid of, e.g., urban voids, degraded or underused areas. In the background, of course, there is a cultural and educational project that starts with promoting and encouraging walking in the city from schools onwards.

A solid urban planning framework must translate the political-strategic goals. The master planning becomes an operative design structure that could be implemented through shared projects extended in time and space. The issue of green and blue infrastructures can be a valid reference in this respect. The integrated design of green and blue networks creates suitable public spaces for sociality, play, well-being, health, and safety of people, paying attention to the context in which the works fit (ARUP, 2014). In other words, the integrated studies – between health and territorial disciplines, strategies and actions, themes and issues – put the human dimension back to the center of urban space design, not in the sense of the individual but as a prerequisite for improving human social relations. The search for space for pedestrians takes on new meaning and significance in urban design.

The walkability of urban space is a multi-dimensional concept that is also difficult to measure. Still, it is essentially attributable to the places in the city with performances – in terms of accessibility, functionality, and density – that encourage people to walk (Dovey & Pafka, 2020). In this sense, promoting the regeneration of public spaces by equipping them for walking and recreational uses is a significant urban planning action. Some planning guidelines are related to the forecast of dense and mixed-use blocks (residential/services) but with reduced extensions. The experiences of Paris with the 15-minute city, or Singapore and Portland with the 20-minute city, are going in this direction, precisely to contain long journeys and at the same time encourage pedestrian mobility. In addition, the multi-functionality of public space, which creates opportunities for meeting, recreation, and enjoyment, matches the principle of attracting people to the public areas, bringing them to life, and supports both the inhabitants' need to use essential services and to engage in daily activity. The article shows the research experience carried out between the end of 2018 and the beginning of 2020 at Politecnico di Milano for the city of Milan. It is action research that developed a series of design proposals to improve the performance of the public spaces according to well-being, greenery, and active mobility topics.

The innovation of research lies in its operability and replicability. There are many studies on the importance of green and blue infrastructures or urban planning strategies based on nature-based solutions to improve people's well-being. However, there are still few experimental urban projects, especially in the dense and stratified urban contexts of Southern Europe, which show how to transform the existing city to encourage the population to move around and thus reduce the effects of the ever-present chronic-degenerative diseases.

The research developed a system of surface paths and public spaces that branch out into the city following the underground route of the new M4 metro line in Milan. The project is called Milan's Green-blue backbone (*Dorsale verde-blu di Milano*). In particular, the paper dwells on the description of the design proposed for Forlanini FS Station in the city's eastern sector. The project is characterized by reconstituting the ecological and cycling system on a metropolitan scale and furnishing the new metro station's spaces with areas and

outdoor activities equipment. Although, in a pre-pandemic period, the project proposal defined a series of strategies to stimulate a behavioral change promoting a 'Salutogenic City'. A design challenge is necessary to cope with the changing environmental and climatic needs and encourage the people to less sedentary lifestyles, promoting active mobility and greenery, thus operating in prevention of possible future chronic-degenerative diseases. In European cities, 50% of car trips have a distance of less than 5 km (Dekoster & Schollaert, 1999). Active modes of transport can easily do this distance. The concept of a 'sustainable city' includes the idea of 'Active mobility.' Active mobility has multiple implications for health by changing the exposure to specific health determinants like physical activity, traffic incidents, air pollution, noise, social interaction, and crime. The Green-blue backbone project aims to combine well-being, greenery, active mobility, and efficient public transport.

1.3 The action research for Milan's Green-blue backbone

Milan is a very dynamic city in terms of urban transformation. Among the significant changes underway is the new subway line (called M4) that will be open in 2023. According to the new metro line route, the research topic is a Masterplan for Milan's neighbourhoods. It is a project for public space regeneration, and it regards designing a framework of coherent urban planning strategies and urban design actions to implement time by time. The project is a local-based design that could help Milan face post-pandemic planning and prevent contemporary diseases related to sedentariness. The aims were mainly the following:

- to implement the slow mobility, integrating Milan urban planning agenda in force that supports the walkability and cycle paths;
- at the local scale, to design green and blue infrastructure such as an urban project and not as a policy. Connecting metropolitan parks through green corridors into the built-up city;
- to redesign urban spaces' identity, using the opportunity offered by the M4 stations' top area, such as regenerating public space consistent with the emerging need for a healthy city that promotes the health of its inhabitants.

The paper shows research results carried out by a group of professors, researchers, and collaborators of the Department of Architecture and Urban Studies at Politecnico di Milano. The clients were the Municipality of Milan and the Metro Line Company MM SpA. The two primary research outcomes are summarised as follows. The first outcome is constructing a united representation, on a large scale, of the project for the regeneration of public spaces, routes, and green connections along the new M4 metro line. In other words, the overall design of a network of places that join urban peripheries and the city centre, dense fabric and metropolitan parks, proximity services and neighbourhoods. The design is supported by the definition of urban planning guidelines for implementing ecological corridors and extending areas dedicated to the practice of movement (sidewalks, cycle paths, squares, and pedestrian areas).

The second outcome is the design deepening of some pilot areas to improve the environmental and social performance of neighbourhood public spaces. The goal was to create vibrant, resilient places that stimulate people's physical activity, such as the realization of equipped and green spaces integrated into dense urban fabrics (playgrounds, sports areas, bicycle lanes, gardens, tree-lined parterres, etc.).

The article consists of four main parts in addition to the introduction and conclusions. The materials and methodology used in the research are presented in the second paragraph, while in the third paragraph the elaborated master plan and the project results are discussed. In the last paragraph, the research results are examined, and conclusions are discussed, which outline some reflections on how it is possible to realize a salutogenic city concretely through small operations of mending the urban tissues by redesigning public spaces.

A brief description of the research's contents is provided below. In Milan, the M4 line will connect two large environmental systems at the territorial scale: the Regional Agricultural Park (*Parco Agricolo Sud Milano* and

Parco delle Risaie) on the south-west side; while on the east side, the Great Park System made by *Forlanini-Lambro-Idroscalo* areas (the chain of open spaces formed by the Forlanini metropolitan park, the Lambro river park and Milan's seaplane base). These large natural areas outside the city represent a vital ecological resource that must bring benefits to the town and well-being to its inhabitants and users daily.

On the surface of the metro line, the action research planned to accompany the subway route by the Green-blue backbone project. It is a network of itineraries and spaces dedicated to pedestrians and cyclists, which completes the walker itineraries of the Sustainable Urban Mobility Plan in force. The design of the backbone does not entirely overlap with the underground route of the M4 but rings relevant places in the city and relates/connects them to the metro stations. The importance of these places is given by the environmental issues (green areas and water), services and infrastructures they pose; by the history and memory that characterize them.

Metro stations become the nodes that match the subway with the city. The stations' top areas have been the testing ground for urban regeneration projects. In these spaces, functional and material arrangements and the reorganization of routes for neighbourhoods and the metropolitan railway service have been tested, considering the historical characteristics of the fabric, the socio-economic dynamics, and the real accessibility of the metro stations. According to the stations' surroundings, the proposal identified seven design issues. The seven design issues characterize all along the Green-blue backbone route and differentiate the new 21 stations' top area design. The goal was to design the public space to regenerate and define the stations' identity according to the principle of a sustainable, healthy and active city. Moreover, to recognize a link between public transport, the open-air areas, and the neighbourhood. Among design issues, were identified:

- the relationship with water circuit and in particular with the existing or future sections of the Milanese canals (*Navigli*);
- the existence of strategic and attractive uses of supra-local importance, such as hospitals and universities, or monuments and architectures with high historical and cultural value;
- the importance of the station as an intermodal mobility node.

The proximity dimension and the context's characteristics have led to the redevelopment of street layouts to increase: people's well-being (in terms of space for movement and sociability), permeable and vegetated areas, space to practice exercise by facilitating daily activities (such as shopping, a walk to school or work, visiting a friend, or enjoying the monuments and attractions of the city). This mapping was followed by an in-depth examination of some particularly critical or strategic stations for implementing the principles of well-being, greenery, and active mobility in the dense fabrics of the city. The Forlanini FS station is among them. The project is a system of bicycle and pedestrian connections linking the dense part of the city (west side) with the Forlanini Park areas (east side of the railway). The recovery of the subway used for moving the waste material during the construction phase of the M4 makes possible the realization of this project with a strategic metropolitan role. Forlanini FS station project deals with places' identity by recognizing the central green area (called *Pratone*) as a compact and integral nucleus of the station and the neighbourhood for recreation and leisure activities protected by a shell of trees and paths.

2. Materials and methodology

The design proposal of the Milan's Green-blue backbone arose with a traditional working method based on urban analysis, master planning, and urban design.

The development of urban, environmental, and transport-oriented analyses in GIS environment helped to discover opportunities and threats at urban scale. Municipality of Milan and M4 SpA provided their data and other open source data were retrieved from regional (*Geoportale Lombardia*) and national databases (Istat). The urban, landscape, environmental, and transport system analyses covered three thematic fields:

- the assessment of the M4 stations' accessibility by foot (using pedestrian isochrones);

- the mapping of urban functions that generate or attract city users (attractors and traffic generators);
 - the mapping of services and urban transformation opportunities present in the M4 stations surrounding.
- The pedestrian accessibility was calculated considering pedestrian spatialized isochrones of 5, 10, and 15 minutes (high, medium, low pedestrian accessibility considering an average speed of 4 kilometers per hour) using the Open Route Service plugging in QGIS (Fig.1). The catchment areas highlighted the walkability network considering the urban constraints such as architectural barriers and discontinued connections. The Sustainable Urban Mobility Plan offered other information (2018), such as Limited Traffic Zones or existing/predicted cycle lanes. The collected information suggested where to increase the pedestrian area through new safe routes or improving the continuity of existing itineraries. The Green-blue backbone Masterplan is a network of slow-mobility that considers the level and the quality of the pedestrian accessibility around the M4 stations.

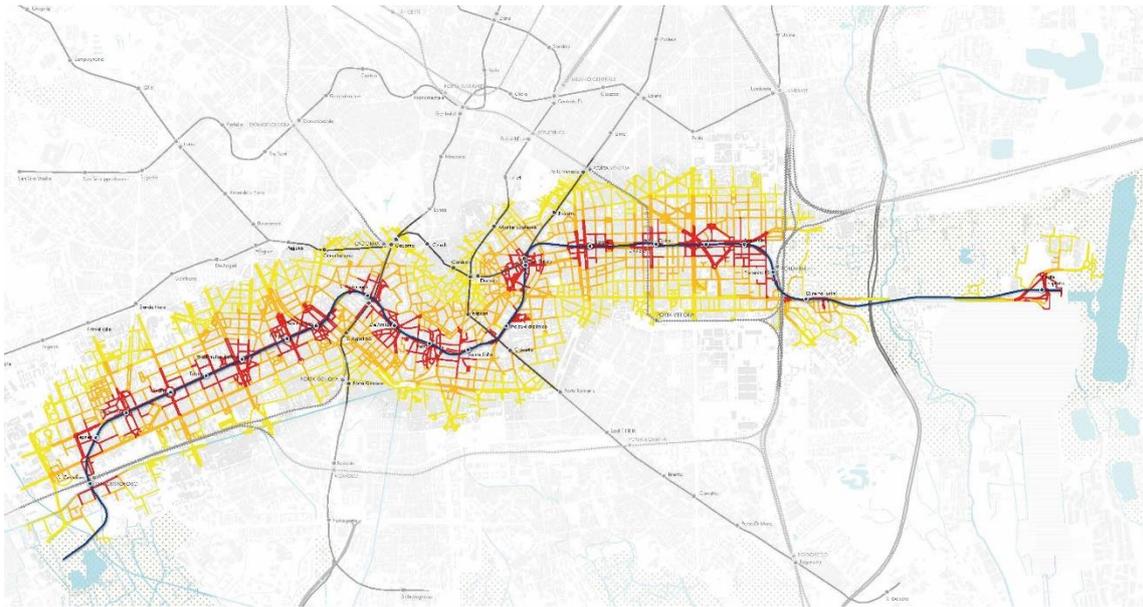


Fig.1 Pedestrian isochrones along M4 line. In red: 5 minutes; in orange: 10 minutes; in yellow: 15 minutes by foot

The distribution of uses and functions that generate and attract users was necessary for understanding stations' functioning and design. Using census data (2011) about inhabitants and enterprises, geospatial operations designed maps of 'attractors' and 'generators' (Fig.2 and 3). Attractors are companies, tertiary-commercial, and service activities, while generators are residential districts. The number of enterprises per census area and the number of employees per census area were used to analyze the attractor districts. On the other hand, the number of inhabitants per census area was used to analyze the generator districts.

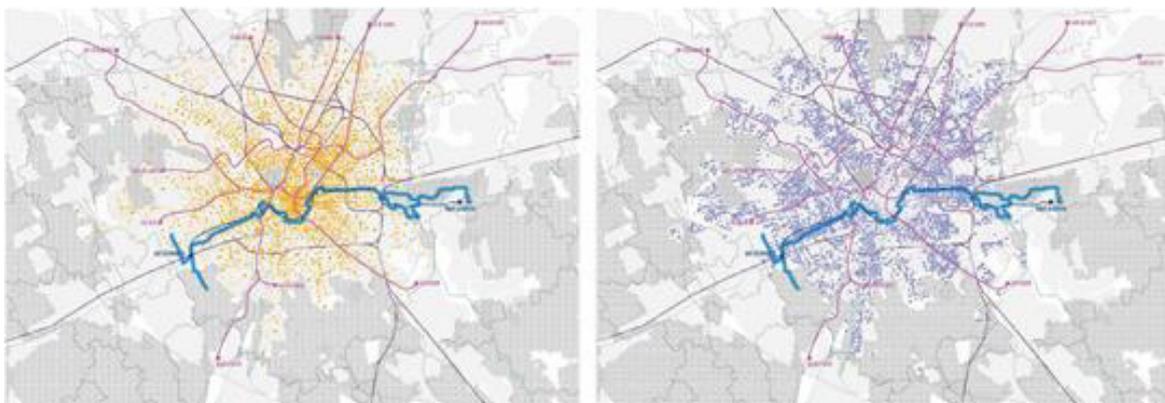


Fig.2 Attractors (orange dots) and Generators (purple dots)

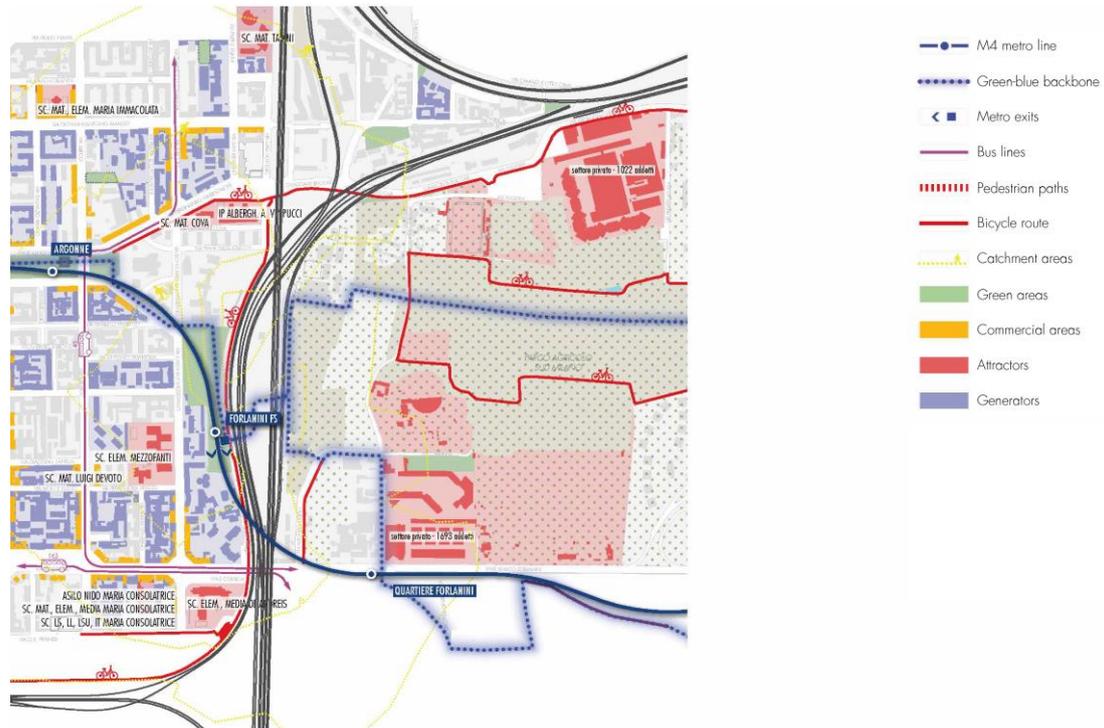


Fig.3 Attractors (red areas) and Generators (purple areas) around Forlanini FS station

The maps allowed the evaluation of the flows potentially generated and attracted in each station. Moreover, they were helpful to assess whether there are conditions for possible densification (building rights transfer) around the transport node.

Data on land use and land cover by the Municipality of Milan was used to map services, public facilities, and urban transformation all around the stations. The mapping involved the existing and planned system of public facilities (green and sports areas, education, universities and research districts, health services, and social housing, etc.), as well as strategic functions (conference centers, theatres, museums, libraries, shopping mall, etc.), transformation areas predicted by the General Plan of Milan (*Piano di Governo del Territorio*), and existing disused or underused areas. The aim was to improve the knowledge of the urban context within the pedestrian isochrones, identifying the strengths and weaknesses of each station. Moreover, the aim was to identify thematic issues for the urban projects at the neighborhood scale.

The Masterplan design and the definition of the project guidelines for the entire Green-blue backbone offered technical support to coordinate future urban development (Fig.4). At the city scale, the output is a map discussed and designed through a co-design process with Municipal offices.



Fig.4 The Masterplan Design. The Green-blue backbone

Finally, the implementation of hot-spot areas, particularly relevant for urban re-greening, slow-mobility connection, public facilities, and cultural identity, helped test the guidelines and suggested public spaces regeneration.

The hot-spot design implementation was an essential phase of the design process because urban actors (politicians, technicians, and experts) were involved to co-create innovative and resilient urban neighborhoods.

3. Master planning and urban design results

3.1 The design of an urban planning framework

Briefly, the action research developed four specific activities. The main outcomes are maps.

- the Urban Contexts Analysis (*M4 incontra la città* - M4 meets the city) output a list of maps, at city scale, covering different topics (from environment to mobility). The most important topic is the assessment of walkability around the new metro stations;
- the Masterplan Design (*M4 incontra i territori* - M4 meets neighborhoods) outputs a Masterplan at the urban scale, covering the entire M4 route and the pedestrian and cycle network and greenery design;
- the new Urban Hubs Development (*M4 incontra lo spazio urbano* - M4 meets urban space) output 21 Masterplans at local scale, one for each new metro station;
- the Design Guidelines (*M4 incontra i luoghi* - M4 meets places) output a set of planning recommendations for some metro stations. This activity was dedicated to the space design of the open air space around the metro station.

Downstream of the knowledge acquired in the analysis phase, the research considers the new M4 line as the opportunity for developing a linear green and blue park. The metro line, running underground, develops a system of interconnected spaces defined as green-blue backbone on the surface. The design links several environmental systems – the regional park (*Parco Agricolo Sud Milano*), the metropolitan park (*Grande Parco Forlanini*), the Lambro River and the seaplane base (*Idroscalo*) – reduces the traffic impact, and promotes active mobility. This system of routes, green areas, water connections, urban services, public transport nodes is the Green-blue backbone of Milan 2030. The backbone has a metropolitan dimension that touches the city centre and reaches the municipalities of the first belt (Segrate, Peschiera Borromeo, Buccinasco, Corsico).

The new metro line crosses Milano city from East to West, touching working-class neighbourhoods and the historic centre. All the new stations are in dense urban areas, and assessing their accessibility meant questioning the level and the quality of pedestrian (and cycle) usability. Moreover, the distribution analysis of generators and attractors was helpful indicator for estimating the station's pedestrian flow and understanding their temporal distribution over the day. Generators require a transport demand mainly concentrated in the morning peak hours (as entrance flows) and in the evening (as exit flows). While, according to their economic activity, attractors' demand is complementary to the generators in terms of entrance/exit flows. Generators and attractors map was essential for orienting public space design around stations through the safety and requalification of the pedestrian access routes.

In the Green-blue backbone, M4 stations are 'urban thresholds' – thus complex urban environments that include homes, services, and activities – that provide access to the infrastructure. In line with Transit-Oriented Development approach (Dittmar & Ohland, 2004; Carlton, 2009) stations are not just the points of the metro route that collect, distribute and bring flows of people to the surface. Station nodes are hallmarks of the city's present time. Stations are 'enabling platforms' for environmental (water, parks, and green areas) and infrastructural systems (trains, metro, buses, cycle paths, squares). Stations are places of memory, including the city's past, i.e., the history of the city; the city's present, i.e. the culture produced (living memory); and the city's future because stations are places of urban transformation. For those reasons, the research developed 21 local Masterplans, one for each station (Fig.5). These Masterplans have given great importance

to the recognisability of the stations and their neighbourhoods. The stations' recognisability is closely linked to the territorial context in which they are located.

The urban analyses defined the design issues for each station. By way of example, Segneri and Frattini stations are described as 'connectivity hubs'. For them, the Masterplan offered solutions to overcome the discontinuity of the routes, creating new connections and enhancing existing urban relationships. The aim was to extend the pedestrian isochrones and bring the stations closer to the neighbouring areas, stimulating a behavioural change and promoting active mobility.

The last part of the research produced design guidelines for three stations and their urban areas (Frattini, Sforza-Policlinico, Forlanini FS). The case studies are particularly relevant in public space renewal, slow-mobility network improvement, healthy perspective promotion, public facilities enhancement, and cultural identity valorisation.

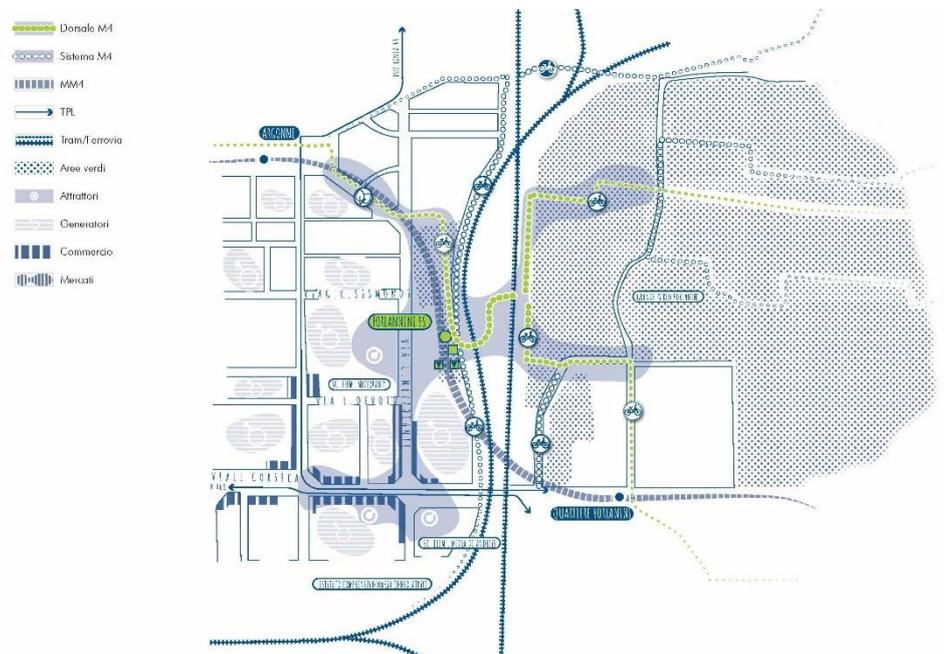


Fig.5 The Masterplan for Forlanini FS Station

3.2 The design implementation: greenery, playgrounds and active mobility

The paper shows the results for Forlanini FS station (Fig.6 and 7). The station is in the eastern part of the M4 line, combined with the suburban railway station. The surrounding is characterized by the XIX Century settlement fabric, the proximity to metropolitan park (*Grande Parco Forlanini*), and a large green area called '*Pratone*' (giant meadow). The *Pratone* is an open space of 15,000 square meters, partly planted with trees, which until 2013 was available to the inhabitants for games, walks, and recreational activities. In particular, the *Pratone* area is adjacent to the new M4 station. It was one of the most exciting areas for in-depth design, increasing the resilience of the surrounding urban fabric, expanding the ecological and environmental corridors, and promoting spaces for sport and game.

The design recommendations goal was to arrange the area considering the needs of the inhabitants, mainly foreign people and families. In particular, the proposal provides the restoration of the green area increasing the continuity of bicycle and pedestrian paths between the metro stop, the city, and the metropolitan park. The proposed design guaranteed the green open space integrated with new public facilities (playgrounds, bar, and kiosk) and dedicated to outdoor movement with areas equipped for free-body sport.

The project includes the central and strategic area of *Pratone*, some important road axes close to it – like Via Pannonia (in the North-West) and Via Ardigò (in the East) –, and the space in between the two branches of the railway line. In the project, the *Pratone* returns to being a protected and domestic neighbourhood space,

such as an access point to the system of open spaces at a metropolitan scale. The project anticipates and creates a system of multifunctional, complex, and connected areas. The system allows people to move by foot safely, through tree-lined spaces and lawns, from the centre of Milan to the seaplane base. The slow-mobility network allows to quickly access places and public facilities that would otherwise be distant and separate from the neighbourhood (such as the Junior Tennis Club, the historic Scarioni football club, and the Sant'Ambrogio farmstead).



Fig.6 The Design Guidelines for Forlanini FS Station. Urban connections



Fig.7 The Design Guidelines for Forlanini FS Station. Architectural Design

The main design principles for the new layout of the Forlanini FS station are three: the essential redevelopment of Via Pannonia, the definition of urban transformation's margins, and the Pratone area as a place for daily activities (leisure time, games, walks, light sports), as well as the creation of slow routes connecting the city and the countryside (Fig.8). The three important design choices for starting the urban regeneration of this area are explained below.



Fig.8 'Pratone' area. Open air spaces and paths for outdoor activities

1. The redevelopment of Via Pannonia. Via Pannonia is a fundamental bicycle link between the Argonne-Susa axis, *Pratone*, and Forlanini Park. The redevelopment of Via Pannonia is strategic to give accessibility to the Forlanini FS station from the city centre through a slow mobility route alternative to the vehicular net.

Via Pannonia is an urban road with two lanes of traffic divided by a green belt of trees. The *Dorsale* project foresees the redevelopment of the road while maintaining only part of its function as a vehicular axis. The project plans to retain only the driveway lane direct out of town, which is also functional for public transport. The proposal boosts re-design the rest of the vehicular spaces by increasing the permeable and tree-lined parts and designing a two-way cycle path. To this would be added a pedestrian path, for a stretch mixed with cars to allow vehicular access to the few house entrances. The project also foresees maintaining the turn off onto Via Sant'Achilleo, leading to the *Basilica dei Santi Nereo e Achilleo* (built at the end of the 1930s) *Istituto dei Tumori* and *Ospedale Besta* (two major Milanese hospitals dedicated to the treatment of cancer and neuro-brain disorders).

2. Defining the edges of the *Pratone* and the heart of the area. The *Pratone* is a relatively small public space and requires a clear delimitation and protection and a precise organization of spaces to be fully utilized. On the west side, the project proposes to maintain the existing ancient wall along Via Mezzofanti as well as the existing trees, and to design a large tree-lined parterre behind the wall, visually in continuity with the double row of plane trees on Via Pannonia. The green parterre is equipped with seats and games. It connects with access to the maintenance and rescue area of the M4 line, which is enlarged to accommodate a small space equipped with toilets and a kiosk. The eastern edge of the *Pratone* is formed by the railway embankment and the subway (see next paragraph), while the northern side is formed by the garden of the Andersen International School. The narrow corridor of open spaces that connects the *Pratone* to Piazza San Gerolamo is reserved for pedestrian and cycle traffic and is flanked by a new row of trees that continues southwards along the railway embankment delimiting the eastern side of the *Pratone*. To define the southern edge, the proposal is to maintain the one-way carriageway (by narrowing its section as much as possible) with an adaptation of the route to make it possible to build the connection ramps of the bicycle and pedestrian subway that will give access to Parco Forlanini. The set of paths and equipped areas of the *Pratone* (one imagines two or more play areas along the edges of the area) represent the protective shell of the green heart. The system of connections with the trees and the areas characterized by permeable paving will circumscribe the central lawn area, becoming a protected but open urban garden suitable for all kinds of recreational and sports activities.

3. The system of paths and the cycle-pedestrian subway. In *Pratone* converge: the pedestrian and bicycle paths are coming from the city centre, from Via Ardigò and the future bicycle and pedestrian section of Viale Corsica (in the South). Therefore, it is a node that must be connected most directly and safely with Forlanini

and Lambro Parks, and *Idroscalo* spaces. The project organizes the paths at the edge of *Pratone*, connects them with the station area, and uses the tunnel under the railway – now used to transport spoil from the M4 tunnels' excavation – to accommodate a bicycle and pedestrian subway.

The space between the two railway lines will be accessible thanks to the cycle and pedestrian tunnel construction. Opening the space between the two railway lines will ensure the presence of people throughout the day and consequently increase safety. Moreover, it offers the city an attractive, ample space that can be used for sports, as a dog area, and for small urban vegetable gardens (practical to increase daily physical activity of elderly).

Finally, the trees foreseen in the project deserve particular comments. In general, the idea is to protect and preserve the existing varieties. On the western side of the *Pratone*, it is proposed to continue the tree system of Via Pannonia (mainly plane trees), which in turn will be enriched with specimens to transform the road axis into a true urban green corridor. The eastern side of the *Pratone* is also characterized by large trees (similar to those on the western side) alternating with smaller species to modulate the area's landscape. On the north side, a sequence of trees is proposed which, while reducing the canopy area, are distinguished from other trees by their height. Both the dog area and the space that remains between the promiscuous access road to the station and the station itself will be characterized by densely wooded areas to clearly distinguish the *Pratone* as a space for recreation. It was also suggested that a careful study be made of possible tree species to be planted to maximize their benefits in shading and CO₂ absorption to reduce urban heat islands.

4. Discussion and Conclusions

Promoting active mobility and walking areas offers people a valid alternative to traveling by car and a real possibility of exercising, reducing chronic-degenerative diseases, and making cities safer and more liveable. Since the health emergency (2020) spread, mobility systems have changed drastically, especially in big cities. Public transport in Italy has halved its offer, and it cannot adequately meet demand, while private car traffic has increased with dangerous environmental and health damage. The best alternative is bicycle and pedestrian mobility, but this is often hampered by inadequate infrastructure. Thanks to the pandemic, building infrastructure for sustainable and active mobility networks has become a priority in many cities.

Therefore, research and reflection on the relationship between well-being and the city find that mobility and the availability of open spaces for exercise are two strategic factors for improving people's health (Capuano, 2020). In particular, it emerges that some characteristics of public space are decisive in supporting a city that is more attentive to the physical and mental health of its inhabitants and users. These include the aspects of:

- density (understood as the number of means or areas available for movement);
- comfort (understood as the quality of the means or areas to facilitate autonomous movement);
- continuity (understood as the frequency and interconnection among areas with which adequate areas are found in the city for the mobility and people's stationarity);
- and consistency (understood as the versatility of the space to accommodate people or its ability to resist different uses over time).

Pedestrian areas, bicycle lanes, and efficient public transport are key features for promoting sustainable, safe, and active mobility networks. A net of paths and areas oriented to:

- the improvement of urban life quality. Promoting safe and healthy spaces for workers, inhabitants, students, shoppers, tourists, and chronically ill patients (diabetes, cancer, stroke, cardiovascular problems, musculoskeletal problems, mental disorders, sensory disorders, etc.);
- the extension/articulation of ecological corridors inside the compact city. Promoting de-sealing and re-greening solutions for paved public areas for adapting the city to climate change and other natural risks;

- the re-balance metropolitan equilibrium improving the accessibility/liveability of different neighborhoods. Furthering the design of attractive and human places and increasing sustainable connections among districts for bolstering a salutogenic city.

Milan's Green-blue backbone project indicates ways to increase well-being, greenery, and active mobility through multi-scalar urban planning and design. On the one hand, big transformative projects (such as the new metro line) are a sustainable development engine. They might be an opportunity to integrate the improvement of green and blue corridors, cycling and walking routes at different scales, and the renewal of public spaces for sports and daily physical activity. The opening of construction sites temporarily blocking circuits of vehicular traffic becomes an opportunity to stimulate the population to a new way of getting around the city while waiting for the public transport system currently under construction to become operational. On the other hand, the project's target audience was widened as much as possible: not only specific categories of the population (younger, the elderly, the chronically ill, women) but citizens, commuters (workers and students), and tourists, who live and populate the city daily. Achieving an adequate state of well-being for the population certainly means helping patients to overcome the limitations of their disease and become promoters of their health by increasing their daily physical activity. At the same time, the whole population must play a proactive role in preventing further cases.

To increase the active mobility and planning of urban-scale projects are necessary through simple planning tools based on constructing a framework of interventions. The interventions should consider organizing routes and spaces for people to pause and contemplate the urban landscape with green and blue corridors, open-air spaces, and playgrounds. Moreover, organizing interchanges between public transport and sustainable mobility are crucial to reducing road traffic and increasing active mobility.

In Milan, the project of the Green-blue backbone result is twofold. First, it provides a directly applicable and feasible tool (the Masterplan) on current urban planning and mobility programs pushing the Municipality to coordinate them, manage transformation, and improve urban resilience. The Masterplan is an agile, multiscale and widespread design tool in many countries. It could be applied in many other cities integrating different scales of analysis and projects facing various topics (environment, mobility, cultural heritage, etc.). Second, the resilient urban design developed and crossed public transport, cycling-walking routes, green corridors, and public spaces, proposing various mobility supplies. The Milanese experience leads the project towards a broad public to trigger a behavioural change in moving into the city (home/work and leisure trips), reducing traffic, air, and noise pollution. Moreover, the project stresses the power of public space as a link between functional areas. The redesign of public space could transform ordinary attitude on moving, emphasizing the benefit of a walk and cycle to appreciate the cultural heritage, take advantage of open-air spaces, and reduce pollution and cars crashes.

Despite this, the principal limit of the research project is the absence of a participatory process. While the Municipality of Milan developed some co-design workshops to transform a few metro stations, the Green-blue backbone project was not discussed with inhabitants even if the Municipality guaranteed maximum dissemination of its results. As is well known, the involvement of inhabitants and stakeholders in urban transformation processes is instrumental. During the construction of the new metro, many committees and association groups were formed. However, citizens, who often confuse participation with protest, must realize that building a 'no' front alone will not benefit. Similarly, strong decision-makers must be convinced that citizen involvement facilitates the reception of transformative choices in the city. It is why the Green-blue backbone project could have had more substance if it had been shared with local actors.

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Image Sources

Fig.1-5: Politecnico di Milano, DASTU Dipartimento di Architettura e Studi Urbani (2019). *Documento di Inquadramento. M4 la nuova dorsale verde-blu*. DASTU: Milan.

Fig.6-8: Politecnico di Milano, DASTU Dipartimento di Architettura e Studi Urbani (2020). *Linee guida progettuali. M4 Masterplan per tre fermate*. DASTU: Milan.

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