

TurnMi□n

Safe and attractive pathways for
active ageing in cities

Politecnico di Milano
Integrated Product Design
a.a. 2020/2021

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Supervisor prof. Francesco Zurlo
Co-supervisor prof. Carla Sediti



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Ringrazio i miei relatori, Francesco Zurlo e Carla Sedini, per l'impegno e la costanza con cui mi hanno seguita e sostenuta durante lo sviluppo della tesi. Come loro ringrazio il Politecnico di Milano, istituzione che mi ha formata e in cui credo fortemente come punto di riferimento culturale e sociale.

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Come loro, tutte le persone che mi sono accanto, o che non lo sono più, hanno contribuito a fare di me la persona di oggi, e per questo, li ringrazio.

Questo progetto è stato sviluppato a partire da uno studio di ricerca che indaga la relazione fra ambiente urbano e mobilità dolce, con particolare riferimento al comportamento degli utenti anziani.

La tesi si inserisce nel contesto del progetto Longevity, nato dalla collaborazione fra Politecnico di Milano, Università di Milano Bicocca, Fondazione Cariplo e centri Auser.

Dopo aver approfondito la letteratura sul tema della pedonabilità, dell'invecchiamento attivo, e della relazione fra questi e l'ambiente urbano, è stata condotta una ricerca sul campo che ha portato alla definizione dei bisogni dell'utente e delle potenzialità e vincoli del contesto.

Il progetto mira a valorizzare gli spazi vacanti intorno alla ferrovia, come tunnel e parcheggi inutilizzati, migliorando la percezione di sicurezza e l'attrattività di questi luoghi agli occhi dei cittadini.

Una volta definiti i parametri di intervento, è

stato ideato, in linea con altri casi studio, un processo in tre fasi concatenate e di impatto crescente. Ogni step coinvolge la comunità nella co-creazione dell'outcome finale.

Le prime due fasi sono soluzioni temporanee che mirano a conoscere il punto di vista degli utenti e proporgli una visione su possibili scenari futuri. entrambi supportano l'installazione della terza fase di progetto, un prodotto ibrido che combina illuminazione d'ambiente con la diffusione di informazioni utili, migliorando così la percezione di sicurezza e l'inclusione dei cittadini senior.

Abstract

The study is a research project that argues the relationships between the urban environment and active living with a special focus on elder users. The thesis fits the development of the Longevity project, born from the collaboration between the University of Milano Bicocca, Politecnico di Milano, Fondazione Cariplo, and Auser association.

After a deep understanding of the existing literature on the topic of walkability, ageing, and the relationship with cities, a fieldwork analysis has been developed to define the key needs of the users and environmental constraints and opportunities.

The project aims to enhance the value and the relation of citizens with vacant spaces along the railway, such as tunnels and unused park lots, improving the perceived safety and attractiveness of the place.

Once defined the intervention parameters a three steps process has been designed,

following the framework of existing case history. The process includes interlinked and progressive steps to involve the community in the co-creation of the final outcome.

The first and second phases are temporary solutions that aim to understand the user's point of view and return a vision about possible futures. They both support the implementation of the last phase, the setting of a hybrid infrastructure combining environment lighting and the provision of useful information. The product impacts the perceived safety and social inclusion of elder citizens.

Keywords

Walkability; Anziani ; Cittadini; Sicurezza; Attrattività; Spazi inutilizzati

Walkability; Elderly ; Citizens; Safety; Attractiveness; Unused space

Research

Literature review

This first section of the thesis is the background desk research that supports the analysis of fieldwork, the concept development and the output definition.

The literature review is structured upon four macro topics, namely the condition of elderly -the target user of the research-, the walkability issues and its relation to active ageing, the discussion about hyper proximity urban environment, and the trends shaping cities of the future.



01

Elderly

The focus of this research thesis is the social cluster of senior citizens. In this chapter behavioural, physical and psychological characteristics of elder will be deeply argued.

As will be discussed below in the research, the aging of cities is one of the trends that, together with urbanization and technological development will mostly influence the 21st century. For this reason it is crucial to consider older adults as a resource for their families, communities and economies and offer to them a supportive and enabling living environment. Statistics (United Nations, 2020) shows that by 2050, 1 in 6 people in the world will be over the age of 65, up from 1 in 11 in 2019.

Aging population is identified as a global phenomenon, indeed almost every country is experiencing the growth both in the number and in the proportion of older adults. The projected increase of the number of elderly in Europe is 48% by 2050, small as in other regions where the population is already significantly older than in other parts of the world. Indeed, the percentage of older adults globally grew from 6 in 1990 to 9 percent in 2019 and the proportion is projected to rise over 16 percent in 2050. Obviously, the increase of older adults imposes financial pressure on old-age support systems, and elderly represent a cost for nowadays societies. Despite this, the population aging

does not inevitably lead to a macroeconomic decline, but through well-chosen policies just the opposite might be truth.

As argued in the document “World Population Ageing” by United Nation (2020:3) , “preparing for the economic and social shifts associated with an ageing population is essential to ensure progress towards the achievement of the Sustainable Development Goals (SDGs) included in the 2030 Agenda for Sustainable Development ”.

Population ageing has an impact on sustainable development, and it is especially relevant to ensuring healthy lives and well-being at all ages (SDG 3), and making cities and human settlements inclusive, safe, resilient and sustainable (SDG 11).

The OECD report Ageing in Cities (2015) assesses the impact of ageing populations on urban areas and strategies for policy and governance.

The key strategies they suggest refer to the development of a long-term perspective and of indicators to measure “aging societies”. Furthermore, the attention is focused on the promotion of health for all ages, which means improving well-being of all people, therefore mitigating the cost of health and long-term care.

The policy action suggested to support this strategy mainly refers to preventive measures and the use of information

technology to improve understanding and management of specific conditions. Walking is considered among the most effective measures of preventing care (OECD, 2015). It is important to maintain a long-term perspective also to evaluate the advantages of active aging at a city scale rather than at a single citizen level.

Also the redesign of urban areas is included as a key aspect of an aging-friendly city. This means reconsidering the appropriate location of services and infrastructures so as to optimize land use and serve an increasing number of citizens.

To support the engagement of cities in becoming more age-friendly and in promoting the active aging of the population, the World Health Organization (2007) presented a guide.

Active aging is defined as “the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age.” (WHO, 2007:10)

In the age-friendly cities, people are supported and enabled to age actively through policies, services, settings and structures. Those anticipate and respond flexibly to aged-related needs and preferences, protect the ones that are more vulnerable and promote their inclusion and contribution in all areas of community life.

In order to create a comprehensive picture around age-friendly cities the guide proposes eight topics that cover the city's features. As an example outdoor spaces and buildings and transportation have a strong influence on personal mobility, safety from injury, security from crime, health behaviour and social participation. Other topics reflect aspects of the social environment and culture that affect participation and mental wellbeing of older citizens. Their engagement in recreation, socialization, cultural and educational activities is referred

to social participation.

The guide is meant to be used by individuals and groups interested in making their city is more age-friendly, including governments, voluntary organizations, the private sector and citizens' groups. Indeed, social inclusion depends on the attitudes and behaviours of other people and of the community as a whole towards older people.

The following chapter will argue the relation between health and mobility among older adults, the implication at life quality level, and the existing projects that leverage information technology to improve active ageing.

01.1

Health and disabilities

The second half of life is usually characterized by health-related changes that ultimately impact on intrinsic capacity and functional ability of elderly. At a biological level, aging results in a progressive and generalized impairment in many body functions and in a broad range of psychological changes.

The World Report on Aging and Health by WHO (2015) summarizes the underlying changes that take place to some degree to all humans as they age.

Muscle mass loss joint limitations and other factors such as coordination and proprioception impact on musculoskeletal function and mobility. This is reflected in the decrease of gait speed, that is the time someone takes to walk a specified distance. Indeed, walking speed is demonstrated to slow with age.

Also sensory functions decline with age, especially hearing and vision, although there is marked diversity in how this is experienced at an individual level. Studies show that more than 180 people over 65 have hearing loss that interferes with a normal conversational speech, this may lead to social isolation and loss of autonomy (WHO, 2015). Age is also associated with many causes of visual impairment, that can limit mobility, affects interpersonal interaction, become a barrier to access information and increase the risk of falls and accidents. However,

these common limitations can generally be managed effectively. Intervention for hearing loss include reducing interfering background noise and using simple communication techniques like speaking clearly. On the other hand, intervention for visual impairment include environmental change, regarding both signage and lighting, as well as assistive technologies such as listening devices and refractive lenses, that are widely used and effective.

At the cognitive function level it is common to see deterioration of memory and speed of information processing. The variation in person to person in the decline of cognitive functions is influenced by many factors and there is also some evidence that they might be reduced by mental training and physical activity. The loss of cognitive functions might lead to Mild Cognitive Impairment (MCI) that is the stage between the normal cognitive function cited above and the more serious decline of Dementia or Alzheimer. The majority of conditions listed above are chronics and non-fatal, and tend to cross diagnostic thresholds. In their mid and late life, individuals often accumulate several of them. A research by Verbrugge and Jette(1994) provides a conceptual scheme for disability, in means of a basic framework on which research, policy, and clinical care are built, aimed to drive terminology, measurement and hypothesis.

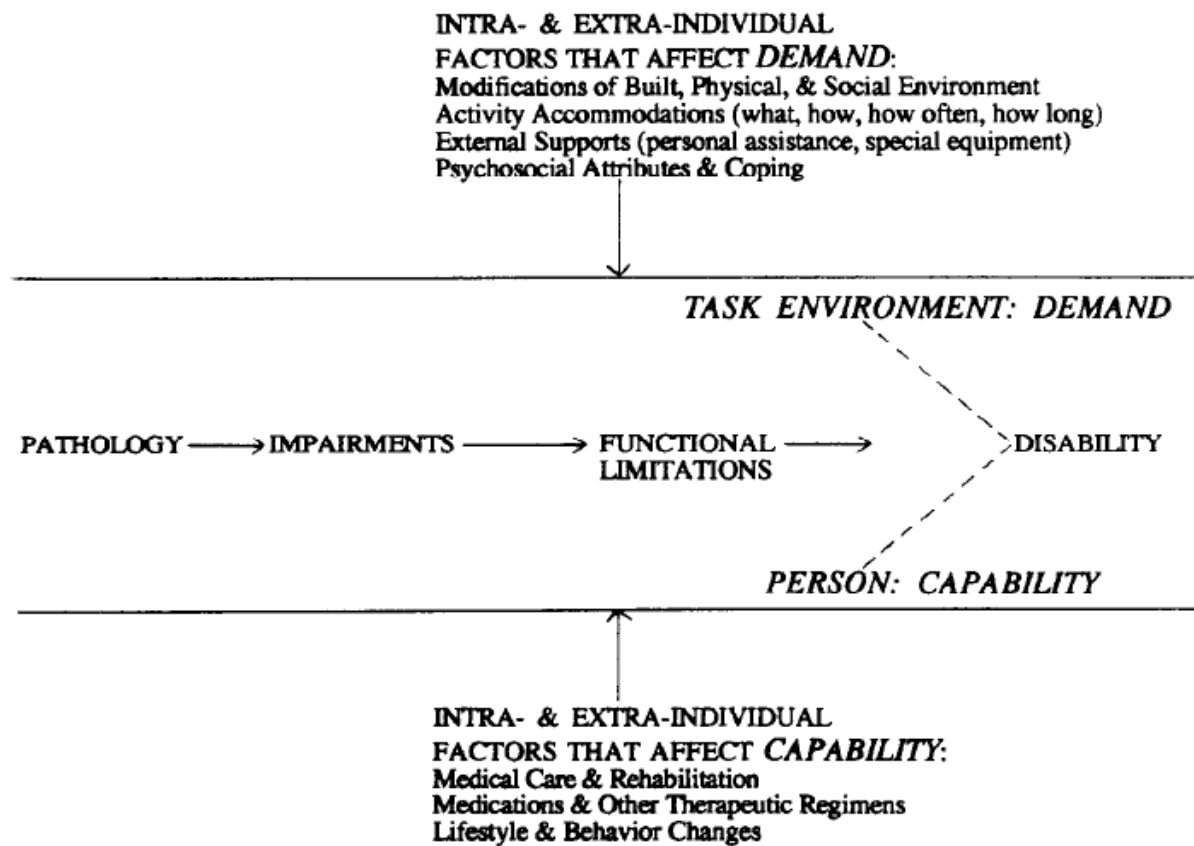


Figure 1
Disability as a gap between capability and demand.
(Lois M. Verbrugge, Alan M. Jette, 1994:10)

The study merges the conceptual schemes of (i) The international Classification of Impairments, Disabilities, and Handicaps (ICIDH) developed by the World Health Organization, that includes three central concepts: impairments, disability and Handicap, and (ii) the scheme developed by the sociologist Saad Nagi, based on four central concepts: Active Pathology, Impairments, Functional Limitation and Disability. The proposed model has its foundation in the Nagi scheme but also pulls on the scope and detail of ICIDH and on public discussion comparing the two schemes.

The concept of “disablement refers to

impacts that chronic and acute conditions have on the functioning of specific body systems and on people’s abilities to act in necessary, usual, expected and personally desired ways in their society. [...] The term process reflects interest in the dynamics of disablement; that is, the trajectory of functional consequences over time and the factors that affect their direction, pace, and patterns of change.” (Lois M. Verbrugge, Alan M. Jette, 1994:3)

Verbrugge and Jette define the key concepts that are included in the conceptual framework. *Pathology* refers to biochemical and physiological abnormalities, usually detected and medically labeled as disease, injuries or congenital or developmental conditions. *Impairments* are dysfunction and significant -in means of leading consequences for physical, mental or

social functioning- structural abnormalities in specific body systems. Otherwise, restrictions in performing fundamental physical and mental actions in daily life are considered *functional limitations*. This category includes overall abilities of body and mind to do purposeful “work” such as walking, lifting objects, climbing stairs and others. *Disability* is defined as the experience of difficulties in doing activities in any domain of life due to a health or physical problem. The authors stress the uniqueness of considering chronic

conditions as potentially affecting any activity domain, adopting a comprehensive and more democratic perspective on human activities, and referred to the activities of the regular milieu of the patient. Those factors are interpreted as reported in the scheme in figure 1.

In the following chapter will be argued how the loss of autonomy derived from the disablement process influences the wellbeing of older adults.

01.2

Wellbeing and accessibility

Compared with other population segments, older adults present fewer mobility needs related to employment or childcare, but face growing physical or cognitive obstacles to mobility that can limit their wellbeing. Therefore policymakers and academics are increasingly paying attention to mobility and environmental factors to improve sustainability and health. Indeed, wellbeing can be considered as a core aspect of health, since high levels of life satisfaction and good mood are beneficial to physical health (Cuignet et al., 2020). In their study

Cuignet et al. showed evidence of the relation between travel behaviour, and more specifically movement, to wellbeing. The authors suggest different notions of wellbeing. In particular they distinguish between hedonic and eudaimonic perspectives. The hedonic wellbeing is based on the concept of utility as a measurement of pleasure, satisfaction or happiness, and more specifically it includes cognitive components (as life satisfaction) and affective components (as emotions). On the other hand, eudaimonic perspective of

well being refers to the actualization by an individual of his or her human potential.

The link between mobility and well being for older adults is assessed in many ways. For instance, the experiences during a destination-oriented trip are usually related to health conditions. At the same time, mobility enables specific activity, thus might satisfy social and physical needs. Older adults might have more time to spend on leisure activities, but physical capacities might represent a constraint. As well, the activities (planned or unplanned) that take place during the travel influence the overall experience and might turn the travel into an opportunity for social interaction.

The study comes to the conclusion that movement appears to mediate the association between geographical context (access) and wellbeing. More generally, shifting the focus from travel satisfaction (and largely hedonic well being) to the eudaimonic parts of wellbeing seems key to future planning actions.

Further research (Gil Solá et al., 2018) argues the paradigm shift that is happening in urban planning, from mobility-enhancing to accessibility-enhancing strategies

that would especially encourage to walk fragile categories as elderly. This study, conducted through qualitative data analysis such as focus groups and interviews- among Swedish urban planners evidenced the recurrence of five themes in their understanding of sustainable accessibility.

The first is basically the need for a cross-sectoral approach, due to the integrated nature of the accessibility concept, fact that several contexts must systematically be adapted to different requirements if people want to access services distributed in the space. As well densification is considered to be a trigger for the development, in which services benefit from increased agglomeration. The third issue is the balance between various transport modes, enhancing public transit, walking and cycling, while discouraging car use. This matter includes also the connection that the transportation system is able to establish between activity locations, including principal destination to leisure activities and not only to work travel and between residential areas and city centres. The attention to daily activities is the core concept behind the fourth theme emerged, namely proximity to everyday activities. This is in means of life

as relational and taking place in an easily accessible area. There are several activities that are considered to be fundamental in everyday living, and many participants stressed the change in needs occurring in the different stages of life. Deepening this concept of diversity depending on age, gender, perceptions of what is valuable, and constraints imposed by physical barriers, respondents defined the last point of convergence about urban planning as the right of all citizens to access basic services. This matter is well established in Swedish policy vision, that aims to take into account the different needs, preferences, and opportunities of groups to access various

activities. The discussion among planners produced the themes of consensus, that has been explained above and themes of tensions, related to practical or more theoretical and ideological issues.

The overall results of the study evidence some criticalities in the further implementation of sustainable policy goals: despite the good intentions and motivation of planners, the fulfillment of sustainable policy and related themes can lead to conflict-ridden trade-offs. The wicked nature of problems to face, the need of a new role for urban planners, more communicative, holistic and layered, will be advisable.

01.3

Supportive technology

In aging cities it is crucial to promote initiatives to improve the quality of life of specific categories of citizens and more broadly to improve performances, usability and environmental compatibility for all users.

A pivotal aspect of this approach is the use of Information and Computer Technologies (ICT) to effectively address problems of the city. A relevant role is assigned to mobility.

Indeed, the transport sector, through the use of digital technologies, can have a positive impact in terms of ensuring elderly people the ability to lead an autonomous life and participate actively in society. The accessibility of transport systems can be defined as "ability of places to be reached, in order to make elderly able to participate in city daily life, by preventing inequality in



Image source Laurent Kronental, Paris Brutalist Utopia, 2017

terms of spatial access” (Battarra et al., 2018: 26). Accessibility and safety are the two essential components of mobility for the elderly and can be supported by the use of ICT both on an infrastructural and managerial point of view.

Existing reviews (Battarra et al., 2018) analyse ongoing projects developed in Europe as the one founded by the programme Horizon 2020. The project City4Age - Elderly-friendly city services for active and healthy ageing is promoting the use of the Internet of Things to create an urban environment where the elderly can move independently. It focuses on the collection of a large amount of personal data from individuals, made through new sensing technology both at home and in public spaces, the management of data flows - following a privacy-aware linked open data paradigm and the disclosure of basic reasoning and learning mechanism for different purposes. The project aims to collect data and activate communities to facilitate social and health services dealing with people with cognitive impairment. Indeed, cities can play a pivotal role in early detection of MCI and subsequent interventions. Collected data can be finally used to identify segments of the population potentially at risk and to closely monitor specific users (City4Age, 2016).

Other projects that involve the use of ICT to improve safety and autonomy of the elderly are funded by the Active and Assisted Living program (AAL) - ICT for ageing well. The aim of the program is to support the elderly in the choice of where and how to live through technology-based solutions. Within this framework, some projects have been developed on the transport and mobility issues. They include the NavMem system, developed in Germany to help elderly with mild cognitive impairment when walking in unfamiliar environments. The ICT technology is used to provide a better travel experience

outside the neighbourhood, simulating a virtual navigation companion, providing spatial information such as distance and direction to the next intermediate step in the path. As well, the system can activate a real-time localization tool to improve safety and eventually ask for direct assistance. It has two different use modalities, the lighter one is the background mode, that follows the user's movement and provides coarse spatial cues. This mode will encourage spatio-cognitive abilities of the user. Instead the navigation mode will come into help when the user feels lost or walks in a relatively new environment. In this case the system provides simple and more detailed information about cues and ties on landmarks (About - NavMem, 2012).

To conclude, we can affirm (Battarra et al., 2018) that companies demonstrate a great interest in developing projects targeted to elderly with the aid of technology, but not all of them managed to transfer projects into practice. This is because the vast majority of interventions are not included in a coherent framework of strategies and probably they do not meet the real needs of such a heterogeneous target as the one of elderly.

02

Walkability

The focus of the research is the mobility and the active ageing, and the potentialities of urban environments to support and promote specific behaviours among citizens.

The city's structure mainly based on delivery and logistics has been influencing the use of private and public means of transportation instead of slow/gentle mobility solutions, although walking is one of the most intuitive and fundamental activities in our lives. The concept of walkability deepens the analysis of walking, prioritizing the needs of pedestrians in urban environments with the perspective of a more livable city.

The potentialities connected with the improvement of walkability refer to the improvement of the quality of life for citizens, as well as the spread of more sustainable transportation habits.

These aspects include an improvement in physical activity and mental health for pedestrians. An active transportation method is a positive behaviour for the prevention of noncommunicable disease (Rebecchi, et al. 2019), like cardiovascular disease, cancer, chronic respiratory disease and diabetes (WHO, 2018). Many studies argued the relation between physical activity (P.A.), personal health, and urban forms (Handy, Boarnet, 2002; Forsyth et al., 2008), and showed the positive influence of walkability on citizens' health (Frank et al., 2007).

From the sustainability point of view, the increase of walkability would lead to fewer vehicle miles travelled as well as fewer emissions of oxides of nitrogen (NOx) and volatile organic compounds (VOC) (Frank et al., 2007).

There is also a financial advantage connected to the reduction of vehicular transport.

A cost-benefit analysis estimates the cost of automobility in Europe around €500 billion per year, while active transportation represents a benefit to society currently worth an annual €24 billion (cycling) and €66 billion (walking) (Gossling et al. 2018).

Both the two aspects of physical activity and sustainable development are included in the 2030 Agenda for Sustainable Development endorsed by the United Nations in 2015. In particular, we can see the goal 11 that aims to make cities more inclusive, safe, sustainable and resilient, as well as goal 3 that wants to ensure healthy lives and promote well-being for all at all ages. More broadly also goal 13 can support the importance of walkability study, because it concerns the importance of taking action against climate change (Rosa, 2015).

In this chapter the theoretical background of walkability study and an investigation of the existing studies and researches on the topic will be presented. Moreover, the chapter will

end with an overview of the potential and critical aspects of the urban environment influencing walkability and therefore physical activity.

02.1

Theoretical background

The research about walkability has its origin in Europe and rapidly develops in the United States. Here cities are more recent and subjected to frequent renewal. Urban politics that characterized the 50ies, both in Europe and U.S., were strongly oriented to vehicular transit.

The literature can be temporally divided in two clusters, the first one is located in the second half of the 19th century when the issue of the quality of life was a crucial matter for post-war European cities. It deepens the action of walking within the bigger argumentation about the tangible urban environment.

The first season of interest about walkability is led by the production of literature that still can be considered as crucial in the design and promotion of walking activity.

One of the most influencing thinkers was Janet Jacobs, who in her landmark book "Life and Death of American Cities" refers to the elements of public space, focusing on sidewalks. She argues the double nature of the street, both as a place for transit and for social activity of citizens. Through the concept of "street life" she identifies the overall experience of the pedestrian (Jacobs, 1961). Moreover, Jacobs argues the use of sidewalks as a parameter to street safety. She actually expands the meaning of sidewalks, not only considered as a place for pedestrian transit but also for human interaction. As reviewed by Eaker (2008) Jacob's point of view emphasises the role of businesses on the street level to promote unconscious control of citizens on the street. Crime episodes are more likely to happen in streets where people do not use their

sidewalks, such as in neighbourhoods where people do not socialize with their neighbors.

The contribution of the urban sociologist William H. Whyte on urban planning deepens the analysis about street life as urban vitality, introduced by Jacobs, arguing how to translate the concept into an urban planning strategy. White affirms the importance of the sensory role in the interaction between humans and urban environment (Whyte, 1988). His work comes from years of unobtrusive field observation, that lead to pioneering research on people's behaviour in public spaces (Project for Public spaces, 2010). The results identify a number of key factors to determine the attractiveness of public parks and squares. First of all, he identifies the presence of inviting places to sit and relax, but also to allow for visibility in the area (Hine, 2013). Indeed the possibility to see what is happening in the surroundings enhances perceived comfort.

The second season of interest about walkability begins with the end of the century and is still ongoing. It focuses on the issue of sustainability and its relation to the urban transport system. The pieces of research conducted in this period are characterized by a multidisciplinary approach.

Moreover, the literature (Handy et al., 2002) converges on the definition of some terms.

Urban Design concerns the function and attractiveness of public spaces and aims at the good design of physical elements that compose the city, taking into account their arrangement and appearance.

The distribution of different activities across a specific area is defined as *Land Use*. The term also refers to the location and density of activities, that are clustered in coarse categories.

Transport system refers to the tangible infrastructure of roads and the level of

services provided. The infrastructure includes roads, sidewalks, bike paths, railroad tracks, bridges, and so on, while the level of services is evaluated through traffic level, public transport frequency and so on.

Fourthly, the *Urban Environment* deals with the patterns of human activity within the physical activity. It includes aspects related to Urban Design, Land Use and Transport System, and it is characterized by a constant change, both in short and long term perspectives.

02.2

Safety and crime prevention

The matter of concern of modern policy makers and governments - in line with earlier study that will be deepened in this chapter- is to moderate fear of crime. The programmes based upon public reactions to this issue, record levels of fear or worry that are quite disproportionate to its actual experience (Kitchen and Schneider, 2007), as shown in figure 2 .

Moreover, the concept of fear of crime itself is a wicked issue, influenced by the way it is measured and by the way it is conceived. Indeed fear of crime might be considered as a positive or negative concept according to the different circumstances, and its perception might be deeply influenced by the media. Another issue is to determine what people mean when they affirm to be "very worried" or "fearful" about crime. As reported in the book Crime prevention in the built environment (2007), Sandercock argues that fear of crime is actually fear of difference, indeed talking about fear of crime is a socially acceptable way to express concerns

about other people and especially about changes that are affecting cities. What is usually ignored through these conservative stances is that the so-called melting pot is often the result of how cities have grown and developed over time. The European Crime Prevention Network developed a study to evaluate projects designed to reduce fear of crime, but due to the scarcity of reliable studies available they suggested a combination of interventions rather than a list of good practices to be replicated. The overlay of interventions is more likely to be successful than any single intervention by itself, and included the following as being likely to be useful as part of approaches:

- work to increase community cohesion
- work to improve the environment, such as removing signs of neglect and improving lighting
- increase partnership working, rather than regarding fear of crime as the responsibility of the police

	High level of worry	Percentage risk of being a victim
Burglary	12%	2.7%
Car crime	13%	8.2%
Violent crime	16%	3.6%

Figure 2
Study about perceived safety and actual experience (Kitchen and Schneider, 2007) elaborated by the author

- increase the community wardens (European Crime Prevention Network. 2005: 46,47)

This approach developed the classical place-based crime prevention theories. These theories derive from diversified disciplines and from ground-based experiences. They include defensible space, crime prevention through environmental design (CPTED), situational crime prevention and environmental criminology.

The two main theories that support this thesis are defensible space and CPTED measures, that evolved independently at about the same time, although they have grown together over the years.

Defensible space evolved out of Oscar Newman's study, which focused on the comparison of public housing projects in the United States. As an architect, planner and critical observer of human behaviour, Newman proposed the concept to design places and spaces so as to increase residents' feeling of ownership and control. Kitchen and Schneider report, talking about Newman perspective about defensible space: "At his heart, then, defensible space is about creating, shaping, preserving and maintaining proprietary control over one's territory" (Kitchen and Schneider, 2007:19). Newman's early thinking and philosophy was influenced by Jane Jacobs' (1961) reflections about the importance of vibrant street life, diversity of street uses and the identification of clear boundaries between public and private space, cited in the previous chapter. The concept of territoriality, crucial in both Jacobs and Newmann works, states that a place with a close-knit social network can develop voluntary community guardianship, and that a place continuously controlled by its own residents, who share a sense of community, can be more effective than police enforcement (Jacobs, 1961). Newman

stresses the importance of semi-public community space to develop territoriality.

On the other hand CPTED theory was originated by Ray Jeffrey, a criminologist that argued the ineffectiveness of punitive strategies, and proposed a crime prevention model based on moulding punishment and reward stimulation provided through the built environment. The concept has changed drastically since its first appearance and the notion we have now is much closer to defensible space theories and focuses on environmental psychology (Kitchen and Schneider, 2007). The CPTED theory leverages activity support, which embeds the idea of crime reduction in spaces where a variety of activities continuously take place and attract people. Activity support can be obtained through the strategic design of a built environment or signage, so as to promote the intended use of a public space through community activities.

An experimental study (Lee et al., 2016) deepened the complex relation between CPTED measures, physical activity and fear of crime, analyzing behavioral data of residents living in participatory neighborhood regeneration project areas and matched neighborhoods. The study reveals that "sufficient CCTV coverage, street lighting, and maintenance play a significant role in mitigating fear of crime." (Lee et al., 2016 : 12). Despite this, the article specifies that safety devices like CCTV and street lighting contribute to decrease fear of crime rather than social activities and other natural surveillance activities. People that are more afraid of crime tend to walk less, while those that do not feel fear of crime are not influenced by CPTED measures.

Brighter security lighting is one of the methods that provides positive psychological effects to pedestrians by ensuring good visibility in the street (Kitchen and Schneider, 2007) and smart security lighting is a recently developed system that

performs various functions in smart cities (Cho et al., 2019).

Other studies (van Rijswijk and Haans, 2018) argue the effects of lighting and other physical attributes on perceived safety during the nighttime. The results highlight moderate to strong relationship between appraisals of lighting quality, prospect, concealment, and entrapment, therefore suggesting the relation between those physical attributes in the urban environment. The study supports the idea that lighting may indirectly increase people's sense of safety by increasing prospect, and reducing concealment and entrapment. Moreover, the authors suggest "Beyond providing visibility for basic tasks such as object detection, lighting may thus be targeted to increase site-specific perceptions of environmental safety by optimizing the salience of safety-relevant environmental characteristics (van Rijswijk and Haans, 2018 : 18)".

The qualities of light that improve perceived safety are its uniformity in distribution and minimization of contrast (van Rijswijk and

Haans, 2018), as well as a warmer color temperature (Cho et al., 2019).

Other than lighting, also auditory input can influence safety perception. A study (Sayin et al., 2015) argues the possibility of using environmental sound to give the impression of having social contact with a living being, therefore having a positive impact on the feeling of safety. The results confirm the hypothesis when the soundscape includes human or non-human vocal sounds (versus non-vocal or no sound condition), showing a significant positive effect on public spaces' perceived safety. Perceived social presence has been demonstrated to be a mediator in the analysis.

This conceptual framework and practical guidelines will drive the development of the thesis outcome.

02.3

Research analysis

In order to analyse walkability, scholars made several conceptual frameworks that cluster variables of data about the urban environment, trying to understand internal and mutual relationships.

Cervero and Kockelman (1997) study, called 3Ds Model, provides significant research on land use and transportation. They indicate three principal dimensions along which the built environment can influence the transport demand: Density, Diversity and Design.

"The research finds that density, land-use diversity, and pedestrian oriented designs generally reduce trip rates and encourage non-auto travel in statistically significant ways, though their influences appear to be fairly marginal." (Cervero and Kockelman, 1997:1)

Some further development emphasizes the lack of specific variables and measurements to reliably capture the model developed by Cervero and Kockelman. The critique is stronger in the evaluation of slow travel behaviour rather than the automobile travel, because slow travel requires more detailed and precise analysis.

Other studies investigate the relation between the built environment and the quality of walking, proposing different sets of parameters. One of the most affirmed opinions is the one of Jeff Speck, an American city planner and urban designer

and author of many books. In the TEDx speech as well as in other articles (Speck, 2012) he defines the parameters as:

Usefulness, so basically a reason to walk that is preserved through the balance of uses. This concept comes against the separation of the landscape into large areas of single use. The key characteristic for the neighbourhood – to be considered walkable - is to be compact and diverse. The mixed land use model and the sprawl model contain the same things, the difference is how close they are and how big they are.

Safety is probably the most important condition for a walkable city and is connected with the dimension of blocks. In fact bigger blocks usually need bigger roads to serve the community. Statistics (The general theory of walkability | Jeff Speck | TEDxMidAtlantic, 2012) shows that in cities with bigger blocks size and lower intersections density, the number of fatal crashes is almost 3 times more if compared with cities with smaller blocks. Also the width of the street impacts on safety: people drive faster in wider streets and this impacts on street's safety.

The *comfort* of walking has to do with the fact that humans – as all animals do – seek simultaneously for prospect and refuge. This means to be able to see potential danger but also to be protected. From this comes the importance of edges and the ratio of height

to width, if it gets beyond 1:6, users will not be comfortable anymore.

What concerns the *attractivity* of a place is the signs of humanity. Basically nothing interests people more than the presence of other people (The general theory of walkability | Jeff Speck | TEDxMidAtlantic, 2012).

All the argumentation that Speck is showing focus on the average American city, that is usually more recent and bigger than European cities and especially Italian ones. Nevertheless this set of parameters has been used as a reference for more and more studies on walkability, both to analyse cities inside and outside the United States.

The conceptual framework used to identify and cluster variables are translated into a combination of quantitative and qualitative data.

Usually, quantitative data are collected through GIS (Geographic Information System) analysis, runned in the area scale of the city. This tool is a system designed to capture, store, manipulate and analyse all types of geographical data. GIS collects information about the overall urban factors from a top-view perspective.

On the other hand, qualitative data are collected through street level tools like interviews or observations on the field to understand the user's perception and behaviors at micro-scale (Rebecchi et al., 2019). Within the category of qualitative data analysis many different approaches might be adopted, as argued by Nilles & Kaparias (2017).

The analysis can be runned on a single scale -so on quantitative or qualitative data only- or with a combination of the two scales.

3

Beyond 15 min city

In recent years scholars have deepened the analysis on the pedestrian accessibility of services in the city. The focus is scaled down to the neighbourhood area and the aim is to provide daily urban necessities within a 15 minutes walk or cycling trip. The concept of *la ville du quart d'heure* has been developed by Professor Carlos Moreno at Sorbonne in Paris and deeply influenced the pedestrian and bike schemes implemented by the Paris Mayor Anne Hidalgo. It is an attempt to "reconcile the irreversible development of an urban world with crucial needs for real quality of life" (Moreno, 2019) through a change in lifestyles that modifies the pace of urban life. This means to transform the urban space - still highly monofunctional - into a polycentric city based on four major components: proximity, diversity, density and ubiquity. The goal is to provide dwellers a better quality of life within short distances across six essential functions: living, working, supplying, caring, learning and enjoying. This approach involves all urban stakeholders to participate, reconsidering their own role, and opening up alternative horizons. The development of social, economical and cultural interactions will ensure functional diversity and increase the space for public meeting and mixing. Diversity and proximity are essential characteristics of urban areas to satisfy citizens' needs.

The role of technology is to optimize the

range of services through digitalization, collaborative and sharing models, and to become a factor of social cohesion and inclusion (Moreno, 2019).

The concept of *crono-urbanism* developed by Moreno (2019 : 2) deepens "new relationship between citizens and the rhythm of life in cities" and became a paradigm in the pandemic period that occurred recently. Actually the limitation on mobility and on the use of public transport evidenced the need for a more diverse and dense urban pattern of services.

At the same time, the aim to decentralize urban communities received some criticism (Yeung, 2021) connected to the differences that might result in central or suburban neighborhoods. Indeed potentially the differences between central and peripheral areas could rise, therefore the most deprived areas might not achieve good standards for basic need services, leading to further discrimination and inequality and territorial stigmatisation.

A second matter of critique to the 15 minutes theory is the potential impact of altering the very essence of what a modern city is. Indeed, density and the attractiveness of the city centre constitutes the focus of urban melting pot and creativity. Once the city centre will lose its role, will cities remain so vibrant and innovative?

Despite the criticism, Moreno argues the positive impact of the 15 minutes model, led by and above all for its inhabitants, creativity and wellbeing will flourish, pointing to the role of participatory budgeting, which since 2014 has allowed residents to vote on 5% of the municipal spending in Paris.

3.1

Unused spaces and vacant lots

The 15 min model has been introduced in many cities worldwide. The concept has been scaled and replicated in other cities, such as Stockholm, where the government project “Street Moves” is fostering the discussion about what happens when cars are displaced, and how every street in Sweden could be healthy, sustainable and vibrant by 2030. The architecture curator Kieran Long is the director of ArkDes, Sweden’s national architecture and design museum, which has been funded by Vinnova to lead the project. Talking about the project in an interview to the Guardian, Long says: “an addressable space – it’s something where we could intervene and start testing possible versions of the future. There’s a general recognition around the world that the role of the motorcar must be reduced, but that creates new questions”(Orange, 2021).

The core concept is to change the function of parking lots around the city, providing new enjoyable space for the community. This idea spreaded faster thanks to the pandemic, and in this chapter will argue its potentialities.

Great interest has been raised upon vacant spaces in cities since the beginning of densification processes and the discussion on services accessibility in proximity areas. The key aspect is to create decentralized and sustainable urban communities that access the services they need by shifting the function of unused parking lots. This has the double effect of decreasing urban space dedicated to cars, therefore discouraging car use, and providing useful services to the citizenships, thus encouraging sustainable behaviours.

There are several examples of lot re-allocation in different cities. Probably the most famous is the experience in Paris, where funds and efforts are oriented to a more green, mixed used, community friendly policy approach. An article on Bloomberg about the changes in Paris states that “the new trees and cycleways, community facilities and social housing, homes and workplaces all reflect a potentially transformative vision for urban planners”(Feargus O’Sullivan and Laura Bliss, 2020) highlighting the potential of those changes.

However the shift is happening also in the United States, as stated in the article by Alan Mallach (Mallach, 2018) where cities host many vacant and abandoned properties, from boarded row houses to empty factories and collapsing farmhouses. These structures are usually considered as negatively impacting on the neighbourhood, undermining the quality of life, and diminishing the value of nearby properties, and lowering local tax revenue.

Yet the municipalities are shifting perspective and considering them a strategic and long term asset that can support communities during gentrification processes. Perhaps the most compelling opportunity is the one of greening urban spaces, making it to environmental friendly uses such as community gardens, vineyards, and tree farms. The step beyond is to give the tools to the citizens to imagine a new potential future for their neighbourhood.

A powerful example is the one of Cleveland, where a plan to restore the ecosystem of the city has been studied. The results have been reported in a pattern book intended to provide inspiration, guidance and resources for community groups and individuals who want to create productive benefit from vacant land in their neighborhood. Projects are clustered as neighbourhood connections, green spaces and parks, and

environmental strategies. For each of the presented experiences, cost estimation and project description -written and sketched or photographed - have been reported.

In Detroit the guide Detroit Future City is aimed to connect different stakeholders that might collaborate to parklets renewal projects. The platform shows many different projects promoted by the association, at national or local scale, giving information about costs, budget structure, place characteristics, as for example sun exposition or stormwater management capability, and experience level needed to perform the intervention.

Those experiences represent a good reference for future projects, both as tangible results and tools needed to accomplish them, as a framework to follow in terms of structure and variables.

3.2

Care and value in meaning of a place

The social and environmental crisis that dramatically worsened in 2020, was actually ongoing for decades, as the efforts to bring forward sustainability issues demonstrate.

The author Pamela Mang, principal and founding member of Regenesys Collaborative Development Group, argues in an article (Pamela Mang, 2016) the interlinked nature of the social, economic and environmental crisis ongoing at the time, which according to her, is the symptom of a fractured relationship between people and nature. From this perspective, the core issue for sustainability is cultural and psychological and only secondarily technological. Creating living spaces where people and nature are partners, is the challenge to tackle this crisis, driving seemingly intangible issues like motivation and will.

To trigger the process that enables citizens to imagine new potential futures for their community, the creation of a connection between humans and places is needed.

This connection is established through caring. Rootedness to a place is one of the most deep and unrecognized needs of the human soul, a driving force that can also unite different people. Indeed a space shared and enjoyed by all the citizens is the commons that allows people to call themselves a community.

Moreover, love of a place is what leads people to political and practical will to implement a radical change, and also to preserve this shift turning it into a long lasting mutation.

The narrative approach represents a framework capable of initiating an ongoing learning process that continually and consciously regenerates the story as the place evolves. Storytelling creates a shared set of values connected to a specific place.

The discussion about Values in Care Economy, Commons, Cyberspace and Nature, has been deepened in a Deep Dive, hosted by Commons Strategies Group in cooperation with the Heinrich Böll Foundation and David Graeber (5-8 sep, 2016), and synthesized in the Re-imagining Value Report (Bollier, 2016). During the convention, several experts argued around the topic of value. David Graeber, an anthropologist and activist who teaches at the London School of Economics, opened the session with a presentation stating the in-hate connection between value and politics. According to the author, the concept of value itself speaks to human condition, and in this sense, it is a starting point for thinking about politics.

Another participant provocatively wonders whether it is truly necessary to use the word “value” at all, stressing the possibility to talk

about “good life” without the notion of value and proposing a variety of other possibilities. Indeed according to the speaker this term is culturally and historically relevant for merchants and economists, but has little relevance when talking about ethical living or the human condition.

The conventional economic definition of “value” can be encapsulated in numbers, manipulated mathematically and therefore has a significant rhetorical advantage on other notions of value/s.

Despite this workshop participants set forth a rough alternative theory of value, that sees value arising from relationships.

“Value does not inhere in objects; it emerges through a process as living entities – whether human beings or the flora and fauna of ecosystems – interact with each other. In this sense, value is not fixed and static, but something that emerges naturally as living entities interact.” (Bollier, 2016: 16)

This concept is intertwined with Marx’s theory of value. The far-reaching implication of this idea includes that the “labor” of nonhumans -as the Earth, other creatures, plants – can be regarded as a source of value since they produce such an excess of wealth that it overflows what capitalism can capture in the commodity form.

From the general agreement upon this new ontology of value, our relations with each other, with various human and beyond-human communities, and with the Earth gain a renewed potential and rise several difficult challenges.

The first is how to quantify value, if overcoming the economical reference. To do this, a set of abstract measurement systems might become an asset, thanks to their ability to make something visible. Namely, Extended Producer Responsibility (EPR), attempts to rigorously measure externalized environmental costs, LifeCycle Assessment

(LCA) measures the actual holistic costs of products; and LEED building certification and the Forest Stewardship Council’s wood and forest certification system, can help overcoming value estimation issues.

The second challenge is to understand how to properly use abstraction applied to nature, avoiding the process of marketizing and exploiting natural systems, while the 3rd is the concern about whether to de-monetize or not everyday life.

On this matter the results of the conversation seem to converge on the need to undo the structures of capitalism rather than criticize the role of money itself.

Based on this new ontology of value, next chapter will argue the benefits of designing and building relationships within a community.

3.3

Participatory approach

The report “Re-imagining Value: Care Economy, Commons, Cyberspace and Nature” (Bollier, 2016) not only provides a new perspective on what is usually considered value, but also stresses the importance of a common-based peer production as a fundamental shift to understand value. Actually several projects are taking place on digital networks and in the subsistence economy, showing that value-creation is indeed highly relational and does not conform to the standard economic narrative.

A participant (Bauwens) reports a significant surge of self-organized civic and co-operative organizations in southern and western Europe, growing participatory and local initiatives, considered as a “silent revolution”. Anticipated by the Italian thinker and designer Ezio Manzini, in the network age there is no pure locality. Indeed local groups and social movements use global networks to organize themselves, empowering themselves and amplifying their impacts through digital networks.

The local empowerment is further sustained by design practices such as the participatory approach, which is especially used in urban planning. Participatory urban planning is meant as the direct engagement of neighbourhood residents in the process of land use planning to fulfill the vision

of experts and officials through local knowledge and information. The purpose is to collectively develop solutions, meeting the needs of the community (“Participatory Urban Planning – Participedia,” 2021). Moreover, it is an attempt to raise urban qualities in modern cities, characterized by societal, economical, and environmental changes. The approach leverages various methods of participation and public engagement. These tools increase the effectiveness of planning proposals and create new perspectives that are usually not considered within the formal planning process (Kunze et al., 2014). As described by Semeraro et al. (2020) the current method for urban planning is characterized by a top-down approach where experts put forward proposals and decision makers can approve or reject the urban plan. Since the missed inclusion of citizens’ perspective in the decisional root, conflicts might arise about many aspects of urban development.

The authors affirm that “In socio-ecological systems like an urban ecosystem, the bottom-up and top-down participation approaches can give both a contribution to encourage the evolution in systems and increase the resilience of the area, understood as the ability to adapt their functions and structures to social changes” (Semeraro et al., 2020 : 25)

The inclusion of all stakeholders in the design process is also called triple helix approach. This model is capable of addressing the complexity of innovation from a systemic point of view (Carla Sedini, 2020) and focuses on the relations between universities, industry, and governments through the perspective of their history, approach, and stance. These factors can preclude the creation and the success of an innovation system based on knowledge. Scholars developed different helix models including civil society and environment in the proposed schemes, but the relationship between these models and social innovation is biunivocal. On the one hand the goal of social innovation is to remove traditional boundaries between civil society actors. On the other hand social innovation is allowed by the renovation of roles and relationships between these different stakeholders.

This combination is allowed by the effective communication between experts, institutions and citizens, aimed to harmonize interests of the involved actors and combine the layers of urban complexity.

Actually the bottom-up perspective highlights the involved stakeholders and their social needs, stimulating the development of a vision about urban planning that is not conditioned by the cultural background of the decision-makers. By contrast, the top-down approach based on bottom-up information can help decision makers in overcoming a deep-rooted conservative view that slows down the urban regeneration process (Semeraro et al., 2020).

4

Smart city

Cities are dynamic entities that evolved since ages thanks to the change of population, infrastructure and technology. At present the use of networks, software, data, applications and citizens engagement make the urban reality an interactive, measurable, innovative and real-time responding entity. Several cities adopted participatory approaches taking advantage of Internet, web technologies, social networking to improve their general quality of life through the enhancement of their problem-solving capabilities (Komninou, 2018).

The concept of smart city took place in the 90', with the reflection of Saskia Sassen and Manuel Castells, who, together with other scholars, argued the potentialities of globalization and ICT networks in cities and resulting opportunities for citizens and bottom-up initiatives.

In an interview, Sassen (2017) describes the discussion about smart cities as a political matter, central to the environmental question as well as to social justice. Commenting her major work *Global Cities* (1991), she argues the raising importance of cities at the expense of national states on the matter of geopolitics, the global economy, and social justice. The emergent power system needs to be counterweighted, strengthening the status and capacity to make effective claims of the vast majority of a city's population.

Besides the growing concentration of power there is also the option - especially in larger cities that cannot be fully governed - to make a bottom-up local economy, a local culture, a local politics.

On the other side the research of Castells focuses on the results of ICT development and on society. The professor R. Van Krieken (2016) of Sidney University describes the term network society deepened by Castells (2004) as emerged when human societies moved from the industrial age to the information age. Above all, the transition involves capitalism that is no longer centered on the production of material goods but to information and knowledge. The term network society refers to the social structure of this new age, that comes together with an economic manifestation (the global informational economy) and a cultural expression (real virtuality). The new social architecture is based on networks, meant as a decentralized system of nodes through which communication can occur. This shift leads to multidirectional and multidimensional communication, not restricted by either time or space, more efficient than ever. New social networks better manage complexity and transform social dynamics and interpersonal relationships, as well as how people relate to institutions and organizations leading to new forms of power.

Based on these concepts, many scholars and institutions argued the development of the smart city concept. The definition that mostly fits to the aims of this thesis is the one proposed by the British Standard Institute, that describes the term as

"denoting the effective integration of physical, digital and human systems in the built environment to deliver a sustainable, prosperous and inclusive future for its citizens." (BSI 2014)

A study by Nam and Pardo (2011) clarify the pillars of the smart city concept, often blurred.

Analysing and clustering existing terms that overlap partially or completely on the subject, they identify three fundamental dimensions, that are technology, people, and institutions. The technology factors include infrastructures of hardware and software, used to provide interoperable,

Internet-based government services that enable ubiquitous connectivity to transform key government processes, both internally across departments and employees and externally to citizens and businesses. Human factors in means of creativity, diversity, and education create specific services to address city objectives while advancing community skills and capacity. Institutional factors as governance and policy should include every sector of the community to create synergy and allow individual projects to build on each other. This condition results in the informed and trained critical mass necessary for transformation of how the entire community carries out its work (Nam and Pardo, 2011).

This research is an attempt to deepen how technology and human factors can support the strategic direction of walkability for elder citizens in the smart city context, as shown in figure 3.

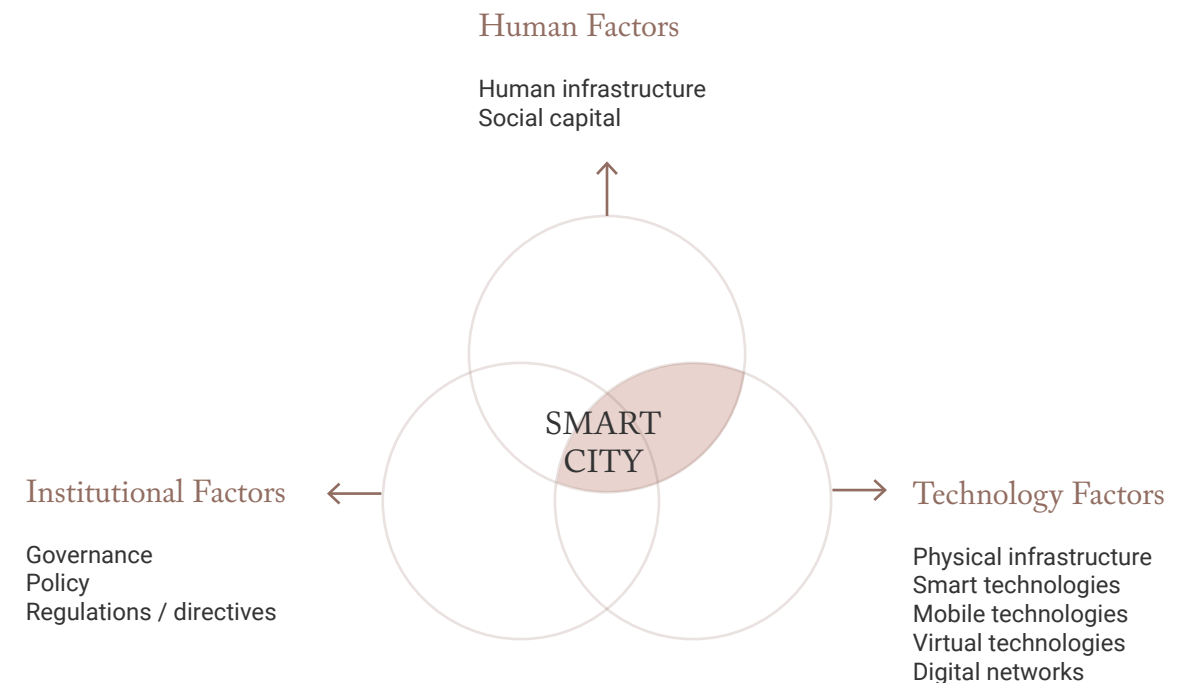


Figure 3
Fundamental Components of smart city
(Nam and Pardo, 2011:286) elaborated by the author

4.1

Future cities' data and trends

This paragraph analyses the meaningful characteristics of future cities. As the British Standard Institute (2014) suggests, the future of cities is the challenge facing humankind's aspiration to attain or maintain a high quality, but sustainable, way of living. Smart cities can be seen as a response to this challenge and the two pivotal concepts have a complementary relationship.

The cities we are living in are changing constantly and a great effort is needed to maintain policy up-to-date. Even if the change cannot be considered as a new phenomenon, its pace is accelerating in many important dimensions and global megatrends will affect economies and societies. The OECD Regional Outlook 2019 deepens the argumentation about future megatrends affecting OECD countries, identifying three main directions. They are the rapid introduction of new technologies, the intensification of climate change, and population aging, that will affect many places worldwide.

The technological change will not only affect quality of life of people but also improve productivity of economies. However the benefits of technological change need to be supported by policies to ensure that the majority of people can access them. Furthermore this kind of innovation requires policies to support its rapid diffusion as well as to regulate their use, limiting the potential

negative impact.

The environmental change will be the most affecting trend of the next decades. It will not offer challenges and opportunities for policymakers but only require an effort to mitigate its effects on society. The results of an unchecked development in the next years would lead to dramatic consequences.

The rise of life expectancy is one of the greatest achievements of civilization and allows people to contribute longer to societies. This trend represents a challenge especially in regions where the rate of birth is low. It is important for policy makers to engage productively older residents in the economy, helping them to age in place.

Automation, climate change and aging have been for a long time the focus of public debate. Recently the attention is on the variation on the regional dimension of those megatrends that mainly impact urban areas, characterized by the constant rural-urban migration and related increase of dwellers. Actually in 2015 the 40% of people worldwide lived in cities with more than 100'000 inhabitants and the number of people living in megacities more than doubled (OECD, 2019). Even if the migration to cities usually involves younger people, looking for life and job opportunities, still the population aging remains a crucial aspect for most urban policy makers, as it is going to be discussed successively.

4.2

Emerging urban perspectives

Mobility has always been a crucial characteristic able to define cities and their populations (Martinotti, 1996) . Cities are more and more crowded and the congestion of people, goods and vehicles is increasing significantly. As cities are growing, also their streets are changing. At a policy level, local investment is moving from highways and sprawl to transit and cities. The role of design is no longer the one of building bigger roads but making streets that support quality places. Due to the nowadays rural-urban migration, most people live in cities, and vast majorities move on foot, by bicycle, or by public transport. Nevertheless most public spaces are designed for cars. This increasing visible imbalance is changing the way cities are planned. The fast growth of cities enables the shift from a low-density, auto-centric development pattern to a multimodal transport system that are best suited to provide sustainable growth, equal economic opportunity, and a high quality of life. This implies a benefit for the health and safety of citizens as well as improvement in the quality of air and water and level of emission. Many scholars tried to define guidelines and principles to create mobility and transport policies. One reliable example is the Global Street Design Guide, that purpose "A new approach to street design, based on people and place, demonstrates the possible transformation of existing streets into great urban places." (NACTO,

2019: XXII)

The guide is divided into three sections and firstly analyses streets, then gives design principles and guidelines and finally shows streets transformations. It is interesting to see the analysis of the streets, meant as the basic unit of urban environment, through which people experience urban environments. Streets are, in fact, multidimensional spaces consisting of many surfaces and structures.

"They stretch from one property line to another, including the building edges, land uses, and setbacks that define each side. They offer space for movement and access and facilitate a variety of uses and activities. Streets are dynamic spaces that adapt over time to support environmental sustainability, public health, economic activity, and cultural significance." (NACTO, 2019:4)

In order to create a valuable framework for this research, the literature about future vision of urban society and mobility has been reviewed. The large part of studies focus on mobility, envisioning potentialities, weaknesses and issues related to this complex aspect of urban life. In particular, it has been decided to explore the topic of responsible innovation.

As OECD (2019) and other entities pointed out, automation is one of the major trends that will shape the future of cities and

mobility. In particular the foreseen scenario of driverless cars has been prototyped, tested and now is part of reality. This brings an enormous potential and related risks. The debate about mobility automatization has achieved awareness within the public, government, and stakeholders involved in digital technology evolution. It will not only bring changes in the transportation system but also in the socio-cultural aspects of life. Needs and habits will change, new services will be provided and the society will transform itself in its complexity.

The discussion about societal impact of those technologies is growing and it aims to prevent negative consequences but also to uncover new possibilities for innovation and its capability to remain relevant in the long-term.

The Bassetti Foundation is fostering the analysis on the topic of societal impact and responsible innovation. Through a workshop they investigated a full spectrum of topics surrounding autonomous transportation, pursuing a diversity of perspectives and trying to foster a dialogue between different fields and collected the results in a paper (Besti & Samorè, 2018). At first they gave an overview of how the future of autonomous vehicles will look, then they analysed the key aspects of responsibility. The topics highlighted by the Bassetti Foundation are ethics and safety, cybersecurity, privacy, accessibility and equality, human compliance, environment and sustainability as well as the integrated approach.

The majority of case studies provided during the workshop focus on the vehicle unit, by contrast the project "Public Square for Driverless Future" (2017) deepens the analysis on cityscape and how people live in it. The award-winning entry by FXFOWLE with Sam Schwartz Engineering, provides New York City a way to rethink its streets and reclaim space for pedestrians through a modular system, light and sharing

mobility oriented. The system transforms incrementally parking slots into sustainable pedestrian-oriented units. This project is an interesting and inspiring example of how the streets of the future might look like.

As a conclusion of the briefing phase the organizers compare different policies and regulations around the world. Italy has a lack of a specific regulatory framework, actually it refers to the European document "On our way towards connected and automated driving in Europe" (2018). It is the outcome of the first European High Level Meeting by the Dutch Ministry of Infrastructure and the Environment and can be summarized with eight conclusive points.

1. Continue Informal High Level Meetings
2. Adopt a joint European approach
3. Assess the use of data
4. Develop Vehicle to Vehicle and Vehicle to Infrastructure Communication
5. Foster cross border testing
6. Close cooperation in UN-ECE34
7. Work with coherent international, European and national regulation
8. Starting work with the shared agenda

The topic of responsible innovation emerged as full of potential and therefore must to be considered when discussing future perspectives. It not only relies on technological innovation, but can be further expanded to the social one. Despite this there's a lack in framing the concept on a policy level, especially on a national level. For this reason a deeper investigation is required as well as the sharing of knowledge on the matter.

4.3

Pandemic Resilience

At the beginning of 2020 the world as we know it changed significantly in a few weeks. The COVID-19 pandemic has altered the way people travel around the world, live everyday life, get groceries and food and their choice of where to go, what to do and with whom to stay. The introduction of social or physical distancing, requiring to maintain at least 6' (2 m) distance between people, combined with restriction or ban on group gatherings or crowd; the discovery about the coronavirus transmission, lead to the reallocation of our streets and sidewalks for public use, both during the crisis and for the future.

Cities around the world are dealing with the death toll of COVID-19 and its devastating social and economic impacts. In order to meet citizens' health needs and to safely allow businesses, institutions and services to re-open cities must innovate and adapt. As NACTO (2020) suggests, the change would focus primarily on streets.

"These emerging street design and transportation practices are at the front lines of cities' defense against this coronavirus, essential to preventing future outbreaks and an integral part of our total public health response." (NACTO, 2020:3)

It is interesting to notice that the nowadays crisis is evidencing the need to shift the paradigm from vehicle-oriented transit to pedestrian-oriented transport system, as other scholars theorised ahead. In the

guide Streets for Pandemic Response and Recovery, NACTO (2020) suggests six principles for a sample approach to use in the response and recovery phase. The really first point is to prioritize the support of the most vulnerable people. This means that planners and decision-makers should consider inequities and work to provide support at first to people who need it most. The other principles that mainly serve the discussion of this thesis concern adaptability and partnership with local based organizations. Actually the iterative approach allows for rapid implementation, continuous feedback and course correction. This would be especially significant in case of a future COVID-19 outbreak. On the other hand partnerships with local organizations would ensure projects meet the community needs and help disseminating information wider than government channels typically can.

Other reports (Litman, 2020) compare urban and rural capability to face pandemic as well as safety and affordability of travel mode, in order to analyse community resilience to pandemic and other sudden economic, social or environmental risks. Resilience is defined as the capability of a system to effectively absorb shocks.

A key conclusion in the report is that cities remain the overall safest place to live in pandemic periods. They offer better health and safety benefits, despite the higher risk

of exposure to infectious disease. In fact, most infection risks are linked to specific activities that are similar in cities, suburbs and rural areas. Therefore density should not be considered only as a potential risk, but a resource that enclose community and services to citizens.

“Analysis described in this report indicates that most people are best off during a disaster living in a walkable urban neighborhood with convenient access to common services and activities, and social connections that provide security and support. This is good news overall, because it indicates that policies to increase disaster resilience also tend to help achieve other community goals including affordability, economic opportunity and environmental protection” (Litman, 2020:3).

Also in this case, mobility remains a crucial aspect of investigation. Public transport as well as sharing transport are great sources of contagion risk. A paper by Harris (2020) claims that subways had a central role in the spread of coronavirus in New York City, based on maps showing reported Covid-19

cases along subway lines. On the other hand, walking and cycling are the safest and most affordable transit mode (Litman, 2020). This implies the need of a fine grained and differentiated pattern of services within the city, in order to guarantee their accessibility also by walking and cycling.

Those arguments about the transport system are confirmed and supported also by the European Commission (2020), in the communication Guidelines on the progressive restoration of transport services and connectivity for Covid-19. The commission proposes guidelines to restore mobility in Europe, concluding the document with a focus on the confirmed importance of sustainability in the transport system. “Lessons learnt from the COVID-19 crisis will be reflected in the upcoming Sustainable and Smart Mobility Strategy in 2020.”(European Commission, 2020:15) - they stated. Again the connection between safety, transport system and sustainability is defined clearly.

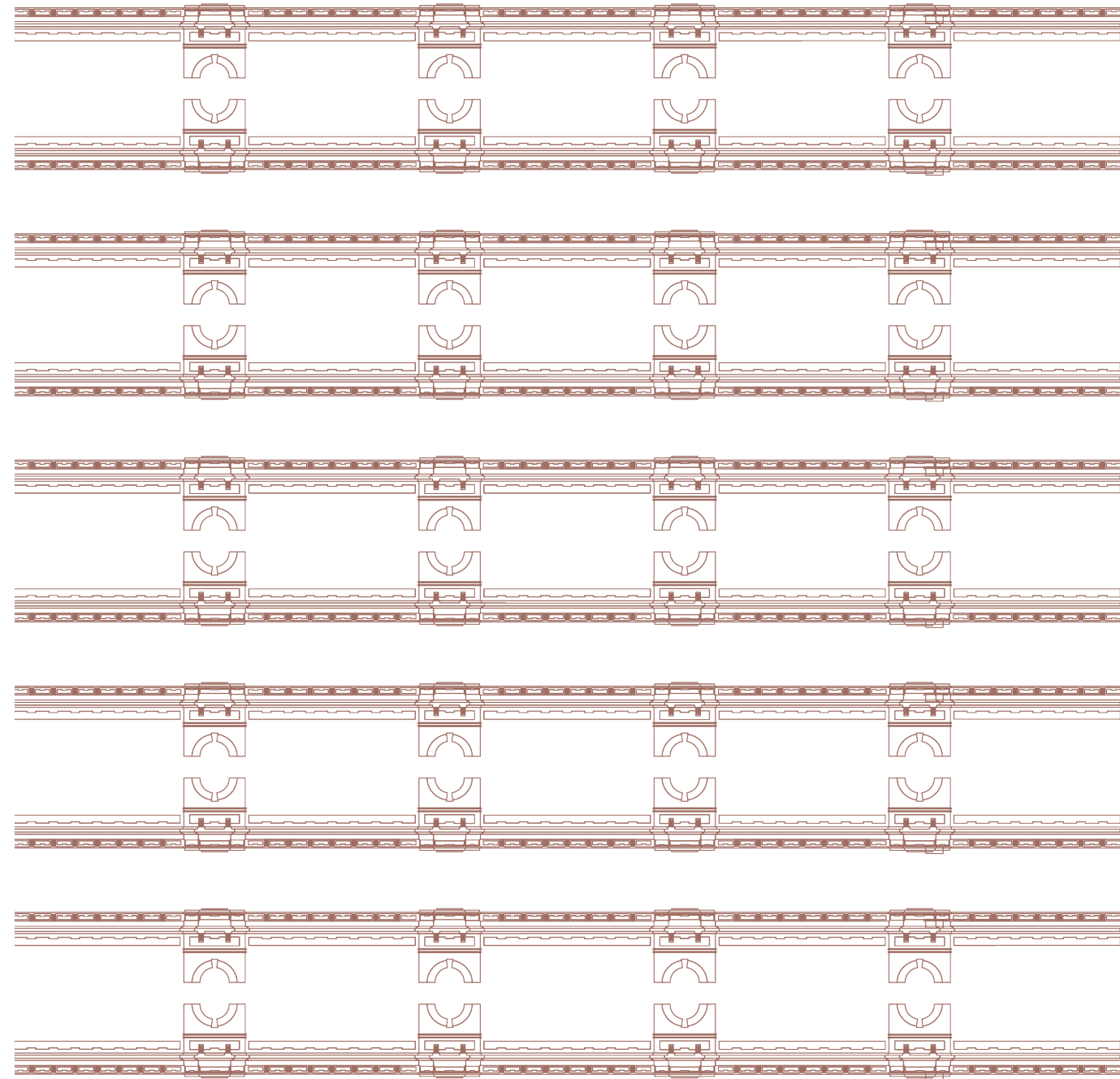
Analysis

Framework definition

This second part of the thesis will envision the analysis process, based upon the existing framework developed and used in the Longevity project and further explored for this specific integrated product outcome.

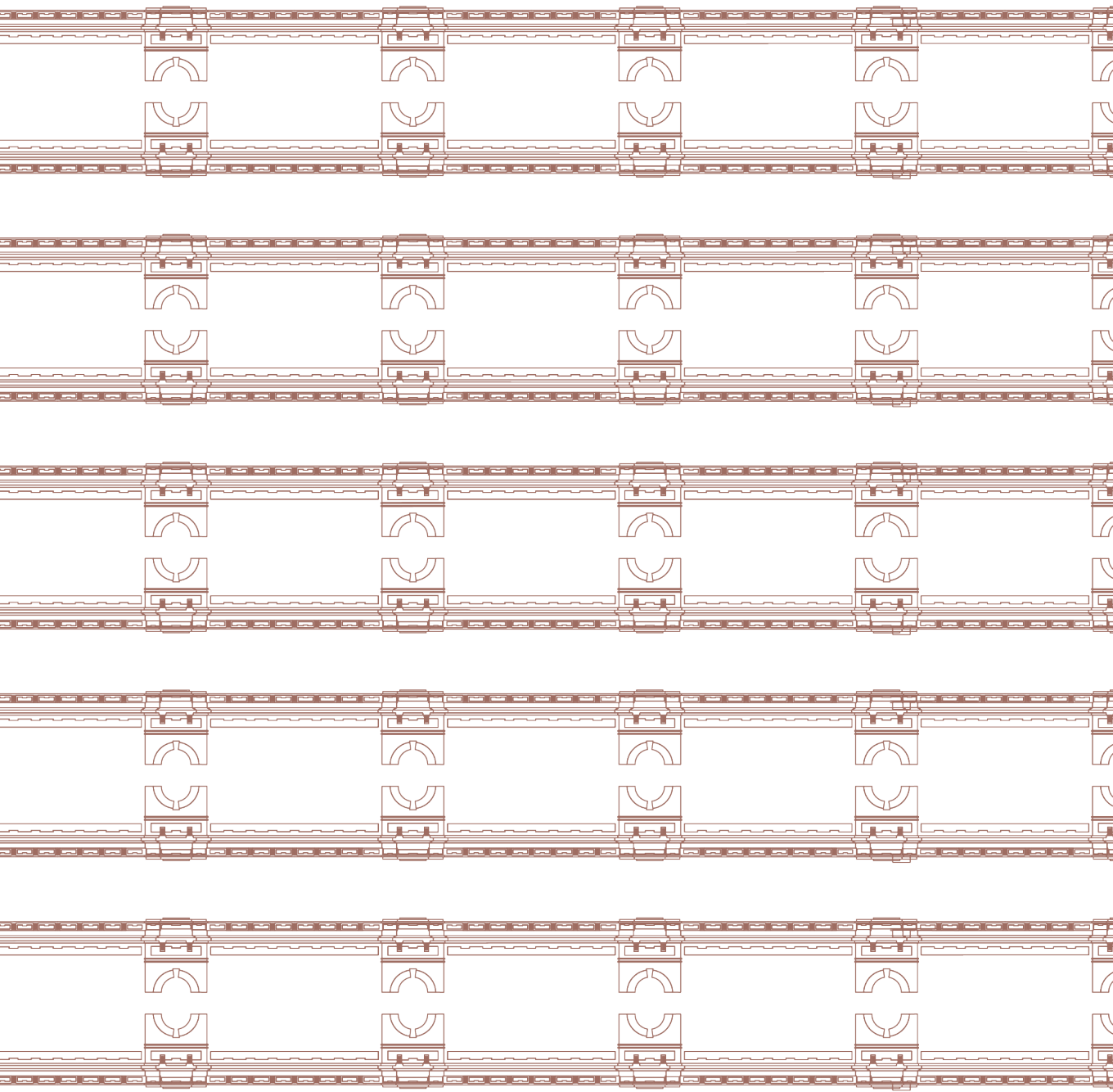
The section starts with the interpretation of the context, defining the project brief, and describing the strategies implemented by Milan municipality and Longevity project.

The methodology of the thesis derives from the Longevity framework and ongoing analysis. The second chapter discusses the results of the fieldwork while the last one defines the drivers for the expected output of the thesis.



5

Context



Urban areas are growing, expanding further from the city centre and creating vibrant decentralized communities. Far from the core commercial and administrative area, in peripheral neighbourhoods the public space has some difficulties in being livable. As emerged from fieldwork reported in the next chapter, the public soil is usually available in large quantities, but the lack of maintenance and the scarce presence of people leads citizens to a negative feeling about places. The scale of public places may represent an issue, due to the difficulties found from people in feeling welcome and dwelling in large spaces (The general theory of walkability | Jeff Speck | TEDxMidAtlantic, 2012). Moreover, in peripheral areas, the community life focuses around collective spaces like markets or schools, that often are not connected to other public spaces (Forsyth and Southworth, 2008). Those areas need a systemic, long lasting transformation, that includes all citizens and triggers care about places.

To act in the peripheral context means first of all to develop consciousness of collective value that the space may assume, raising a sense of identity within the community. Single and collective identity in its positive, dynamic, and constructive dimension allows the needs and willing of people to emerge, attempting to valorize resources and leverage existing energies. Therefore the key aspect of the interventions in

decentralized areas is the active involvement of citizens, the rise ownership feeling towards transformation processes. This approach requires multilayered interventions, and allows the rootedness of new and positive behaviours. Furthermore, those areas demonstrate great capabilities of self organization through the deployment of sharing and solidarity services. Here more than elsewhere public spaces become laboratories for innovation. This opportunity is the hub of the thesis project.

Citizens' participation in the transformative dynamics of the urban area contribute to the enhancement and preservation of a common good, namely public space. The transformation process can be fostered by the relationship between a city and a brand, that might play an active role in urban areas.

The concept of brand urbanism unfolds this relation, described by IGPDecaux as "a branding activity that generates a benefit for the city. Essentially brands allocate a portion of their marketing budget to finance a urban regeneration project within a collaboration with the city and its inhabitants" (Vailati, 2020). IGPDecaux is a leading company in the sector of brand urbanism and characterizes the renewal as aimed to improve wellbeing and quality of life of citizens, and is identifying 4 key structural points of the process:

- Shared interest: brands' contribute

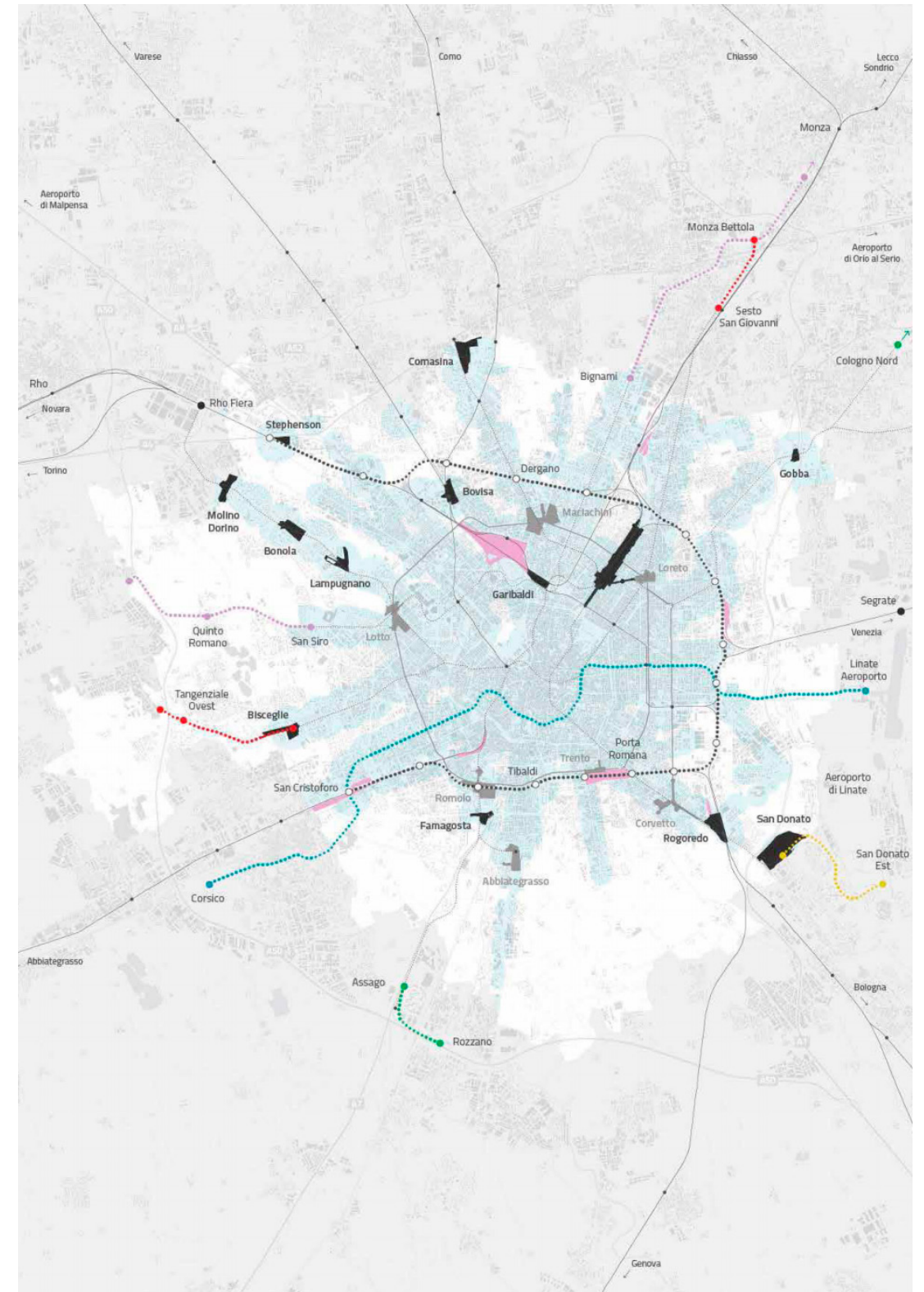
should be the reaction to observed or expressed social needs

- Valuable intervention: there must be coherence between the needs, the choice of the space, the project and brand engagement and values.
- Participation and length: the co-designed projects that offer long-lasting solutions.
- Transparency and honesty: objectives presentation and development monitoring in a constant improvement perspective.

It is possible to identify different models of brand urbanism, that promote temporary interventions, or services for the community or lastly long-term relationship between the city and the brand.

The project of this thesis will programmatically focus on peripheral areas of the city and will also leverage on some brand urbanism methods to positively transform the everyday living environment.

Figure 4
PGT strategies 2030: Connecting places and people
(Comune di Milano, 2019)



5.1

Milan adopted strategies

The project fits the strategies promoted by Milan municipality to respond to contemporary challenges. The Piano Governativo Territoriale P.G.T. (government territorial plan) adopted for Milan 2030 is an urban planning tool that proposes objectives and strategies to drive the asset of the entire municipality in the next decade. The 5 purposes objectives (“PGT adottato - Milano 2030 - Comune di Milano,” 2019) include at first (i) a connected and metropolitan city, achievable through an empowerment of the public transport system, both with

metropolitan extension and strengthening the railway system. The second objective is to (ii) create a desirable city through the settlement of great urban services as hospitals, sport centres, parks and other projects with far-reaching functionality.

The goal of a (iii) green, liveable and resilient city is supposed to be achieved through a reduction of soil consumption, park extension and the creation of ecological connection between them, as well as the increase of trees and the rise of energetic standards for buildings.

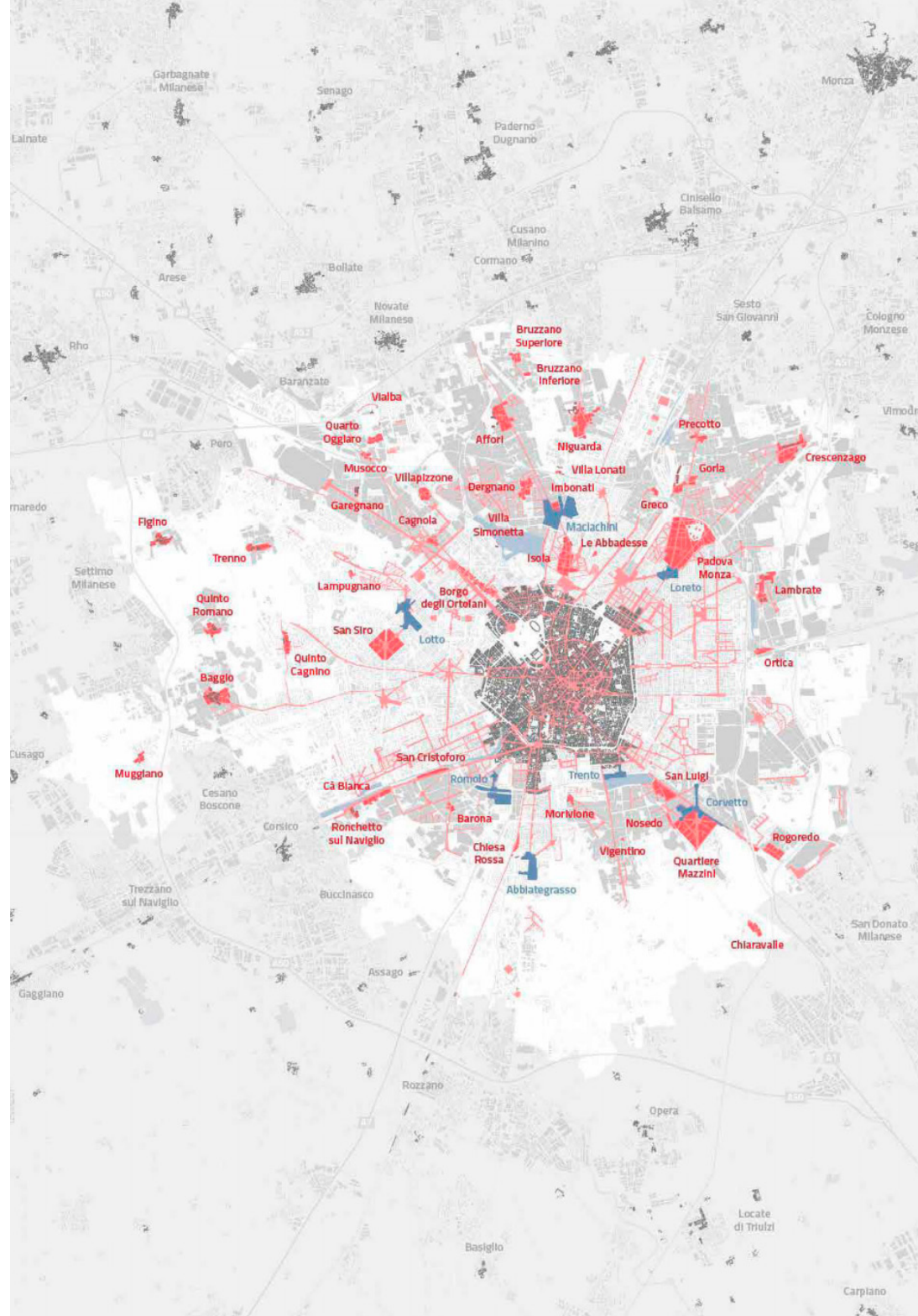


Figure 5
PGT strategies 2030: Enclose neighbourhoods, public space as a common good (Comune di Milano, 2019)

Figure 6
Milan 2020: adaptation strategy (Comune di Milano, 2020)

The last couple of objectives are the one that mostly fit with the aim of this thesis: (iv) One city, 88 neighborhoods to call by name, and a (v) regenerative city. The first refers to the valorization of public space and services in suburbs to overcome the differences between central and peripheral areas of the city. The strategy focuses on the opening of the Navigli canal, the upgrading of the railway stations (scali ferroviari) and renovation of specific squares along the pathway of the 90/91 bus. This strategy is partially overlapping the theme of the project thanks to the identification of the neighbourhood as a core asset and railway as an identitarian place in cities. Moreover one of the squares identified as in need of renewal is Piazzale Loreto, which is quite close to the spot of the project.

The last objective of a regenerative city aims to retrain existing places to avoid further consumption of public space. The strategy includes elements of specific interest for this thesis as the valorization of sidelines areas through interventions on architectural downgraded heritage.

In addition to the PGT 2030, this thesis pursues some of the guidelines of the adaptation strategy for Milano 2020 - drawn up to face some of the challenges raised with the covid-19 pandemic.

The document (Comune di Milano, 2020) is used in our study to identify the intervention strategy of the project within the frame of pandemic adaptability.

The baseline scenario is the one of “new ordinary”, therefore the one providing measures for a new-normal situation, and the precondition to the recovery is “immunity” so the ease of active life upswing for immune people. The reference target is selected through age, previous impairments and level of engagement in active life.

<p>Scenari di riferimento La strategia interviene in un contesto incerto e in continua evoluzione, pertanto deve poter essere dinamica. Per questo identifichiamo misure diverse in base ai seguenti scenari:</p> <p>CONTENIMENTO pre-lockdown Progressive restrizioni</p> <p>LOCKDOWN Quarantena</p> <p>CONTENIMENTO post-lockdown Progressiva ripresa</p> <p>NUOVO ORDINARIO Misure per una nuova normalità</p>	<p>Condizioni necessarie alla ripresa Perché si possa finalmente uscire dalla fase di lockdown e progressivamente riprendere l'attività quotidiana, è fondamentale uno sviluppo positivo delle seguenti condizioni:</p> <p>MAPPATURA Mappare la diffusione dell'epidemia</p> <p>TERRITORIO Organizzare servizi medici diffusi</p> <p>ISOLAMENTO Sistemizzare la quarantena dei Covid+</p> <p>TRACCIAMENTO Definire una strategia di screening</p> <p>IMMUNITÀ Facilitare il ritorno alla vita attiva delle persone immuni</p> <p>SANIFICAZIONE Preparare la città a vivere in modo sano e sostenibile</p>	<p>Target di riferimento Per poter essere efficace, la strategia dovrà essere elaborata tenendo presente diversi target di popolazione, a partire da determinate condizioni (di salute, di immunità, ecc.):</p> <p>POSITIVI e NEGATIVI Condizioni di salute</p> <p>IMMUNI e NON IMMUNI Immunità al virus</p> <p>GIOVANI e ANZIANI Età anagrafica</p> <p>CON o SENZA PATOLOGIE Condizioni sanitarie pregresse</p> <p>ATTIVI e INATTIVI Status lavorativo</p> <p>ABBIENTI e NON ABBIENTI Condizione economica</p>
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5.2

Longevity project

The mixed method approach is the one used in the research project Longevity¹. The objective is to study walkability and pedestrian mobility in the Metropolitan area of Milan (Italy), considering the specific needs of senior citizens.

The cities of the future will be characterized by the need to design age-friendly transportation infrastructures and mobility services. The research process is based on a methodological interplay between social research and innovative technologies to study the increasing role that autonomous vehicles will have on walkability and age-driven pedestrian mobility.

The goal is to foster the social inclusion and active ageing of the long-lived citizens through the support of their autonomous mobility.

The project is aimed at assessing and enhancing the level of walkability of the City of Milan (level of accessibility, comfort and safety), considering the needs and perceptions of the elderly with respect to mobility infrastructures and services.

The territorial analysis run for the project

is based on three key steps: the GIS analysis on the city of Milan, onsite inspection in the selected neighbourhoods and the set up of living labs with groups of elderly in the AUSER senior centers.

The GIS analysis is a layered set of information on a macro-scale that evaluates socio-demographic data and elderly walkability index (Bandini et al., 2017). Demographic data show areas of Milan with the higher presence of older residents, while the elderly walkability index is overlapping information about the level of usefulness for the elderly - as transport, social and commercial services -, level of comfort due to transportation facilities specifically tailored for the elderly - as pedestrian friendly areas, pedestrian circulation areas and urban green areas-. The last category included in the GIS analysis is the level of safety, that works with the localization of fatal and non-fatal pedestrian-can accidents occurred in 2016.

The result of the analysis identified the neighbourhoods or NLI of the city with the higher presence of elderly and the lower level of walkability, that is the NLI Padova (within the city of Milan).

The area became the focus for the on-site inspections. These inspections were made on a specific sample of streets, following an online protocol to evaluate five main criteria: Usefulness, Comfort, Safety,

1. LONGEVICITY is funded by Fondazione Cariplo within the Call Scientific Research 2017 "Aging and social research: people, places and relations", along the period between April 2018 and December 2020 [Grant No.2017-0938].

Attractiveness and Legibility. This analysis evidenced strength and weakness of the area, becoming the starting point for the living labs. Indeed an homogeneous group of elderly recruited within the visitor of AUSER

senior center located in the two areas where the performer of the activities of the project. Those activities refer to specific work packages, as social inclusion, participatory design and walkability assessment.

5.3

Case study

The last conclusive section of the context chapter envisions existing projects and case studies.

A deep and wide research led to the selection of a set of interesting case studies, that has been classified through a weighted cross reported in figure 7. The cross explores the approach of the project and the target users. Actually the diagram shows on the horizontal axis the hardware and software dimension of the design approach. The expected result of an hardware approach is a modification of the characteristics of the built and natural environment, while from software approach a support for the relationships between people and people or people and place is expected.

On the vertical axis are placed opposite target users for the design solution. On one end is reported the focus-on target, therefore elder citizens, while on the other end is reported for-all solution, that addresses the issues of a bigger portion of the community,

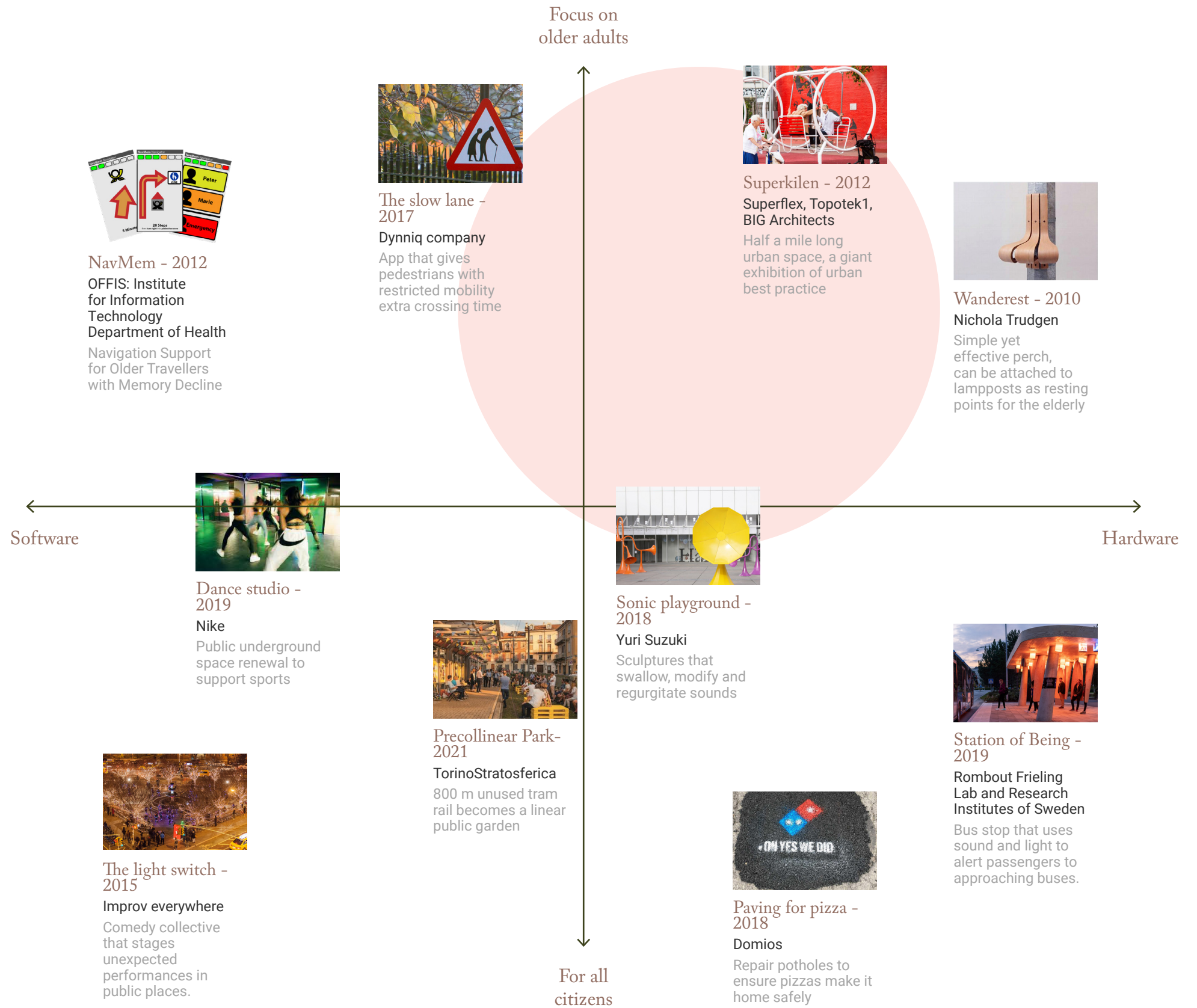
including fragile groups.

The selected case studies in the upper right dial explore the built environment and how it can be shaped to support elderly's needs, with a particular focus on active ageing and mobility. The case study of urban playgrounds is an example of urban furniture designed to foster physical activity among older adults, taking care of their need for socialization and assisting them accordingly to sensory-motor capability. On the other hand, hardware solutions for all citizens that inspired this research focus on sensible and interactive solutions. The most striking example is the Station of being by Rombout Frieling Lab and Research Institutes of Sweden (2019). The project is based in Umeå, Sweden, and aims to improve the waiting conditions for passengers using public transport in cold weather conditions within the Arctic region. The most interesting aspect of the project is the use of lights and sound, which are actually a vehicle

of information for passengers waiting at the bus stop. The sensible input (light and sound) communicate through cultural and heritage-related signs to the local users. For instance when glassy tones sound, the bus goes to the locally famous glass factory. Moreover the waiting experience is redesigned focusing actual users' needs, such as protecting from the wind rather than sitting to rest. The pods protect from cold weather and allow different uses and behaviour, supporting more personal or sociable waiting time. The two lower dials, that represent hardware and software solutions for all, include brand urbanism projects. In these case studies, big brands fund events or interventions in the environment that both promote the brand values within the community, and improve liveability of the community. On the edge between hardware and software solutions for all there are bottom-up projects such as Lots of Love and others that through temporary or low impact infrastructures develop strong social relationship links within the community. The most interesting aspect is the thrust to the renewal of unused urban spaces that are gaining importance in densified cities. The last deal of the scheme is the one of software solutions focusing on elder users' needs. The case study in this dial are digital softwares and iot products that support fragile categories when navigating the built environment. This includes a user-friendly app to guide the elder when reaching a destination and interactive traffic lights that go along with users' needs in terms of time to cross the road and priority over vehicle passage.

Within this panorama, as highlighted in the figure 7, the reference scenario of the project mainly impacts on the hardware dimension but also drives a shift on the software one. The target of the solution is the elderly, thanks to the answer provided to specific needs emerged from fieldwork.

Figure 7
Case study weighted cross
elaborated by the author



6

Fieldwork

The chapter will illustrate all the steps of analysis runned for this thesis project. The fieldwork had been a pivotal phase for the understanding of the context, the conceptualization of the design opportunity, and final output definition. This phase was initially developed by the Longevity team and then deepened specifically for this thesis project.

As mentioned the thesis relies upon quantitative and qualitative analysis runned in different stages of the project definition. A first cluster of fieldwork was conducted by the Longevity team to define the boundaries and frame the structure of a codesign session that should have taken place in march 2020. Unfortunately, due to the pandemic occurrence it has not been possible to accomplish this step, therefore a second session of field research has been conducted. The second session mainly focused on clarifying issues raised by the users during the first round of fieldwork. Specifically the theme of unused spaces and railway tunnels had been deepened.

The fieldwork was carried out through three main tools of research:

- survey
- interview

- site observation

The survey was addressed to users inquiry, while the interviews were devoted to the inquiry of both users and potential stakeholders, as the Milan Municipality. On the other hand fieldwork analyzed the built environment and urban design of the selected area, the Gorla neighbourhood in Milan.

6.1

Methodology

The method that has been used in the analysis phase of the thesis is aligned with the one used by the Longevity research team, that consists of both academics and practitioners from a range of different disciplines including the department of information, system and communication of Milan-Bicocca university, design department of Politecnico di Milano; AUSER - the regional volunteer association for the elderly and Research Center for Advanced Science and Technology of The University of Tokyo.

As described in the article "Co-designing

a walkable city for the elderly through system thinking approach" (Pei et al., 2019), a design-led research process has been formulated to act as a platform supporting the discussion of different stakeholders on the issue of walkability and to co-create possible future visions. The whole research process has been illustrated in figure 8.

The research methodology integrates quantitative data collection techniques and qualitative co-design methods. The analysis of data about pedestrian locomotion behaviour has been synthetized through computer-based pedestrian simulations and a human-centered design approach guided different actors in the active participation in the entire research process. The results deriving from the representational observation and the experimental investigation of pedestrian behavior become the basis for the following co-design phases, validation of computer-based simulation systems, testing the adherence of the simulation results on realistic behavioral dynamics.

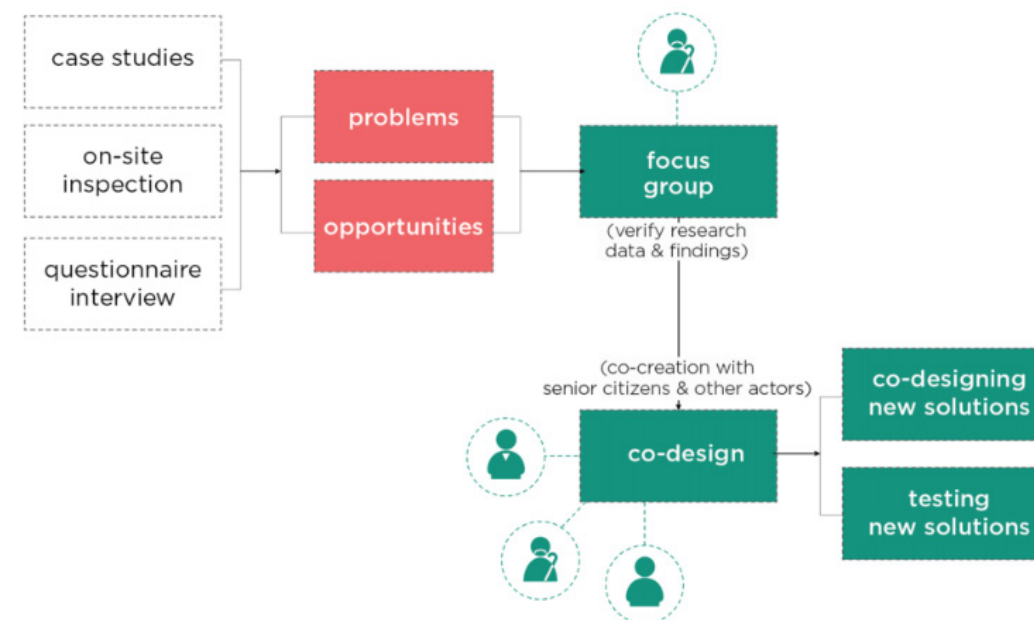


Figure 8
Longevity approach and methodology
(Pei et al., 2019)

6.2

Results

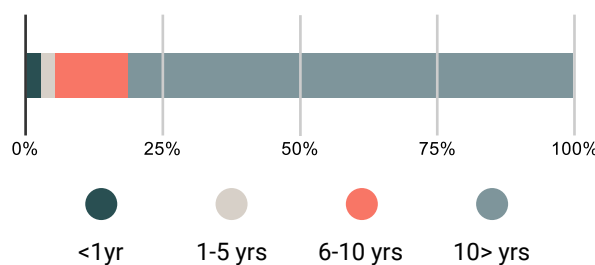
Survey

The survey is one of the activities that the Design Department of Politecnico di Milano developed for the Longevity research project. This questionnaire collects opinions, information and habits of people living around the Gorla neighbourhood, reached among the Auser centre attenders.

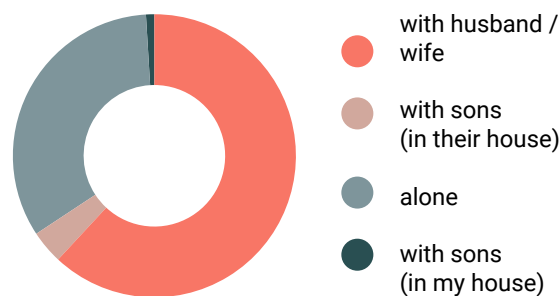
The surveyed sample is 105 people, 72 women (68.3%) and 33 men (31.4%), aged 60-86. Questions are structured to envision personal characteristics of participants, how they spend their spare time, neighbourhood and its liveability, mobility habits and their relationship with technology.

The results show that the sampled users mainly live in a flat for at least 10 years, alone or with the partner. A community of close friends or relatives live in the surroundings.

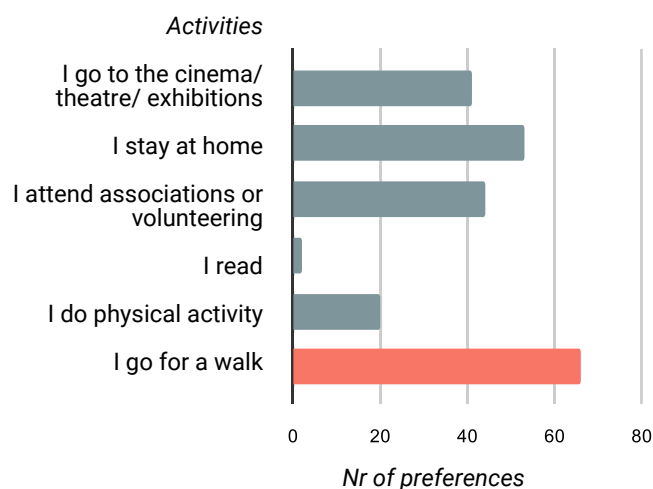
How long have you lived in this area?



Who do you live with?



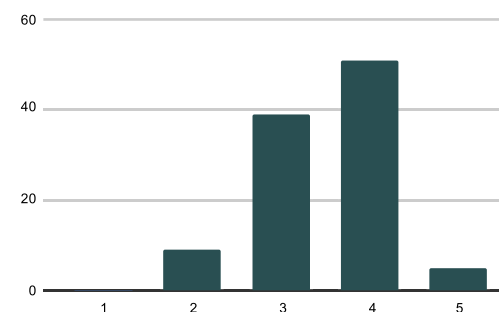
How do you spend your spare time?



Spare time is usually spent walking or staying home, attending community volunteer, or recreational activities as theatre, cinema or exhibitions.

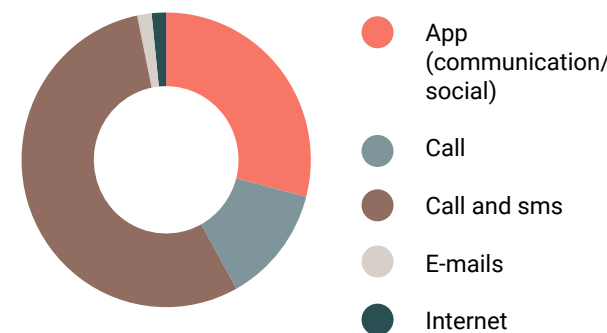
The majority of participants do not feel completely satisfied about its free time.

Are you satisfied with your spare time?



Regarding technology, participants affirms to be used to basic digital devices, such as smartphones and computers, but only partially take advantage of the offered functionalities. Indeed they use communication or information apps rather than social networks and other services.

What do you use the smartphone for?



Received answers about the neighbourhood show that the most relevant issues for liveability are lighting, safe crossing, but also services availability, and street pavement maintenance. The most appreciated aspects in the area are public spaces and services, while the critical ones are bad conditions of sidewalks and infrastructures together with the lack of street furniture. The services mentioned as the most useful are public transport and local grocery stores.

Around the topic of mobility the respondents affirmed to prefer walking and public transport methods to vehicles and bicycles, especially when they move within the neighbourhood. Slow transfers are usually aimed at errands and daily shopping. Reaching aggregative places as sport centres, volunteering associations and social spaces are also a valuable reason to move by foot. Objects that senior citizens bring with them while walking are wallets - including documents and low amounts of money - and cellphones.

How do you move around the neighbourhood?

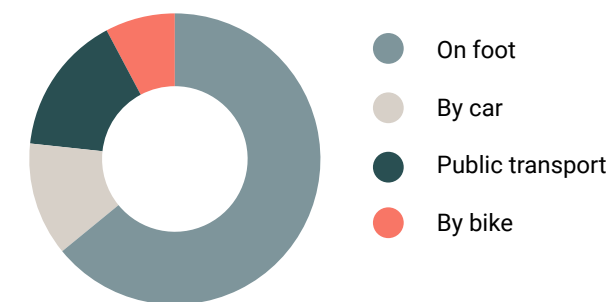


Figure 9, 10, 11, 12, 13, 14, Answer to survey for Longevity project elaborated by the author

Interviews

Within the framework of the project a set of interviews has been run by the research team to better understand the context of intervention.

More precisely the interviewed were users and experts. The users are senior citizens associating with the Auser centre, while the experts are engineers specialized in the management of tunnels, a high potential area identified for the project. The first cluster of interviews, addressed to older citizens that participate in the Auser initiatives to understand their point of view upon district liveability, transport and urban furniture, safety and technology.

The participants answered the questions in person and were provided with maps and other tools to tangibly show their thoughts. The results of a selection of three on eleven conducted interviews is reported on attachment A01.

Concerning mobility the users confirm their preference in walking and using public

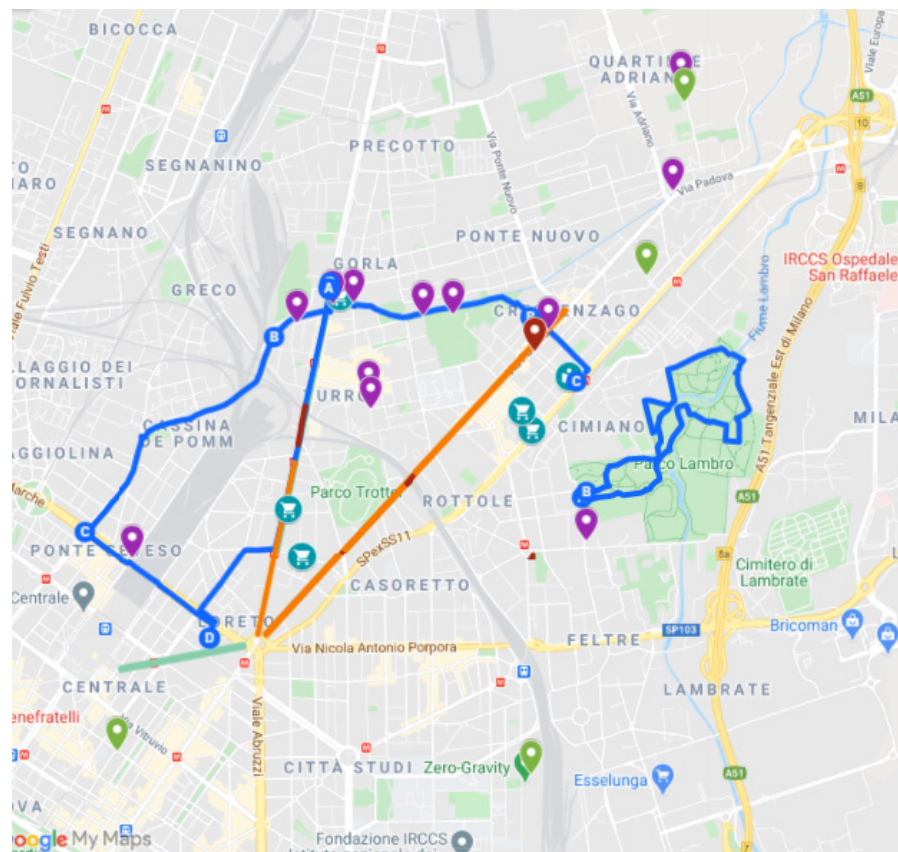
transport. The additional information is that they are used to make group trips and often reach the Auser Centre or other collective destination with small groups of friends.

Regarding safety the biggest issue involves walking in dark hours. Indeed the interviewed affirmed their reluctance in walking through smaller or side roads, despite the sufficient lighting of the overall area. Moreover, the presence of different ethnic and social communities in the neighbourhood represents a barrier for elder citizens.

The users reported some criticalities with the specific place of underpass and railway bridges.

The insights of the interview have been collected in an interactive map, of which a screenshot is reported in figure 15.

“Outside of parks and green areas there is absolutely nothing. It has become a hangout area also because it is not accessible to cars [referring to Piazzetta del Governo Provvisorio]. Other really bad, degraded areas are around the two railway bridges.”



- Safe pathway
- Dangerous pathway
- Places of interest
- Shops

Figure 15
Overview map, elaborated by the author
available [here](#)



Image above
Pictures of the group interview
source: Longevity team

“Many initiatives of the municipality are set up in the city center, so you have to move to the center, in the suburbs is organized very little, which is a shame because maybe even those of the center may have pleasure to see the city outskirts. Besides, downtown initiatives aren’t always advertised enough.”



The other cluster of interviews -see attachment A02, A03 for details- focused on experts from the Milan Municipality and from Rete Ferroviaria Italiana - RFI offices. These couple of structured interviews had been done specifically for this thesis project, without the participation of the Longevity team.

The aim of the interview is to deepen the technical and bureaucratic aspects with regard to peripheral areas and railway underpass, due to the interest raised upon those places by elderly in the interviews conducted by the Longevity team.

The contact person with Milan municipality has been dr. Ing. Nicola Casati, head of the technical area of Infrastructures for Mobility, in the directorate Transports and Mobility. About the maintenance issue and management he declares:

“Maintenance is entrusted through contracts, after drawing up projects to be included in the planning oopp (project levels dependent on amounts and types of contract) and after completion

of the tender and award phase.”

From the monitoring perspective he explained that the collected data measure the structural conditions of the structures and the inspection is regulated according to the conditions of the specific bridge. The goal is to create a database of the state of repair of infrastructures to prioritize future maintenance interventions. Last topic explored with the interview is the one of urban furniture and the constraints it must comply with. The interviewed argues that for the public space national and regional rules are applied, other than specific provisions for constrained contexts (monuments / landscapes). On the other hand for public furniture the choice is not generally set by the regulations, but it depends on the context, the functionality, the maintainability, and the certification of the product, the respect of distances from the road site and similar parameters.

The second expert that answered to an interview for the project is dr. Ing. Davide Cavone, employed in RFI within the directorate of Milan Territorial Production.

He mostly defined the responsibility attended by the Rete Ferroviaria Italiana and Milan Municipality. Talking about subways that cross the railway, the urban furniture and ordinary maintenance are assigned to the municipality, while the structural monitoring and extraordinary maintenance interventions pass over to RFI and third parties. Specific agreements between RFI and third parties regulates the workload and expenses. The most critical aspect of renewal is the management of urban traffic during the interventions.

RFI is the owner and therefore responsible for all the bridges that cross the railway between viale Monza and via Padova,

including spaces adjacent to the railway such as via Pontano between via Padova and via Mosso, or parking lots under the rail.

Deepening the topic of parking lots and unused spaces Ing. Cavone says:

“RFI is in charge of the railway artifacts, while the tenants, to which the underlying areas or railway arcades can be given in concession, turn out responsible for how much of their competence. The car

parks are managed by the City of Milan, as well as the road under the railway arches.”

Again talking about spaces along the railway he specifies that they can be rented and that are managed by a different operational unit.

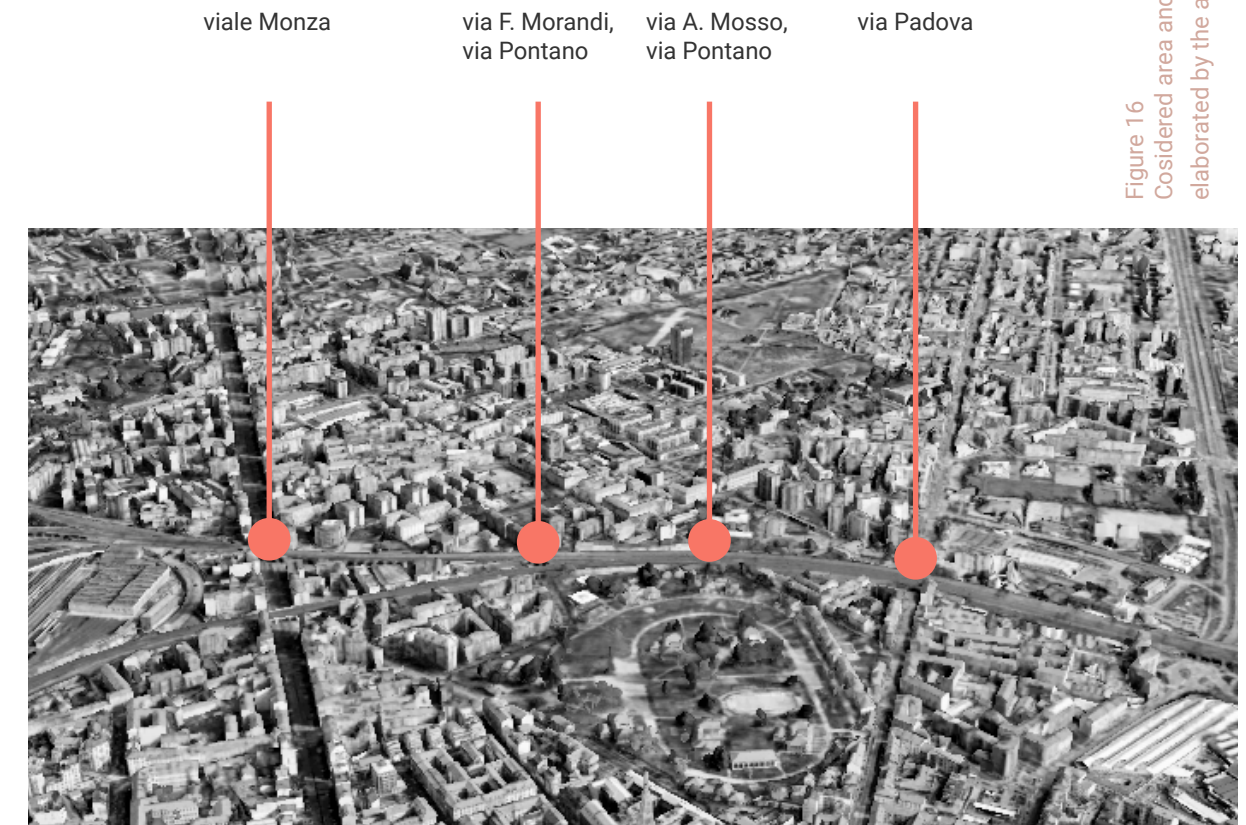


Figure 16
Considered area and tunnels
elaborated by the author



Site observation

The research team has developed a protocol (Pei et al. 2019), based on the walkability framework for elderly identified from the literature review, to conduct onsite observations in the selected neighbourhood.

The observation protocol has included six main indicators: usefulness, comfort, safety, attractiveness, legibility and population. The previous five variables derive from the literature and have been selected as a reference for the project. In order to achieve a comprehensive evaluation, the last indicator "population" has been included in the protocol. Since that, the notion about people and their behaviours is envisioned within the site observations.

The collected data included both the hardware and the software characteristics of the space. Hardware information include sidewalk, building, urban infrastructures etc., while software includes typology of people and the daily activities they perform in the area. For each indicator, specific questions

have been designed to get accurate and as objective as possible data to make a walkability assessment.

The protocol is highly standardized in order to register neutral results without personal preferences.

The observation activity has been carried out both during the day (in the morning or in the early afternoon) and during the late afternoon (around 16:30 to 18:00). In total, we conducted 11 observations in the neighbourhood. Data were collected thanks to the implementation of a shared online protocol. This tool allowed us to easily analyse and compare data according to different indicators. Afterwards, data were analysed using excel and assigning scores for each indicator according to their presence or absence and to their evaluation. In this research, the walkability assessment formula has been designed as:

Walkability = Usefulness (20%) + Comfort (20%) + Safety (30%) + Attractiveness (20%) + Legibility (10%)

The field observation has been further developed through a photojournal that focused on underpasses that deeply characterize the area. This activity was specifically conducted for this thesis project and did not involve the Longevity team. It envisioned four bridges along the railway between via Padova and viale Monza and the two pedestrian bridges that cross the martesana canal.

The bridges along the railway allow both vehicular and pedestrian transit, and two of them have separated roadways for slow and fast transit. Namely via Padova, via Felicità Morandi, and viale Monza have sidewalks for pedestrian-only. On the other hand smaller bridges have a single track for both pedestrians and cars.

The bridges that cross the martesana canal do not allow car transit, therefore are much safer, and attract a lot of people doing physical activity. The overall maintenance conditions of these structures is sufficient, with some strength places as viale Monza crossing, both on the railway and on the

Images above
Tunnels and bridges in the selected area
taken by the author

martesana canal. Bridges with the worst maintenance status are the one on via Padova, both crossing the railway and the river. Generally speaking the environment of the subway presents some criticalities such as cleanliness and air pollution, vandalism, and bad structural maintenance.

The most crowded areas are the ones along the two principal and commercial roads, via Padova and Viale Monza. Here the traffic - both cars and walkers - is kind of dense thanks to the number of shops and activities in the area. As well the Martesana walking path is one of the most attended urban routes for physical activity. Otherwise the bridges between the main streets are much less crowded despite their potentialities of connectivity and in some cases their abundant space.

6.3

Discussion

The fieldwork analysis targeted both the users, through surveys and group interviews, stakeholders through structured interviews, and the built environment through site observation. This approach was aimed to gain a deep comprehension of the context, and develop a design solution fitting the needs of the users and taking advantage of the opportunities of the environment, taking into account the interest of stakeholders.

The interviews' answers concerning everyday habits and pleasure, showed that the majority of participants do not feel completely satisfied about its free time.

This aspect gains deeper importance if we consider that older people don't usually have a daily job, therefore spare time and time devoted to care of relatives become the core

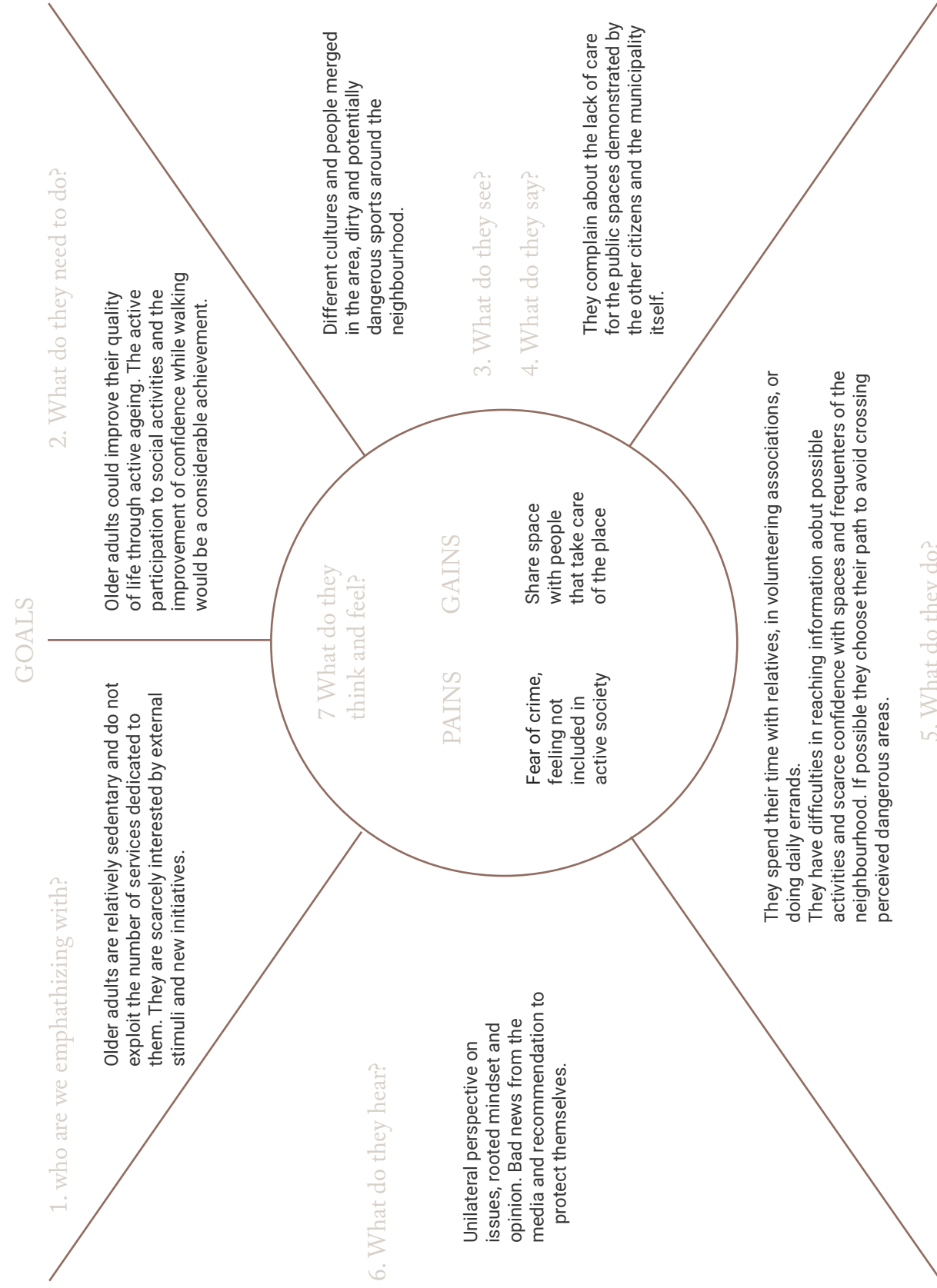
activity of their week. In this perspective the accomplishment of a fulfilling experience in leisure time has the potential to deeply influence senior citizens' quality of life. To wrap-up and visualize the results of the elder's inquiry an empathy map has been designed and reported in figure 17. This design thinking tool helps define deeper insights such as gains and pains of users through the exploration of their thoughts and beliefs.

The results of the observation protocol, reported in figure 18, show a consistent and intermediate walkability rate, characterized by a great legibility level, and sufficient levels of comfort, safety and attractiveness. All the variables have higher results in the area surrounding the Auser centre.



Figure 18
Site Observation results
(LONGEVICITY, 2019)

Figure 17
Empathy map of senior citizens
elaborated by the author



The environment perception analysis pointed out the strong appreciation of citizenship to socialization areas and the lack of designed and well maintained spaces, despite the presence of quality spaces such as parks and green areas. Therefore renewal intervention might have a very positive impact on the community and its perceived liveability of the area. Moreover, the scarce perceived safety at crossroads, traffic, walkside conditions and the lack of equipped green areas discourage waking and active living. Improving streets maintenance and activities accessibility could therefore increase mobility and overall active living.

To synthesize and visualize the results of the stakeholders interviews, comparing their needs to the ones of the users and the Longevity project, a motivation matrix has been developed and reported in figure

19. The matrix includes the Auser centre as stakeholder in the project, even if the staff was not formally interviewed by the research team. Indeed the Auser staff, meant as a representative for no-profit activities providers within the neighbourhood, has slightly different needs than elder citizens, even if it is made of a group of volunteers including elder participants.

Figure 19
Motivation matrix
elaborated by the author

	Elder	Longevity	Municipality	RFI	Auser
Elder	Better experience under the tunnel, less fear of crime, active and community life	A project focused on their needs, a team to join to participate with	Taking care of public space, sustaining good practices, be competent	Maintain train infrastructure, be competent, protect citizens from damages	Ensure good quality standard of services, be accessible
Longevity	Establishment of strong relationship, test innovative approaches of research	Participative approach to engage the community and develop research project	Root a positive collaboration, mutual support, information exchange		technical support collaboration, direct informations
Municipality	Trust, participation	Compelling and solid project, aligned with municipality values	Competitive and accurate plans or activities	Infrastructural maintenance	Satisfy fragile categories, low budget financing
RFI	No complaint, trust in railway system		Urban furniture installation and maintenance, traffic regulation	Offer transport system, take care of its infrastructure	
Auser	Participation, awareness about activities	Fruitfull exchange of knowledge, improvement in the offered services	Financial support		Support fragile categories

7 Design Opportunities

This chapter will wrap up the results of the previous research activities, defining the drivers of the project. At first will be explained which is the mission and the research opportunity, then will be argued the vision to pursue with the project and the deriving strategy.

The last paragraph envisions existing case study and defines the intervention scenario.

In line with the literature review and the fieldwork analysis the strategic place that has been chosen for the project is the tunnel.

These infrastructures are made to overcome a geographical barrier enabling the connection between two separated areas. The pedestrian connection within the city and more precisely in selected neighbourhoods are a pillar for walkability and overall access to services.

The area selected in the early stages of the projects, meaning the surroundings of the Gorla metro station, evidenced by the GIS analysis as a critical area of Milan, is characterized by two important geographical barriers crossed by bridges and tunnels, the railway and the Martesana river, as shown in figure 20.

These two edges define the borders of the project because they are significantly influencing the identity of the neighbourhood, shaping behaviours and habits of citizens.

7.1

Objectives

The literature review displayed the possible variables that influence walkability rates in the urban environment. The features that most strongly emerged from the analysis are safety issues and services availability and accessibility. Indeed according to the qualitative analysis runned for the project, users affirms the fear of crime and perceived safety are the key features of the urban environment that discourage walking, while the technological barrier decreases sensibly the accessibility of available services.

Therefore referring to walkability standard variables this project will mainly focus on the improvement of safety and attractiveness of the specific place of railway underpass.

These spaces have been identified as a critical place by senior citizens, who potentially feel more sensible to perceived safety issues, connected to space appearance and maintenance, to space structure and lack of human presence. Moreover sensory-motor impairments may lead to a more durable bad experience, enhanced by the feeling of entrapment that characterize long and closed spaces.

As said before, the aim of TurnMiOn is to improve perceived safety and local services accessibility and the selected strategies to initiate this transformation is to leverage unused spaces presence and the interest of private brands in local development projects investments.

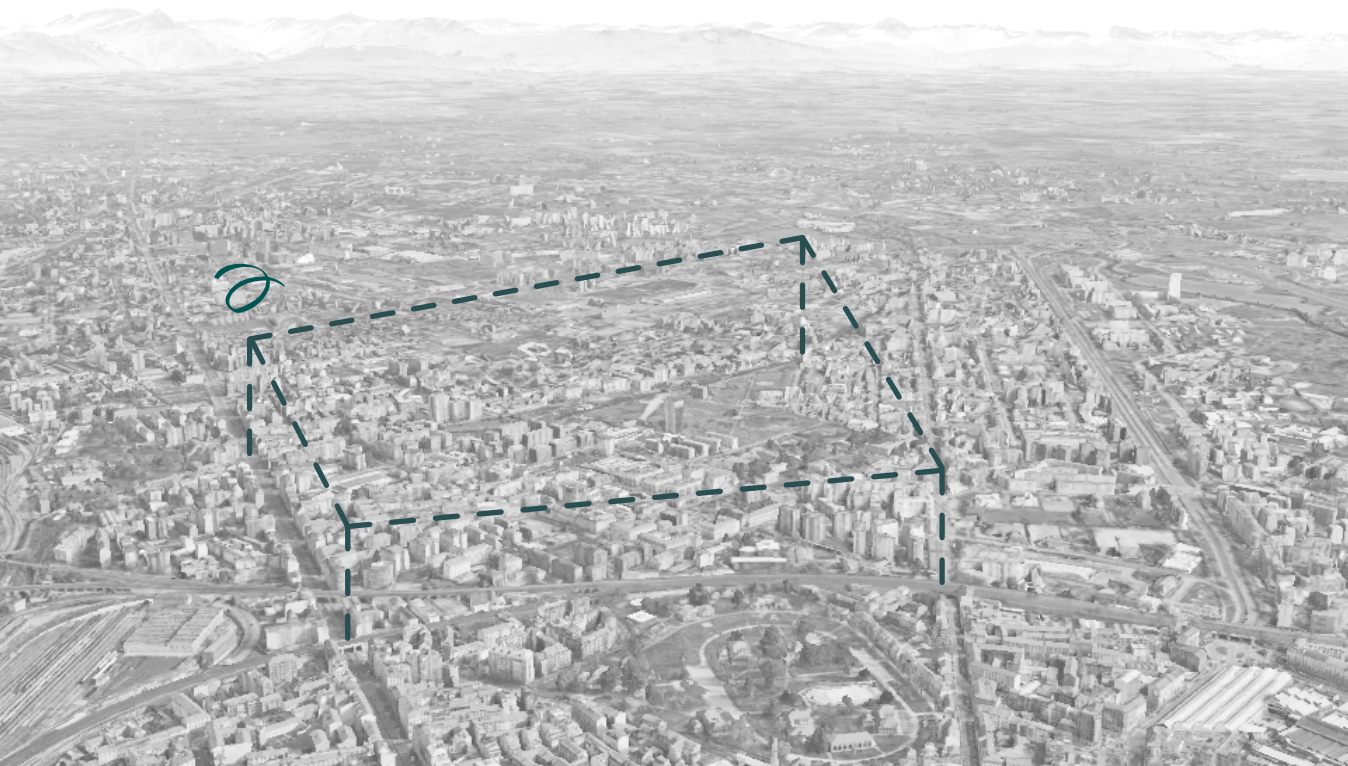


Figure 20
Selected area for the project
elaborated by the author

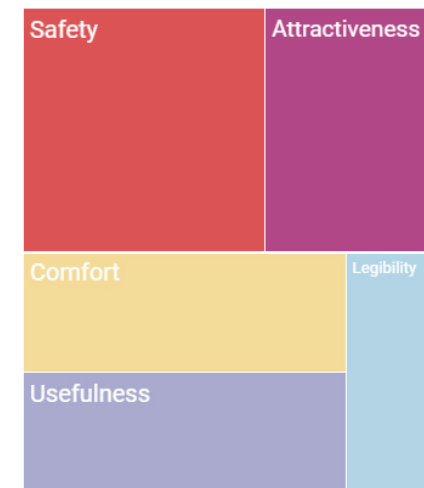


Figure 21
Walkability factors considered for the project
(LONGEVICITY, 2019)
elaborated by the author

7.2

Strategy

TurnMiOn is based on the concept of wellbeing scalability and articulates across different steps with specific targets and strategies.

As discussed by Sedini (2021) in her latest book, the improvements of the quality of life of specific (small) groups of vulnerable citizens, if properly addressed through inclusive practices, can lead to an improvement of life standards of the overall society.

“This means that the satisfaction of the needs of specific vulnerable populations will not deny the satisfaction of other populations’ needs. [...] The improvements of the quality of life of specific populations can positively affect the whole society”. (Sedini, 2021 : 115)

According to the author the concept of wellbeing scalability should be considered in every research project addressing social innovation.

This research project is structured in three upward phases, that aim to extend its footprint and raise awareness within the neighbourhood.

The layered approach allows an improvement in involvement and inclusion of participants, therefore creating a liveable and stable relationship within people in the area and supporting the desired transformation.

As shown in figure 22, the steps are deliberately thought to (i) gather information from the community, (ii) provide a temporary experience, and (iii) root hybrid and innovative infrastructure to improve liveability in the area establishing virtuous partnerships.

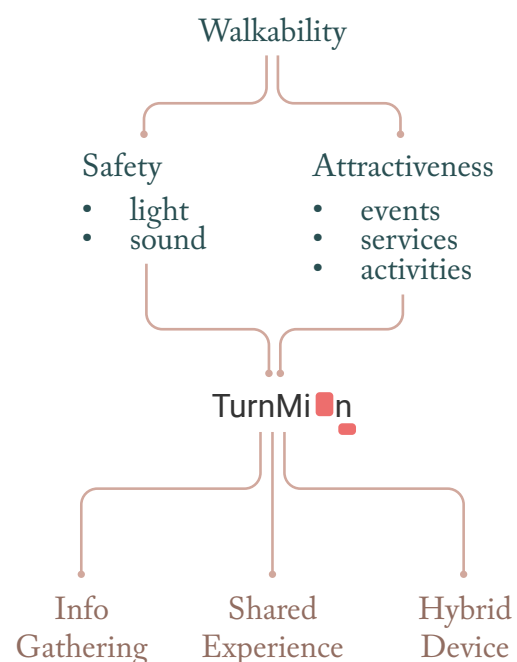


Figure 22
Strategy diagram
elaborated by the author

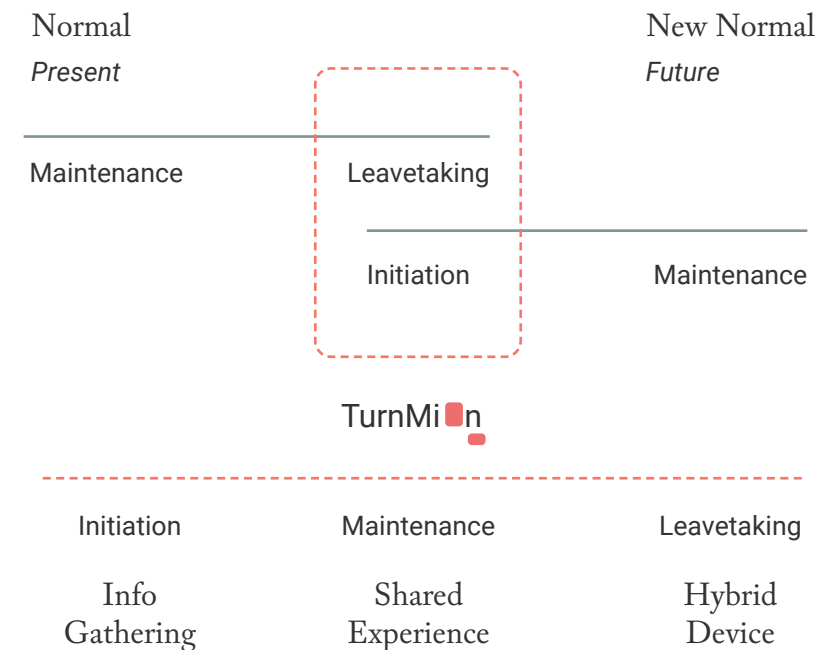


Figure 23
Strategy timeframe
elaborated by the author

As emerged from the literature review, the shift from the design of a functional product to an identity-driven process is a pivotal point for a long-lasting and embraced urban fabric transformation.

This process is more than ever valuable when dealing with new habits grounding, and not only requires conceptual effort but also a great amount of time.

In order to frame the strategy over time, the theoretical structure proposed by Kaja Tooming Buchanan (2013), experience design expert, has been taken as a reference.

The timeframe adopted for the study is the one shown in figure 23. It deals with the passage from the actual situation of elderly, characterized by a scarce inclusion in community life, and high fear of crime

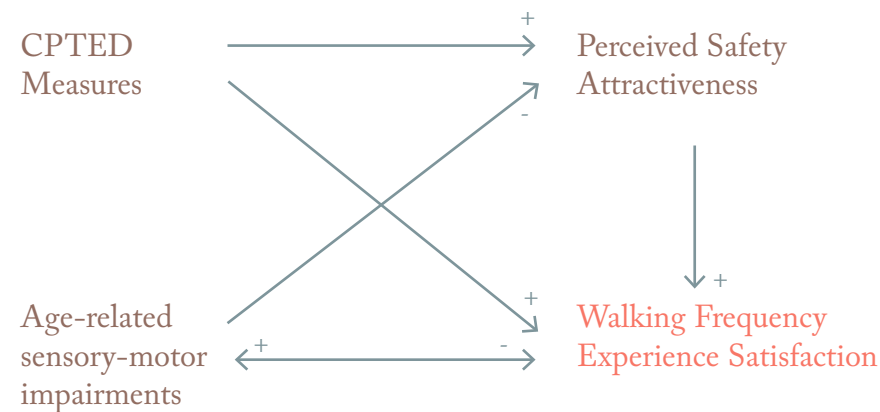
in neighbourhood spaces, to a new normal characterized by a greater accessibility of social services and an improvement of perceived safety in critical spaces.

The TurnMiOn project lies in the transition period between normal and new normal condition, structured itself in the three phases of initiation, maintenance and leavetaking, that overlap the Information Gathering, Shared Experience and Hybrid Device step of the process.

7.3

Project brief

Figure 24
Brief framework
elaborated by the author



According to the issues raised from the literature review and to the driving principles of Longevity project -that will be deepened in the following paragraph- the challenge of this project is to present an integrated product solution that fosters walkability with a special focus on senior citizens.

The conceptual framework of this thesis -in figure 24- derives from the combination of two different schemes used in as many studies. The proposed schemes are similar in the structure, but focus on different aspects that might influence fear of crime and therefore impact walkability in assorted ways.

The first diagram, reported in figure 25 relates CPTED measures to socioeconomic status, psychological characteristics, and

residents' walking behavior (Lee et al., 2016). The authors of the study expected CPTED measures to encourage walking activities, both directly and indirectly, by reducing the fear of crime.

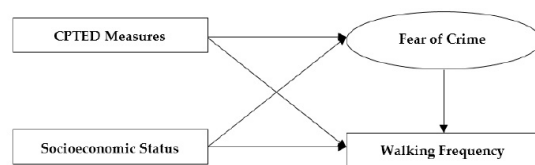


Figure 25
Conceptual framework: walking behavior, socioeconomic status, fear of crime, and the role of crime prevention through environmental design (CPTED) measures. (Lee et al., 2016)

The element of difference is that this thesis won't consider socioeconomic status, but rather age-related impairments.

Within this conceptual framework, this study attempted to answer the following research questions:

How might we use environmental design to affect walking behaviours of elder users?

This question includes the aspects considered in the project, namely environmental design, walking behaviours and elder users. Giving an answer means to understand the relationship between these matters and how they dynamically interact together.

How different strategies of environmental design can affect perceived safety and attractiveness of a place?

The second question focuses on the role of mediators, namely perceived safety and attractiveness. It deepens the relation between environment, its characteristics and functions, enquiring the results that might be achieved through a transformation.

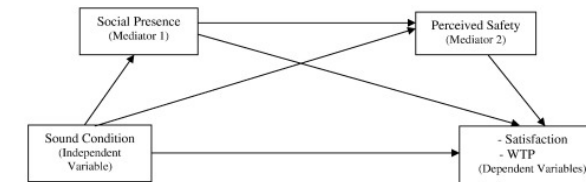


Figure 26
Conceptual framework – serial mediation model for sound condition, social presence, perceived safety, and consumer responses. (Sayin et al., 2015)

The second study (Sayin et al., 2015) examined the impact of sound condition on customers satisfaction and willingness to purchase, as shown in figure 26. The structure is similar, indeed perceived safety is considered a mediator, influenced by an environmental condition (sound condition) that can affect the user's behaviour.

Also in this case the independent variable is not matching with the topic of the thesis, while the dependent variable is only partially overlapping the desired outcome. Indeed, satisfaction can lead to a variation in walking frequency and experience.

The schemes used as a reference conceive only perceived safety, while this study includes also attractiveness of spaces as a mediator to improve satisfaction and active behaviour.

The last element of variation in the proposed framework is that, despite precedent examples, the dependent variable of walking frequency and experience satisfaction has an impact on the physical condition of the users.

Project

Outcome description

This section of the thesis deepens the details of the outcome project. The first chapter includes the description of the design components for each step of the process. The second chapter analyses the features of the product, defining structural and technical aspects, selecting the material and manufacturing processes, and showing product aesthetics.

The last chapter deepens the project on a systemic perspective, arguing its scalability, meant as patterns through which the concept can be applied to other context, the relationships that will be established between the stakeholders, and its economical feasibility.





8

Design

This chapter envisions the content of the project, showing in detail the three phases. Each step is connected and becomes the input for the following one, leading to an upward transformation.

The key characteristic of the project is scalability, from a small intervention to a radical change of the environment.

As defined in the strategy paragraph, the project will be structured in three different phases in the transition between normal and new normal condition. A key aspect is the spatial placement of the project and its role in the community engagement.

Each phase deals with safety and attractiveness of the area in a slightly different way.

Indeed during the Info Gathering phase the idea is to collect as much information as possible from the perspective of fragile users. It includes quick experiments engaging with the community and raising awareness about the project. The goal is to encompass actual perception and behaviours of citizens, generating an emotional reaction. The environment where the initiation will take place is the market, a rooted social crossway in the weekly routine of local citizens, especially of elderly.

The second step of the TurnMiOn project is the Shared Experience. Here the key

goal is to let the community feel the potentialities of change conveyed by the project. In this case the output is a set of temporary interventions with a longer life that might include periodic events as well as environment transformations. This phase will be distributed in different places along the railway, aiming to reconnect citizens with this mobility infrastructure. The chosen spots are via Pontano, in the trait between via Padova and via Angelo Mosso, and a dead-end street between via Padova and via Palmanova.

The Hybrid Device phase roots the project within the community through the installation of an hybrid infrastructure. The infrastructure modifies urban landscape complying with citizens' needs and proposing a flexible and scalable solution that can be applied to several contexts.

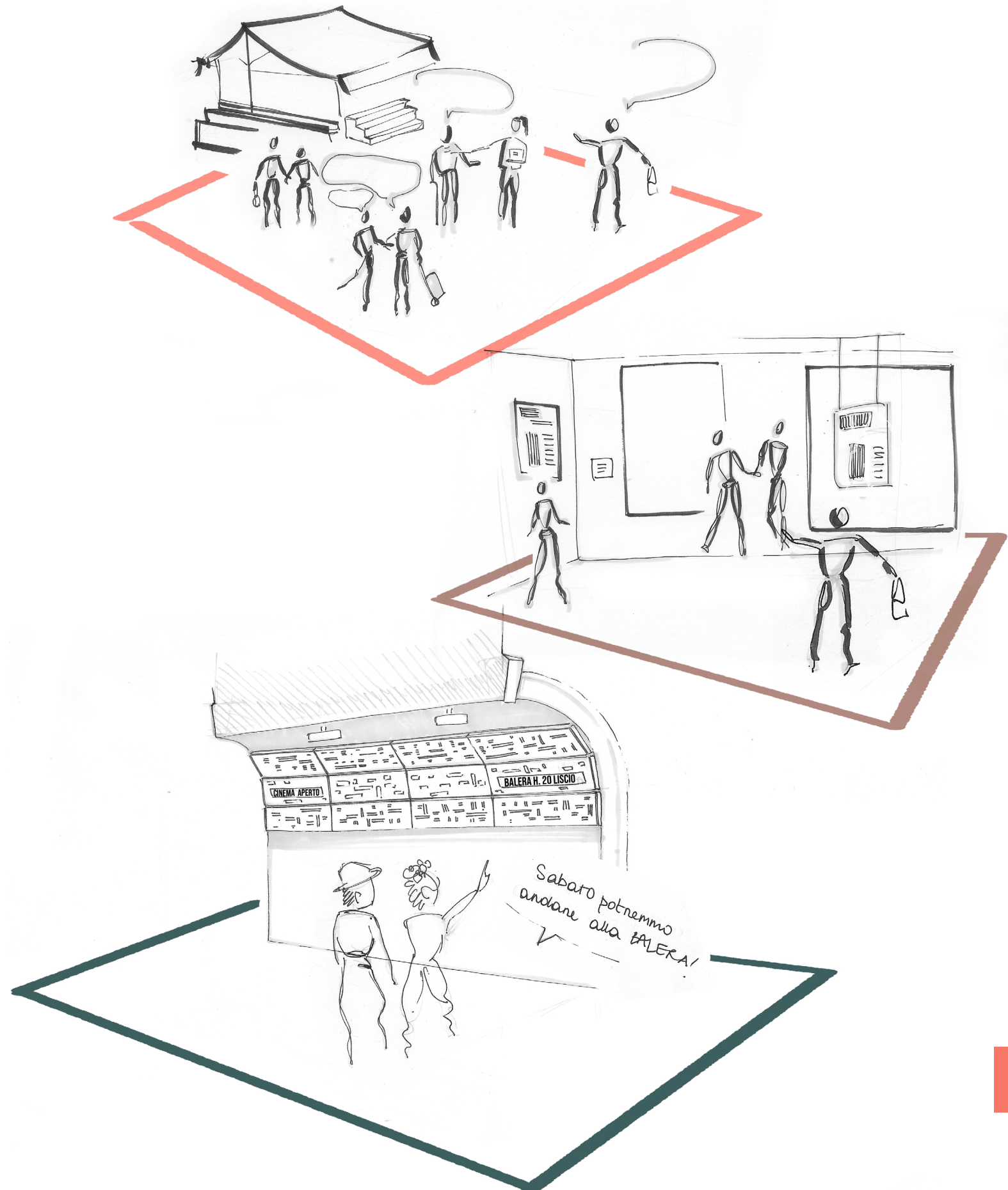
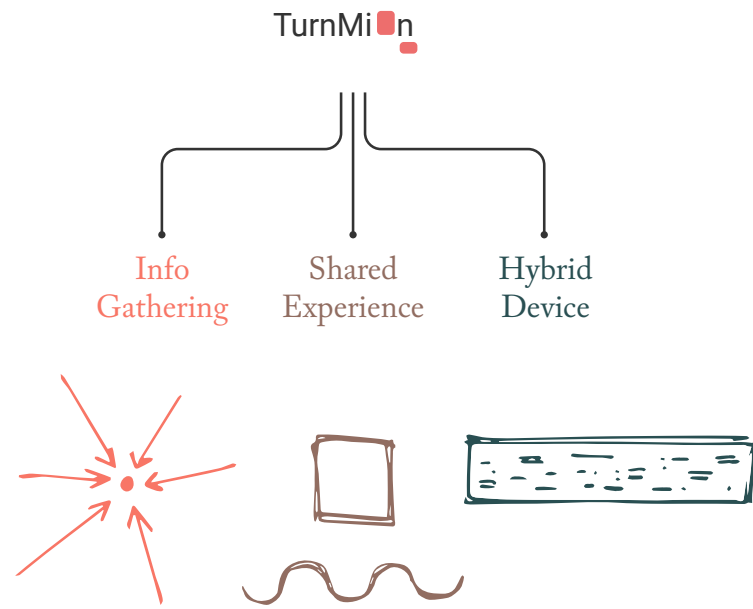
The device is thought to be placed in any tunnel under the railway line, adapting to different characteristics of the environment. For the argumentation and visualization of this specific intervention the tunnel in Felicità Morandi street has been chosen.

In this phase the aim is to create a system of stable relationships, that guarantee funds, maintenance, participation and care about the designed infrastructure.

As mentioned, the overall project purpose

is to sustain the citizens while leaving the present condition and initiate a new set of behaviours and a new relationship with the environment, based on care, awareness, and participation.

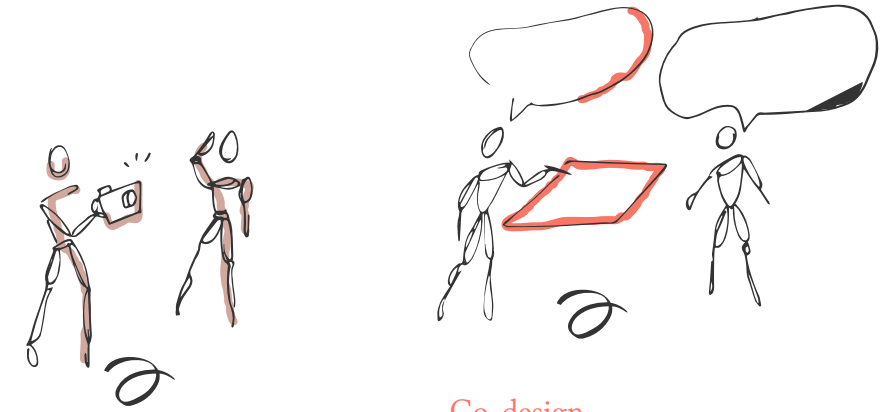
Figure 26
Project activities and relative spatial location
elaborated by the author



Antonio Colombo

Age 81y.o.
In the neighbourhood since 30 years
Past life public transport driver
Favourite transport method Tram
About Antonio is happy about his neighbourhood life, he participate to volunteering associations, mainly teaching at english and photography group. When needed he contributes to the association's activities management.
Goals Be updated about new associations and initiatives
Needs Stable social relationships
Pain points Low access to digital technologies

Figure 27
 Storyboard for user persona A
 elaborated by the author

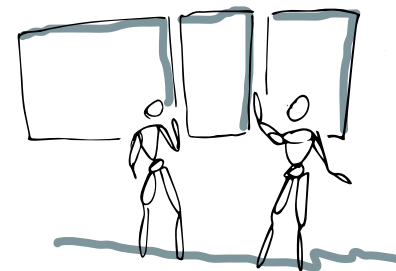


Workshop

Participate to the photography group at the Auser centre, collection of portraits for the fanzine project

Co-design

Co-design through interviews and focus groups at the Auser centre

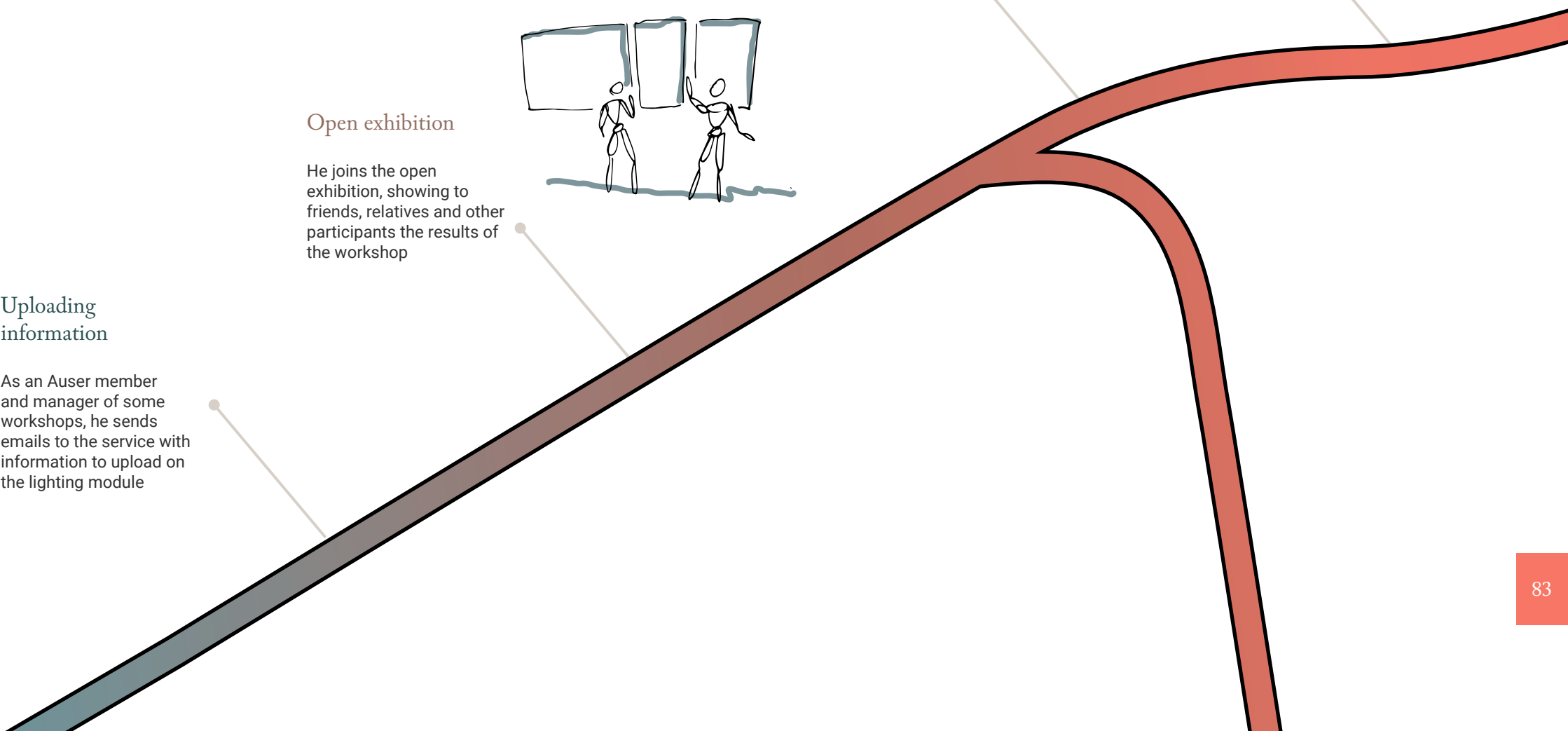


Open exhibition

He joins the open exhibition, showing to friends, relatives and other participants the results of the workshop

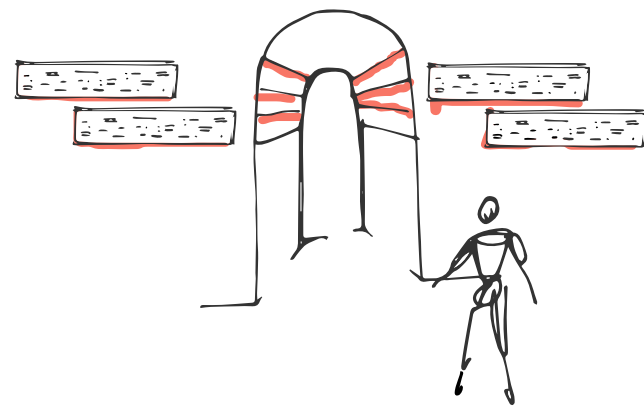
Uploading information

As an Auser member and manager of some workshops, he sends emails to the service with information to upload on the lighting module



Maria Rosaria Bisci

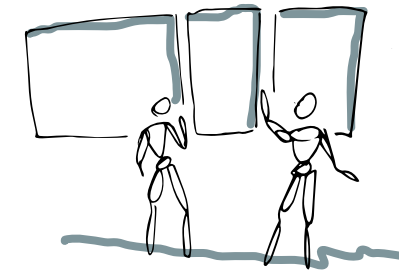
- Age* 75 y.o.
- In the neighbourhood since* Her birth
- Past life* House keeper
- Favourite transport method* Car or walking
- About* Maria spent her life taking care of her family, now she helps friends which have some helathcare problems. When needed she carries her grandchildren to the park and taking them from school.
- Goals* Be confident with the street, walk through safe pathways for her and kids.
- Needs* Lighting in dark hours of whinter.
- Pain points* Scarce confidence in the environment and with strangers.



Hybrid device

Now that she's completely aware of the project, she goes periodically to the Hybrid device site, wondering for new initiatives for ther and for her grondchildren

Figure 28
Storyboard for user persona B
elaborated by the author



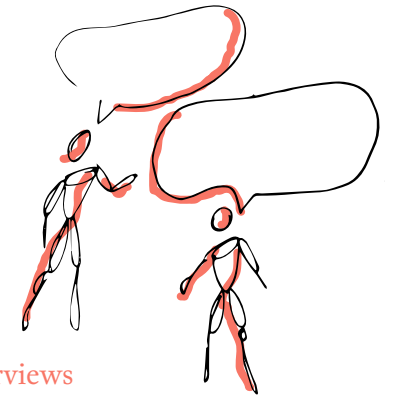
Open exhibition

Walking to the grocery she meets some people talking about an open exhibition, decides to go and see what is happening



Safe and sound

For the first time since years, she decides to walk throug via Pontano with her grandchildren, intrigued and reassured by the narration



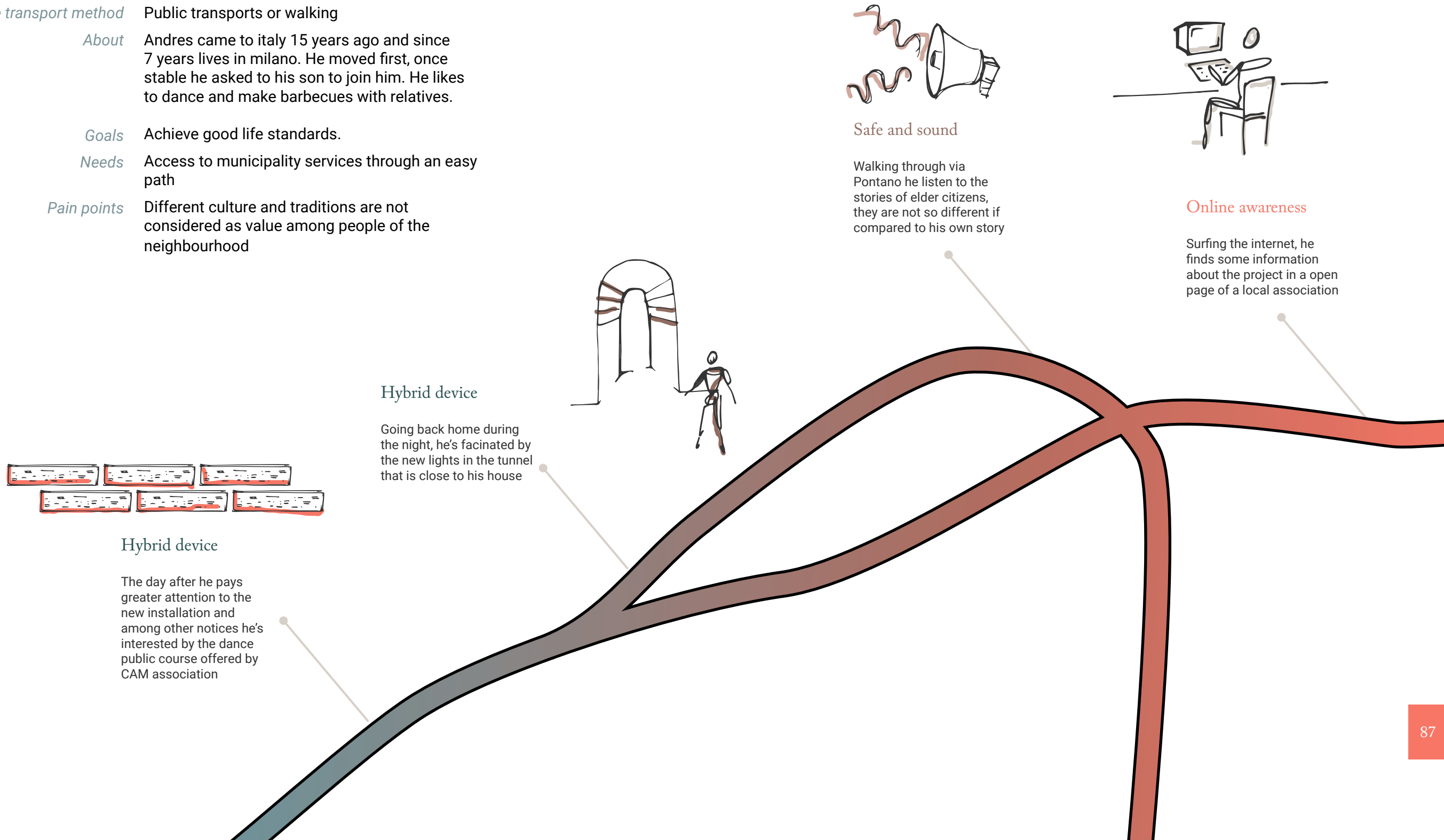
Short interviews

She answers to interviews at the local market, talks about her feelings and thoughts about the area

Andres Mendoza

- Age* 45
- In the neighbourhood since* 7 yrs
- Past life* Employee
- Favourite transport method* Public transports or walking
- About* Andres came to italy 15 years ago and since 7 years lives in milano. He moved first, once stable he asked to his son to join him. He likes to dance and make barbecues with relatives.
- Goals* Achieve good life standards.
- Needs* Access to municipality services through an easy path
- Pain points* Different culture and traditions are not considered as value among people of the neighbourhood

Figure 29
Storyboard for user persona C
elaborated by the author



8.1

Information Gathering

The output of the first activity is a set of flash interviews runned in two sessions at the local market. As said before the aim is to understand the perspective of citizens with a special focus on elder users. This phase has been already conducted in collaboration with Laura Liverani, professional photographer and member of the Longevity team. Indeed the received answers will be edited and included in an editorial project about via Padova and specifically the crossway with via Cambini, identified as a critical place for pedestrian safety. The fanzine will include visual project edited by Laura Liverani, and written contributions from the Longevity team.

The set of questions was focused on the theme of beloved spaces in the neighbourhood and more broadly to the identity places of the area. During the session, attended activities, behaviours and feelings of the interviewed emerged. Participants shared pieces of their life story demonstrating the strong connection with the local environment and its characteristics. In literature, the importance of storytelling is stressed by Pamela Mang -Principal and founding member of Regenesys Collaborative Development Group- saying in an article

"A growing body of research tells us that human memory is story-based, and that stories are fundamental to how people learn and organize what they know. Stories, which

are ultimately about relationships, enable us to make complex wholes comprehensible and, even more important, meaningful" (Mang, 2016: 3).

This phase is therefore a crucial starting point to understand and frame a common narrative with the community.

Images below and right
Local market set, LONGEVICITY ZINE
Source Laura Liverani, 2021



Io sono della zona e mi trovo benissimo. Prima di venire qua ho vissuto per 20 anni ad affori. Lavoravo in ATM e, quando sono riuscito ad ottenerla, mi sono trasferito in una casa della cooperativa. I servizi ce li abbiamo, poi se uno cerca la luna .. (ride)



“Prima vivevo a genova poi mi sono trasferito per lavoro. Il quartiere è ben servito, c’è il comune i supermercati i parchi giochi per bambini. Partecipo a dei corsi per anziani di ginnastica e di inglese per continuare a ricordare.”

Images
Local market set, LONGEVITY ZINE
Source Laura Liverani, 2021

“Mio marito ha la demenza senile, ma anche lui quando si trova nel suo ambiente ai giardini riesce ad identificarsi e nessuno ci tratta male.”



8.2

Shared Experience

The recordings of the interviews and the fanzine visual project are the pillars of the maintenance phase. This step is characterized by two different interventions aimed to create a shared perspective on the neighbourhood among citizens. These experiments are addressed to the entire community and will take place along the railway lines.

Open Exhibition

The first intervention is connected to the fanzine and it is thought to happen in vacant spaces along the railway close to via Padova. Indeed big slots of unused space, now deployed for parking, will host a temporary exhibition of the visual content of the fanzine project. Pictures taken by the professional photographer Laura Liverani during the interviews session at the market will be presented to the community through an open air event. The pictures will be projected on the walls of the railway vacant slots during the event, that will disseminate the Longevity project and its values among the community. The video mapping tool has been chosen for the event due to the low resources it requires, and to the high emotional impact it provides through the use of light. Thanks to the close structure of these spaces that are located under the railway, the video mapping will be visible also during daily hours.

length of the event, people from Longevity team and volunteers from Auser will welcome the public, preventing possible vandalism actions.

The architecture curator Kieran Long, talking about parklets experience in Sweden says

“That is an addressable space – it’s something where we could intervene and start testing possible versions of the future. There’s a general recognition around the world that the role of the motorcar must be reduced, but that creates new questions.”

In the article written by Orange (2021: 2) Long refers to the importance of testing new solutions in order to ease the process of bottom-up ideas generation. Therefore the experiment included in this thesis will let the community experience the potential value embedded in vacant spaces of the urban environment, stimulating the attractiveness of the neighbourhood.



Images on the right
Location and visualization of the Open exhibition



Safe and Sound

The second intervention focuses on safety and uses the recordings of the interviews session to create a common narrative about the complex system of the neighbourhood. Indeed the most interesting pieces extracted from users' voices will be arranged in a loop track and will be set up to play along via Pontano in the trait between via Padova and via Felicità Morandi.

The road is suitable for this intervention thanks to the presence of private gardens facing the street that will be perfect to host the speakers. Moreover this street has a close configuration, a 250 meters corridor that leads the users to a strong entrapment

feeling. As mentioned in the safety paragraph of the literature review, studies (Sayin et al., 2015; Astolfi and Molinero, 2018; Bresci and Siragusa, 2020) argue the role of sound in the environment, stating the importance of human and animal vocal sound in the improvement of perceived safety.

This experiment will take place in dark hours and will improve the feeling of safety of pedestrians through the stimulation of the feeling of human presence.



Images on the left
Location and visualization of the Safe and sound installation

8.3

Hybrid Device

The leavetaking phase of the TurnMiOn project includes the installation of an hybrid device, a module that combines an improvement in perceived safety and in attractiveness of the area. Several modules joined to create a structure covering the internal wall of the tunnel and improving the walk-through experience of pedestrians. The intervention will be done in collaboration with local artists and associations working with mural art, so to create a coherent environment and prevent vandalism episodes.

The modules embed LED panes in addition to service light of the space, contributing to a better overall enlightenment. Moreover, the LED panels show useful information mainly targeted to elder users, such as events and services offered to the community. This attractiveness-based initiative encloses senior citizens to the activities, and supports local associations and shops offering an additional touchpoint with the customers.

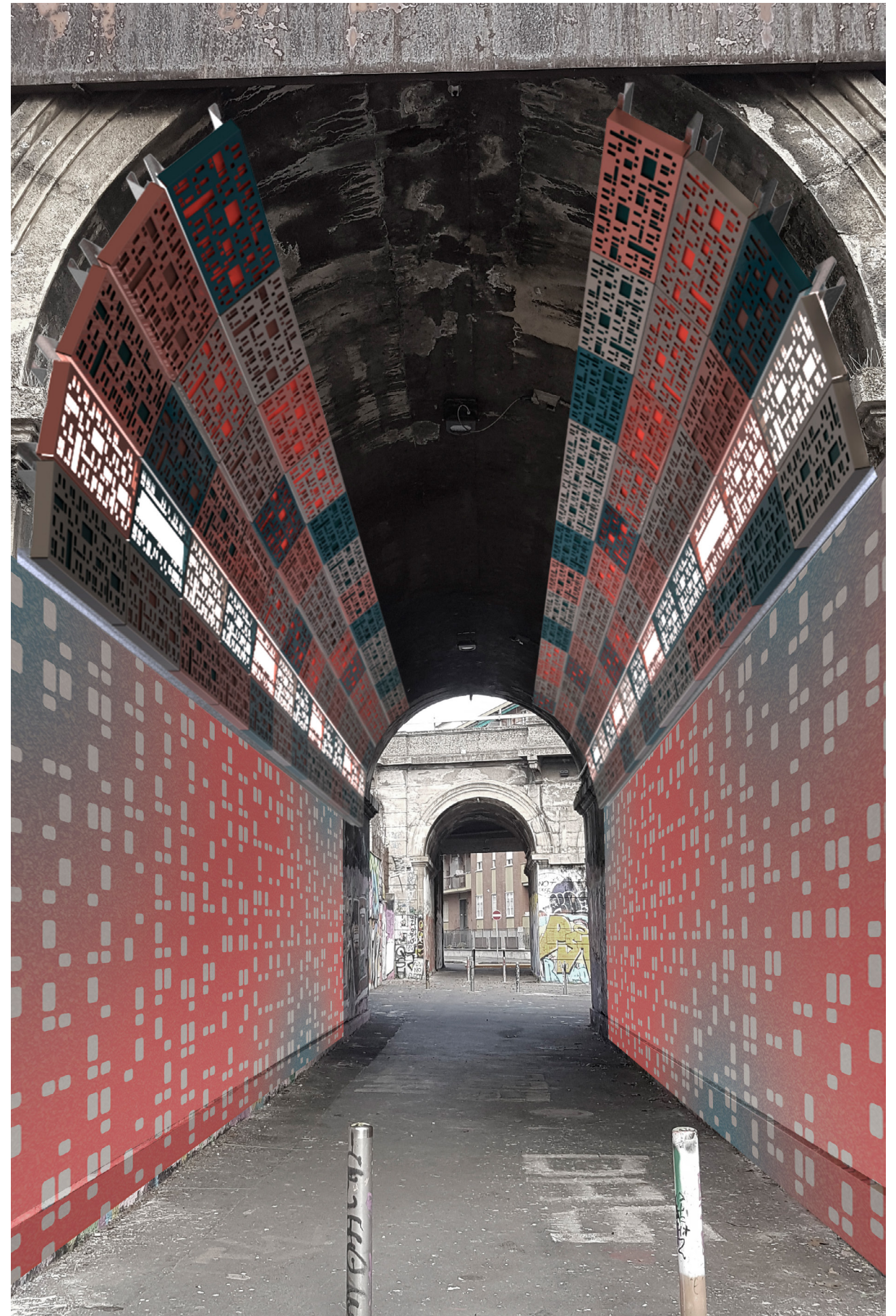
The infrastructure is therefore improving the liveability of the space, but also giving a new function to the tunnel, which will become an information point where people can reach news.

The idea is aligned with the theory of 15 minutes city, fostering the importance of proximity communities (Moreno, 2020), and also with the needs of the users emerged from the fieldwork analysis. Due to the

interactive nature of the module it will integrate a service system to support the communication between the infrastructure, local stakeholders and citizens.

The device is thought to be adaptable to different environment conditions and salable to further outcomes. The concept behind the module is the activation of a transformation that could be expanded to different areas of the city, embracing the urban fabric following the railway lines. This idea matches the vision of the La città Intorno programme by Fondazione Cariplo that aims to develop and improve the wellbeing and life quality of citizens of neighbourhoods surrounding Milan city centre. The programme includes several initiatives among which this thesis project might be inserted.

Image on the right
Visualization of the Hybrid device



9

Product

This chapter will envision the technical and perceptive aspects of the phases of the project, with a special focus on the modular product.

Generally speaking the project tends to have the greatest perceived impact through the lowest possible effort both in meaning of resources consumption, and budget.

The Information Gathering and Shared Exhibition phases are characterized by temporary interventions completely reversible. Therefore their technical details must be defined once all the stakeholders are involved in TurnMiOn initiative, trying to adapt them to the local supply market. As for many temporary projects materials are collected from sponsorships, recycled or upcycled.

More precisely the initiation phase has been conducted without any budget except for the photographer fee, and all the utilized tools -camera and microphone- were owned by the photographer and the interviewer. In the maintenance phase the needed products are projectors and speakers. For this reason a sponsorship with a local electronics retailer or renter would be an asset. The placement and maintenance of the intervention will rely on Longevity team and a volunteering staff.

In the next paragraph will be argued materials, parts and components, and aesthetic qualities of the module.

9.1

Materials

The choice of material in this case has been the first dimension to be explored for the module design. Indeed the envisioning of existing solutions used in urban furniture helps to define potentialities and constraints of the product. To do so a benchmark of the latest project for the outdoor city context

has been analyzed in figure 30. The variables for the weighted cross concern the purpose and the life length of the product. Purpose is meant as functional or aesthetic project, while life length is meant as a durable or temporary intervention. The product which is the object of this thesis will be durable, with a balance between functional and aesthetic qualities. The diagram framed upon these drivers helped understanding which are the materials used in projects with the same characteristic of purpose and life length. The projects included in the analysis cover a wide range of urban furniture such as benches, lighting systems, playground or installations, but also architectural elements as temporary pavilions or facades.

Once found the evidence for the most used materials, which are steel, aluminum, concrete, and glass, they have been compared on a more technical perspective, as shown in figure 31,32. The value that has been used as a reference is the young's modulus, which is connected to the stiffness of a material and represents its capability to maintain its shape under an external strength pressure. This value has been compared to the density of material, therefore the volume and weight of the component needed to obtain a fixed value of young's modulus, and to its price, therefore highlighting the cheapest material with best stiffness characteristics.

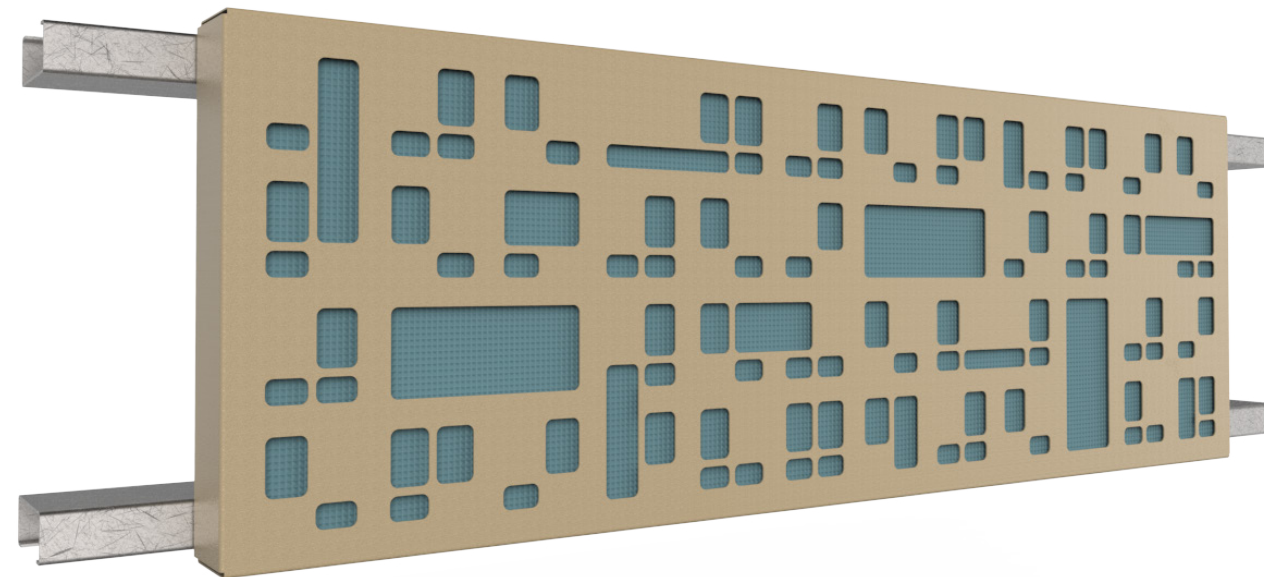


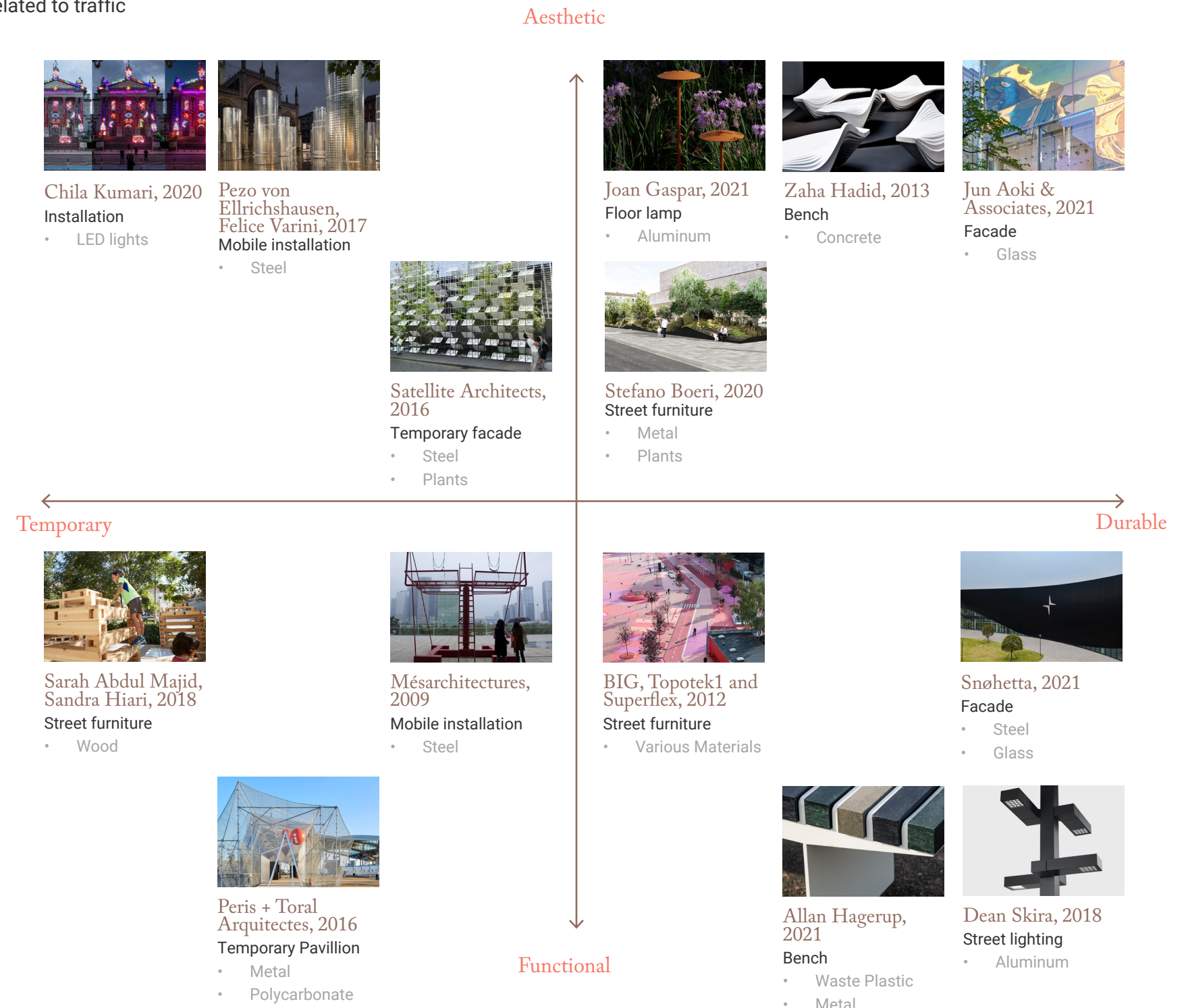
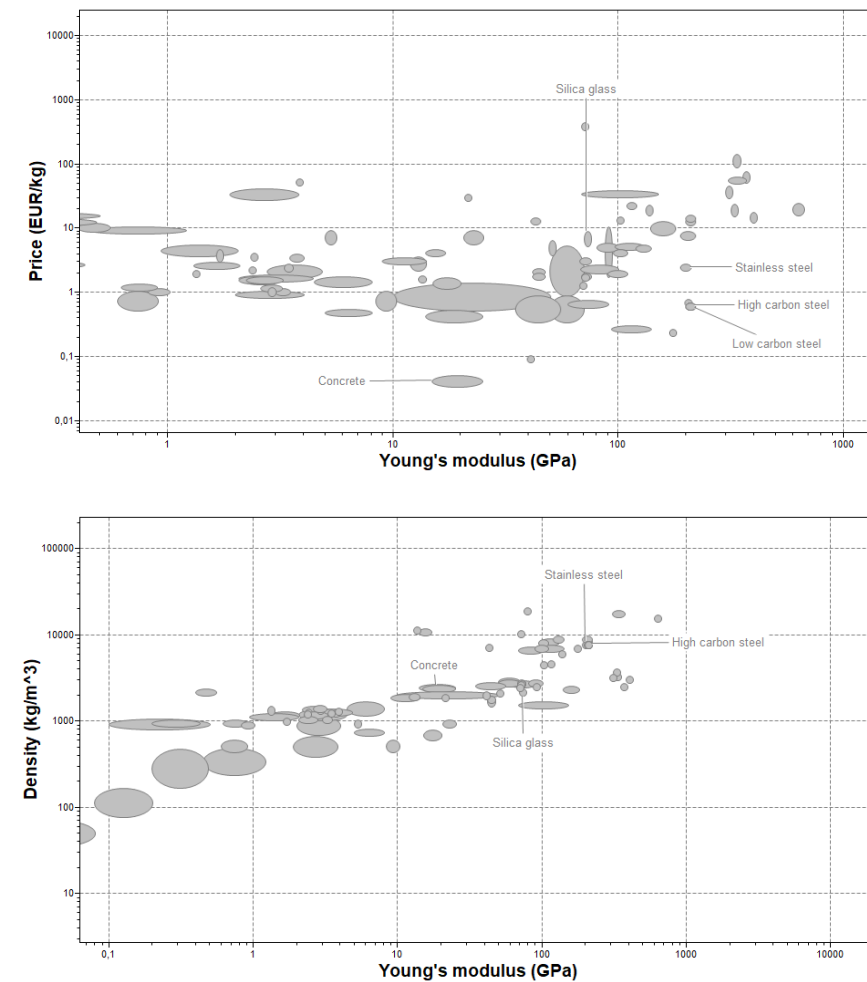
Image above
Visualization of the single module

Through this analysis has been possible to identify steel as the most suitable material for the project. Indeed steel has great mechanical properties, allowing good stiffness performances in low wall thickness. Moreover it is manufactured with low cost processes and it is available in a large number of semi finished product formats. The manufacturing flexibility and mechanical resistance allow the production of lightweight and rigid parts from joined components. This aspect gains a special interest in the site installation and maintenance phase, where a rapid and

secure (safe) intervention is essential. This common sense statement has been hardly evidenced during the stakeholders interviews with RFI and Milan Municipality engineers, that reported the issues related to traffic rerouting or traffic stop.

Figure 30
Material benchmark cross
elaborated by the author

Figure 31, 32
Material properties benchmark with Ces software
elaborated by the author



9.2

Parts and components

This paragraph defines the parts and components included in the product. According to what emerged from the analysis of materials, the core concept behind component design is to create separated parts to be joined together, maximizing overall stiffness of the structure and minimizing the weight of each component. The module is divided in two functional groups, the structure and the cover.

The structural group includes the wall support, made of standard components and the structural frame. The standard components are a wall corner bracket produced by Halfen, and a C profile, that sustain the structure and is thought to accommodate cables in case of necessity. On the C profile is joined the structural frame which is made of a cutted and bended metal sheet soldered with a couple of smaller C profiles on the horizontal edges of the frame. The bending and welding process add significant stiffness to the structure, allowing a wall thickness of 1.5 mm.

The functional group includes the functional and aesthetic components of the panel, namely the acoustic panels or the LED panels, and the metal cover of the module, combined with a clamping profile.

The panels are screwed to the structure - formerly holed - and are made of a

lightweight and coloured acoustic panel. In this case the material appearance has a fairly lower importance than its sound absorption characteristics, its durability, and its weight. These products are available in a huge variety of colours, shape and dimensions, therefore will easily fit the module and eventual variable needs coming from the specific tunnel environment.

The acoustic panels will absorb vehicle sounds coming from the street but also reduce the noise of the train passage above the structure, which represents a strong discomfort issue for pedestrians.

The outdoor LED panels will enable safety and attractiveness improvement in the space by increasing overall lightning of the tunnel and communicating written informative messages to the community. The panes that have been chosen are SAMSUNG XPE Series, made for outdoor LED signage. Each panel has a resolution of 32x32 pixel and 7,500 nit brightness. Panels are sold with a support frame designed for fixing, from which derive the hole position on the module structure. These top of the range panels allow a good resolution and are able to reproduce the entire color spectrum, therefore can easily be adapted to different goals, from color and light experience, information sharing, to advertising messages.

The last couple of components of the

product are the cover and the clamping profile that joints cover and structure. The external metal sheet is cutted, bended and welded to create a holed box with a high aesthetic value.

The dimensions of the module derive from the availability of components on the market. As a main reference metal sheet and LED panel dimensions have been chosen. Thus because metal sheet is the most used material in the module, therefore scrap reduction will be an asset, and LED panels have highly standardized dimensions. Standard panel will represent the higher part of expense for each module, therefore the choice of a custom size would not be economically viable.

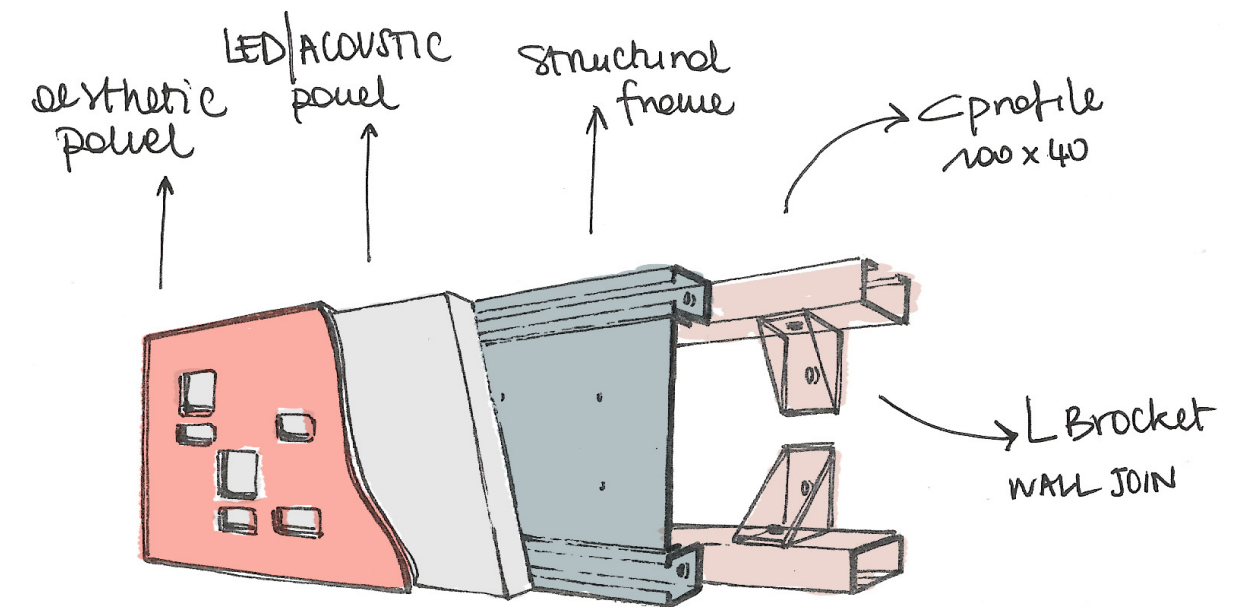
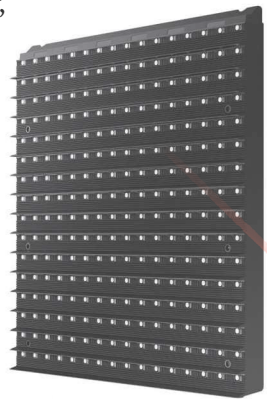


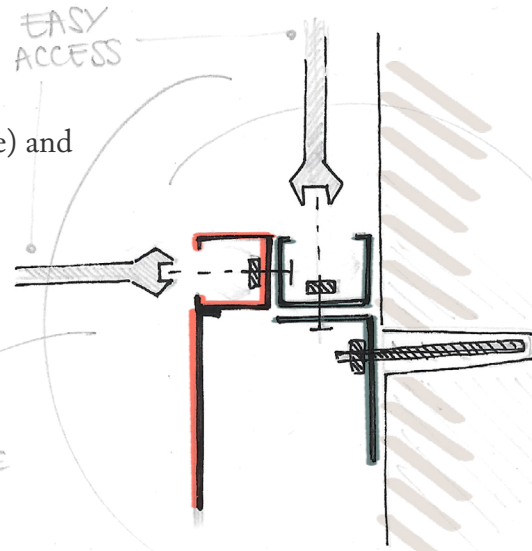
Figure 33, 34
Single module assembly and joints
elaborated by the author

LED / Acoustic panels joined to the structure through screws, according to manufacturers' instruction

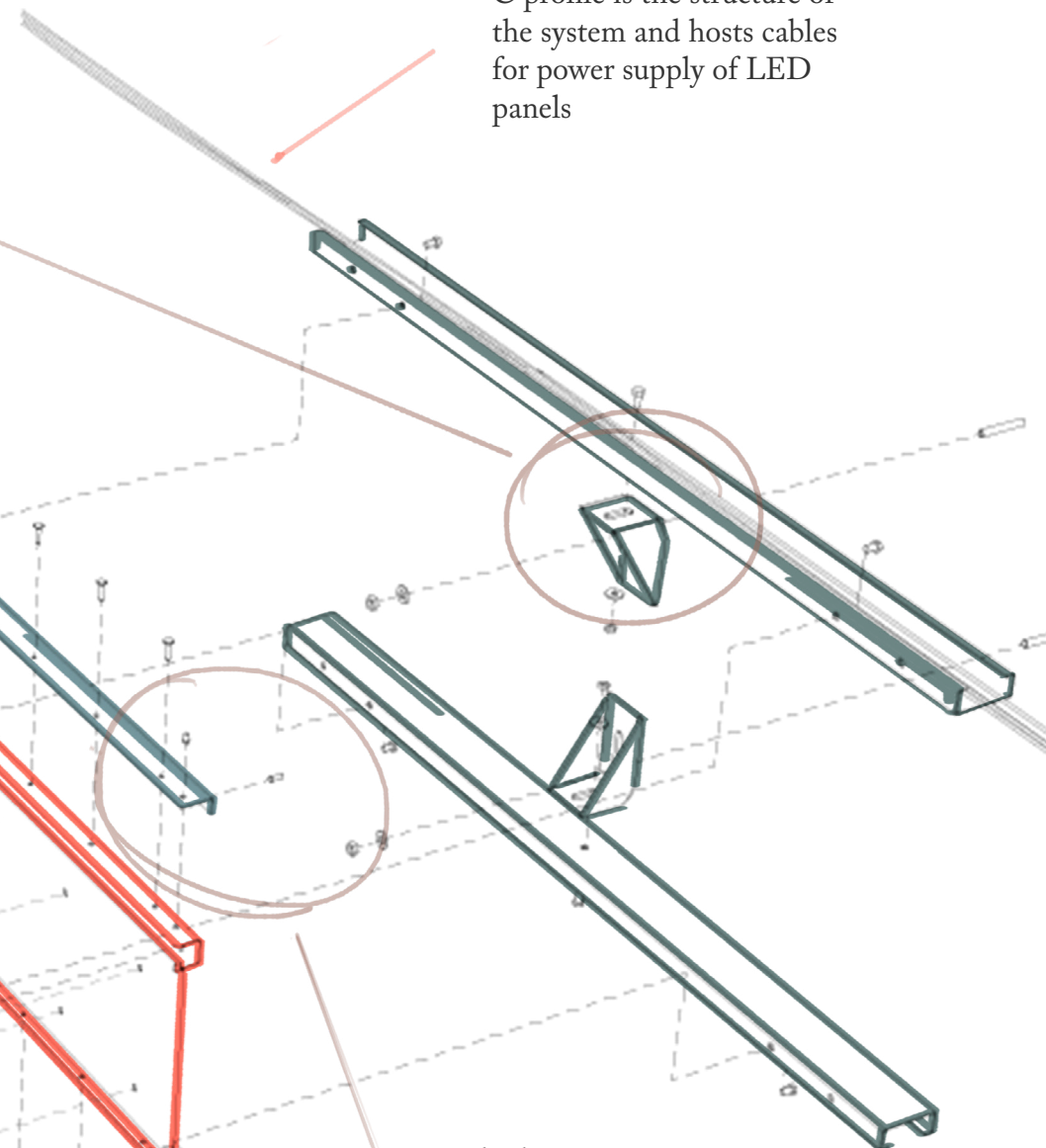


Wall joint of the structure (C profile) and single module

Wall STRUCTURE

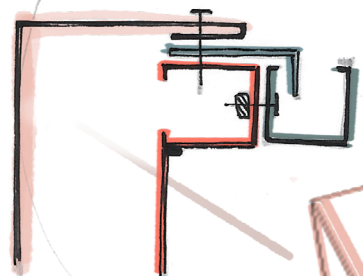


C profile is the structure of the system and hosts cables for power supply of LED panels



vite senza testa

Aesthetic panel



External panel joined to the module's structure

Flat heat screw to adjust levelling of single modules

Upper and lower joint prevent the external panel to rotate

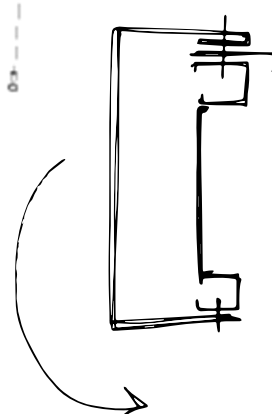
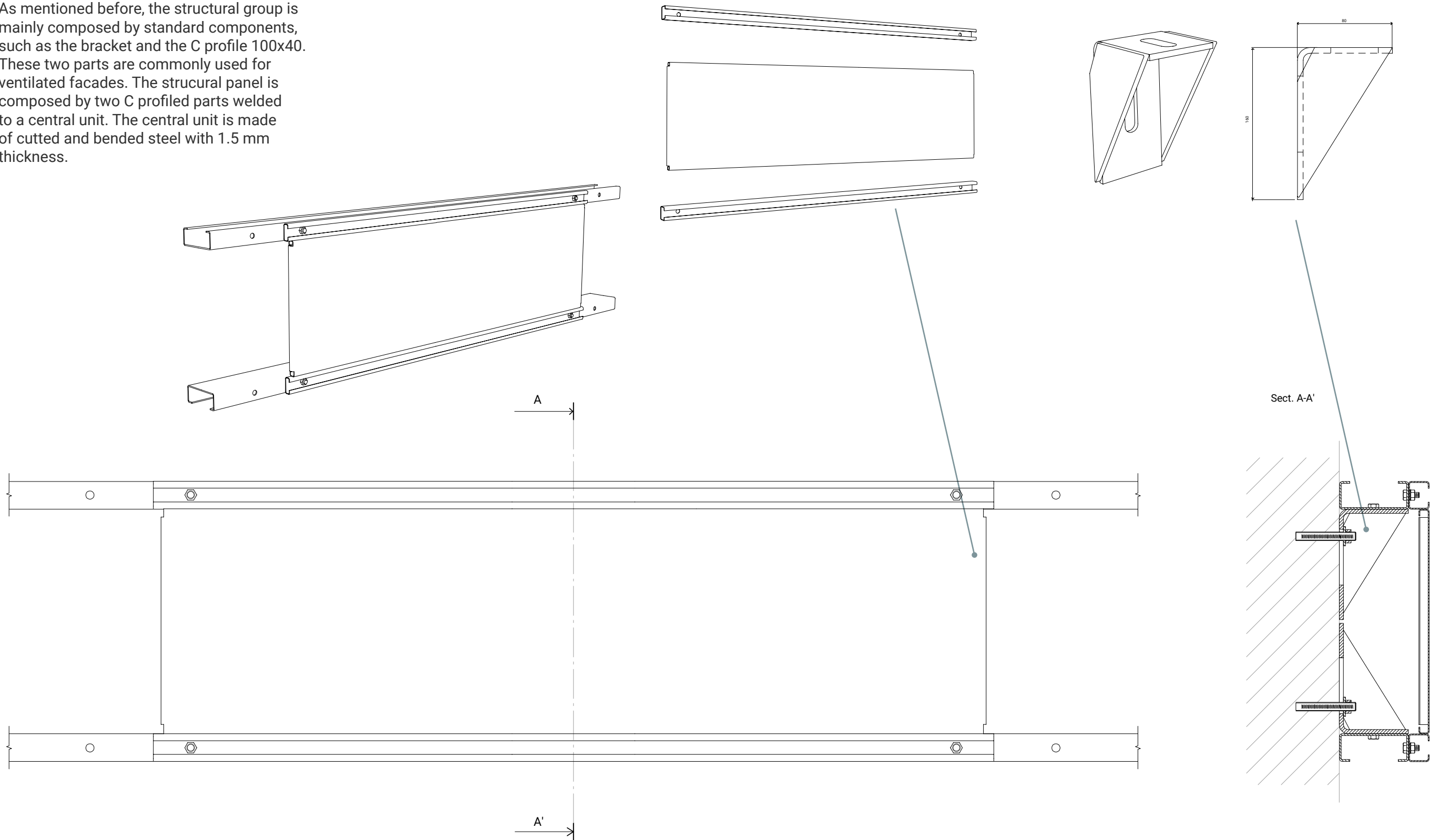


Figure 35
Exploded view and comments about the single part of the module elaborated by the author

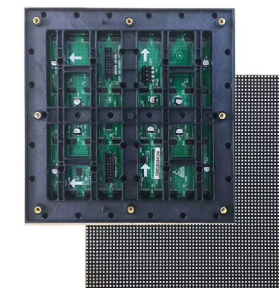
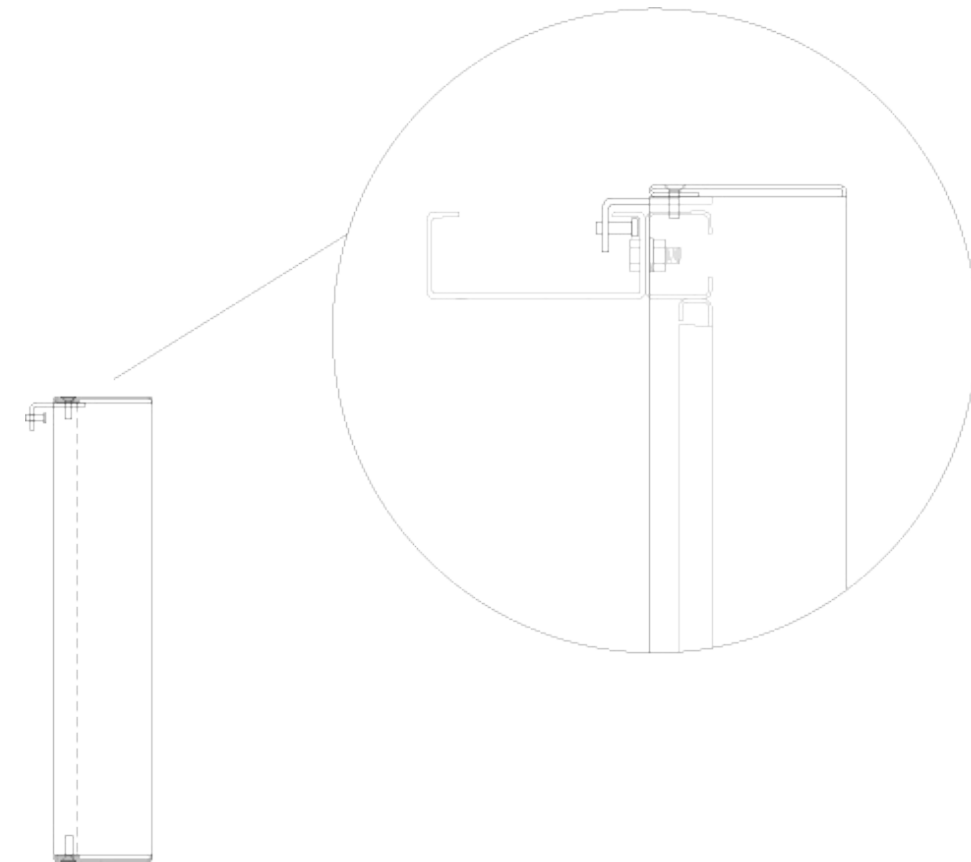
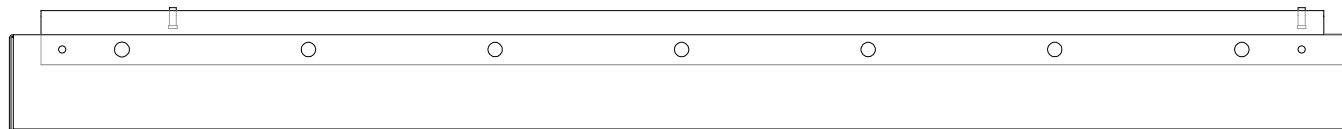
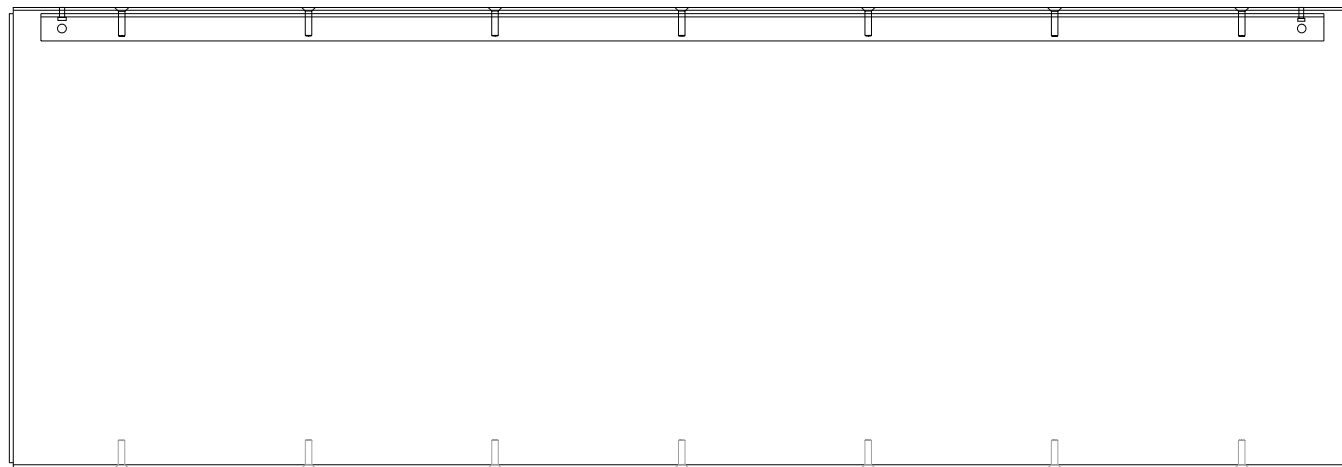
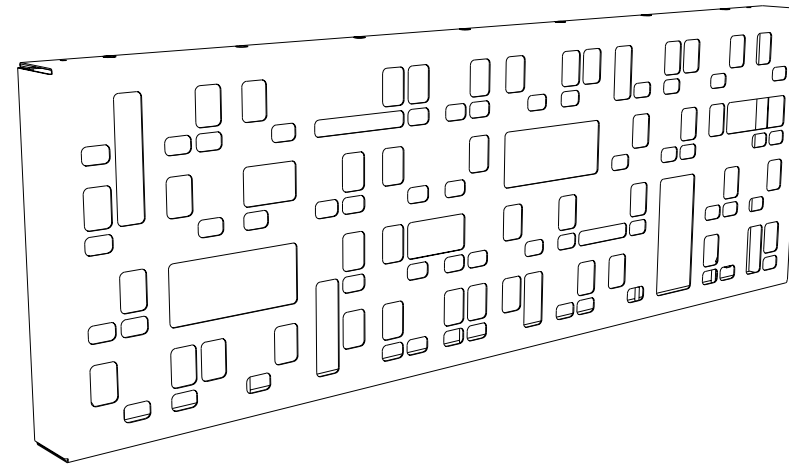
Structural group

As mentioned before, the structural group is mainly composed by standard components, such as the bracket and the C profile 100x40. These two parts are commonly used for ventilated facades. The structural panel is composed by two C profiled parts welded to a central unit. The central unit is made of cutted and bended steel with 1.5 mm thickness.



Functional group

The functional group is joined to the structural one and is composed by the external aesthetic cover and the acoustic or LED panels. The panels are joined directly to the structural panel through screws. The external panel is fixed to the upper and lower part of the structural panel with screws. In the upper side a clamping profile is added to fix the system to the C profile connected to the wall. A couple of flat head screws are added to regulate the levelling of the single module.



9.3

Aesthetics

The aesthetic of the module is inspired by the mobility visual language, and in particular from timetables of railway stations and airports. Since the birth of these infrastructures, a great effort has been done to elaborate the visual identity of the spaces.

The visual identity of timetables originated from the technology of a clock with card control, patented by the Italian brand Solari Udine in the early 50ies. Since then the company started to produce home devices embedding card control clocks, and established a fruitful collaboration with Gino Valle, famous Italian Designer. Many objects have been created through this collaboration, among them the most recognized and successful product is Cifra 33, the smallest electromechanical and direct reading clock, produced in 1966 and now exposed at the MoMa museum in New York.

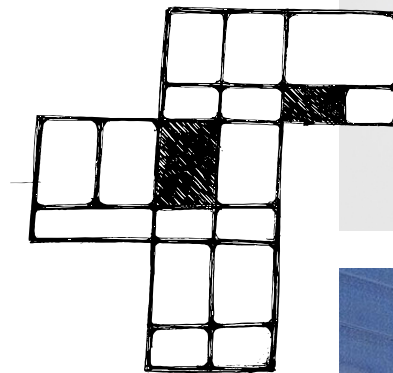
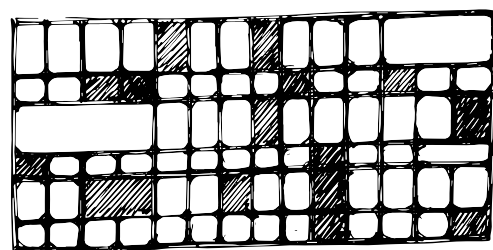
Several experiences of design objects derived from Solari visual identity in the following years. A great interpretation is the one of Calendario Perpetuo (1967) by Enzo Mari for Danese Milano. The theme of time and information is rooted in the shape and evokes the period when these objects have been designed.

The last pillar of the formal research for the module is the work of the architect Steven Holl, that deepened the concept of solid and void, translating its thoughts into a number of different applications from building

facades to home products. Specifically the inspiration about the use of light has been a pillar for the design of the product.

The pattern designed for TurnMiOn combines functional and aesthetic holes, that allow sound to pass through the metal sheet and to be entrapped in acoustic panels, and light or messages to be visible to the users.

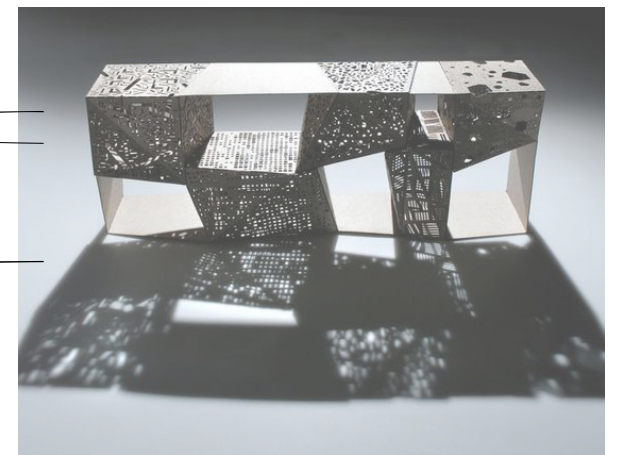
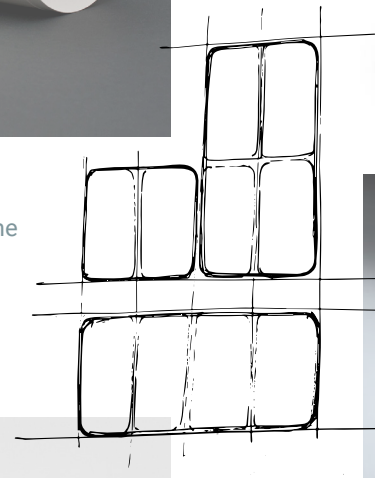
The color palette has been defined by extracting and then selecting tones from pictures taken for the fanzine project.



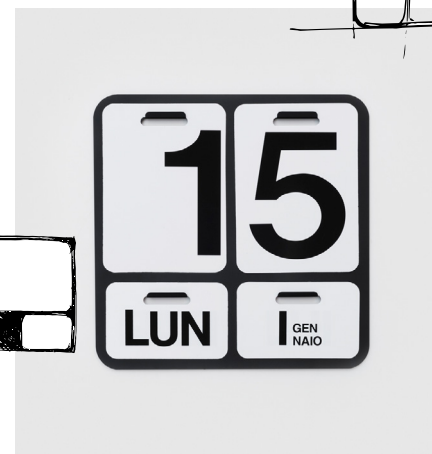
Cifra 33, 1966
Gino Valle for Solari Udine



Clock mechanism patented by Solari Udine



Riddled Buffet,
Steven Holl for Horm



Calendario Perpetuo, 1967
Enzo Mari for Danese

Visual Arts Building at the University of Iowa, 2006
Steven Holl

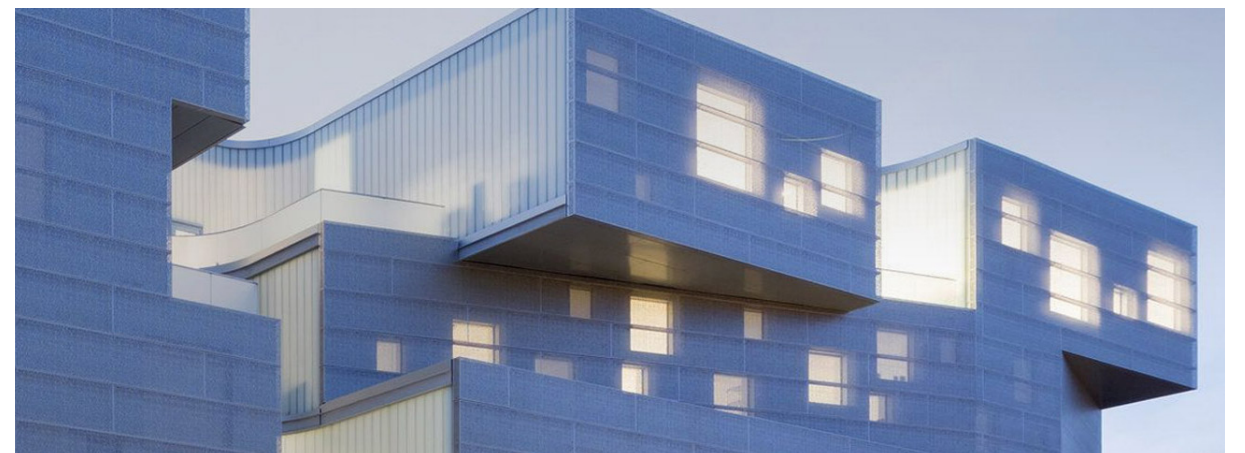


Image below
Project output visualization



Light hours
Information

The concept of providing information about the local initiatives available is aligned with the purpose of fostering 15 min city theory by Carlos Moreno. Indeed the tunnel will become the spot where citizens can find advertise of new events, activities and services provided to the community.

The promoter entities are clustered according to Moreno's frame (2019), that includes access to work, food, health, education, and culture and leisure within the key services needed in proximity.

Many entities provide these kind of services on a local scale and often the community is not completely aware of their presence in the area.

The service will be provided to both private and public entities, that will join a tailored and user-specific advertizing system.

The information flow on the panel will be managed by an in-house team that will receive the content from local entities, validate it, and upload it in the LED software.

The information will include a short description of the initiative, the promoter entity, the space where the initiative will take place, and timing. The height of text is 16 cm, readable from 20 m of distance. The slogan will slide horizontally to overcome the issue of the dimensioning of the module.

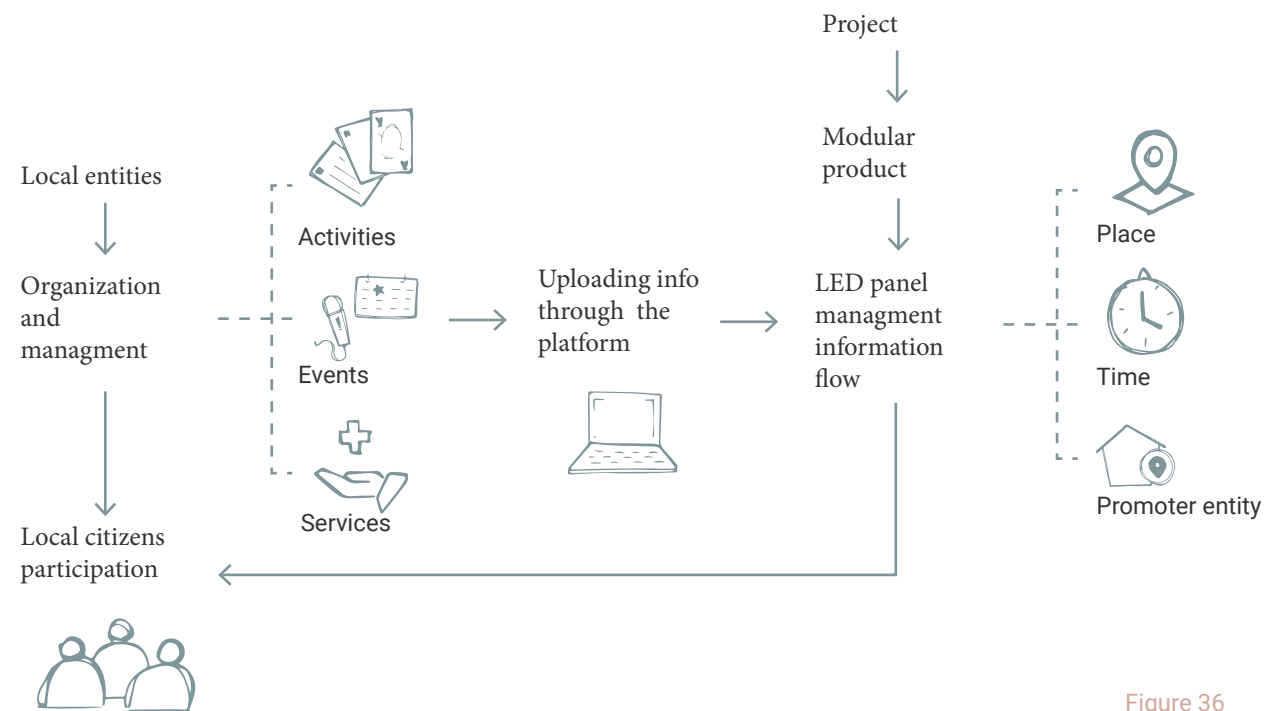


Figure 36
Scheme of interaction to collect display content
elaborated by the author

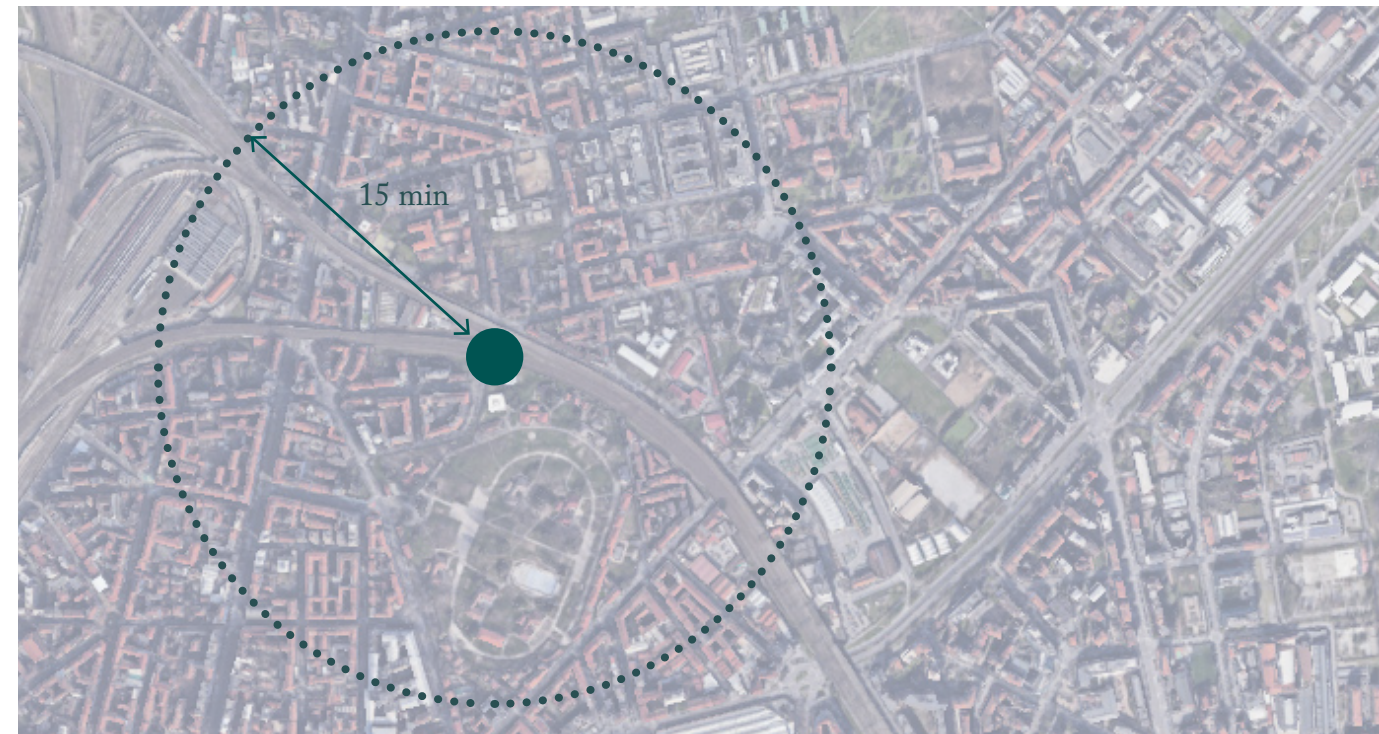






Figure 37
Proximity circle in the selected area
elaborated by the author

-  **AUSER GORLA**
-  **WORKSHOP DI FOTOGRAFIA CON LAURA LIVERANI, FOTOGRAFA PROFESSIONISTA**
-  **MARTEDÌ 24 GIUGNO, ORE 18**
-  **VIALE MONZA 142**



Dark hours
Lights

As argued in the literature background analysis of this thesis, appropriate lighting leads to a positive psychological effect on pedestrians (Kitchen and Schneider, 2007).

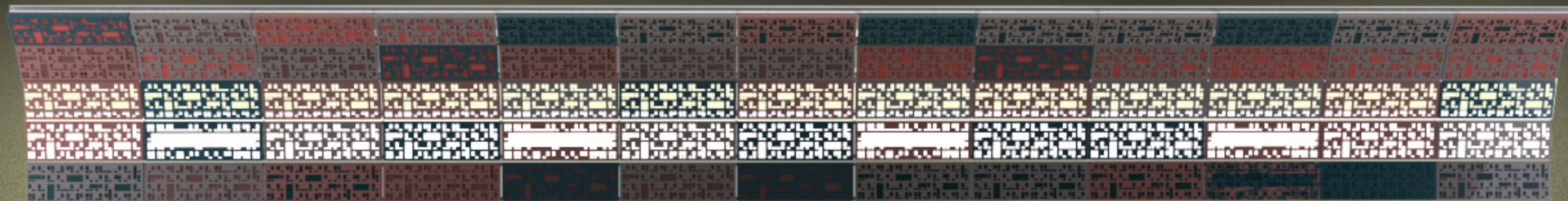
Especially during nighttime, light affects the feeling of entrapment (van Rijswijk

and Haans, 2018) and can influence the perception of the built environment. The study supports the idea that lighting may indirectly increase people's sense of safety by increasing prospect, and reducing concealment and entrapment.

The qualities of light that improve perceived safety are its uniformity in distribution and minimization of contrast (van Rijswijk and Haans, 2018), as well as a warmer color temperature (Cho et al., 2019).

The product will be lighted through a LED panel module SAMSUNG XPE Series, made for outdoor LED signage. Each panel has a resolution of 32x32 pixel and adjustable brightness. It can reproduce the RGB color spectrum and will be programmed with warm colors. In order to improve the

welcoming effect of the space the lights will move smoothly according to the user's walking path.



10 System

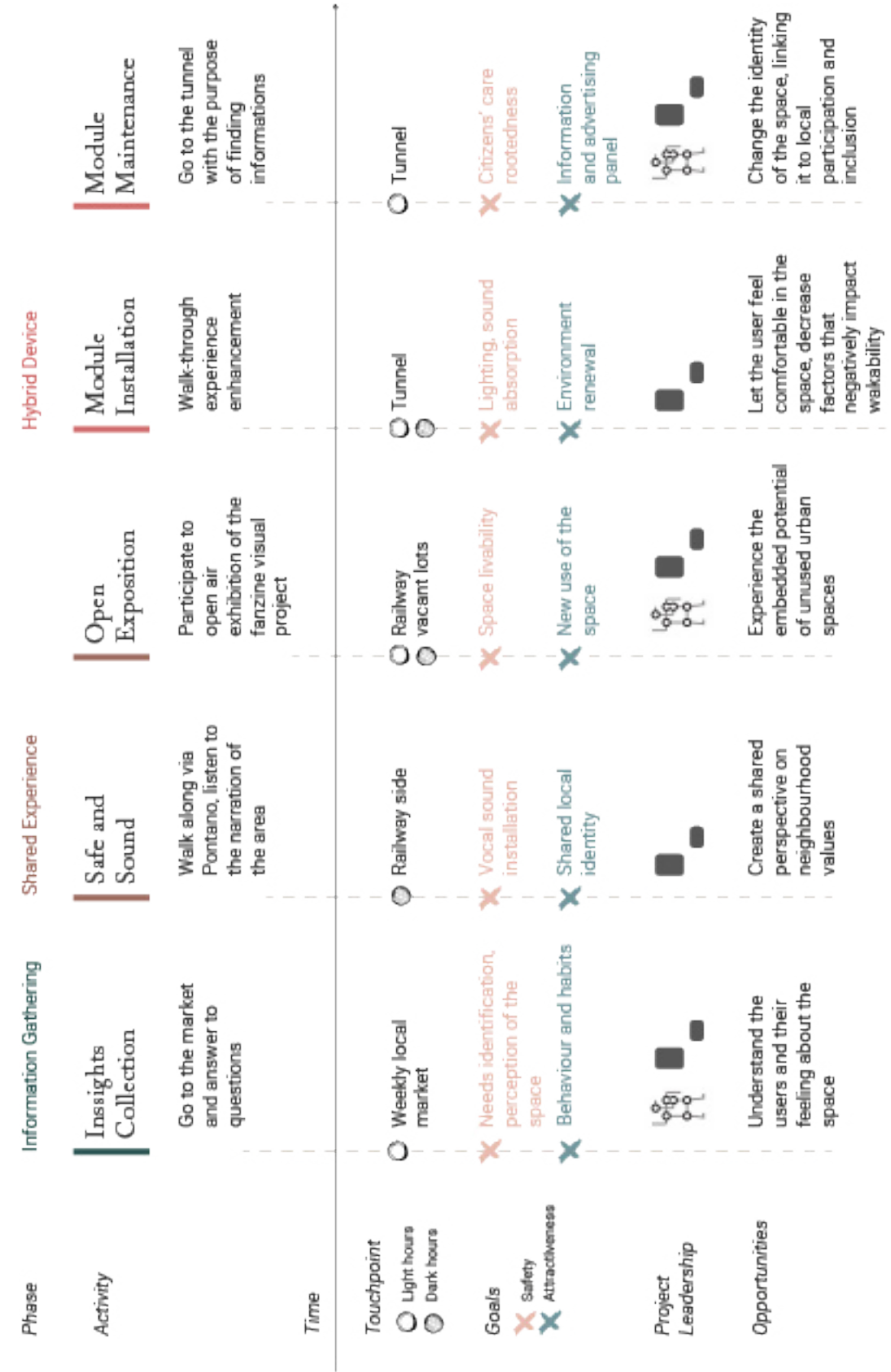
The project is composed of interconnected and increasingly transformative initiatives, aiming to drive the users to a more sustainable and active behaviour and the renewal of public space design and functionalities. This chapter envisions the possible relationships between the users and the project and the product-service-system required to sustain this set of interactions. On the same line, each paragraph will deepen a specific aspect of the system, such as the approach to the scaling impact, the stakeholder partnerships and the economic feasibility.

To sum up the touchpoint between the user and the service in each phase of the project a user journey has been defined. The scheme reported in figure 37 includes the name and a short summary of each phase described in the design chapter, defining the urban place where these activities will take place and the preferred time of the day to perform the activity. This information about time and place is crucial to understand how the users will be enclosed to a new experience concerning the topics of the project. The factors of safety and attractiveness are the overall goals of the project. The scheme associates each activity a main target, and the entity with a leadership role in the initiative management. On this management matter the two associations involved will be Longevity, and TurnMiOn project. They will collaborate supporting each other: one the

one hand Longevity can support TurnMiOn project with its established competence and reliability for public ban participations, while the TurnMiOn project can support the research activities of Longevity by offering new cases and testing sessions to include in the body of research. The last but most interesting section of the user journey is the opportunities emerging by each step of the project in terms of community engagement and transformative potential.

To support these interactions an entire system of relationship must be defined for the project. The system map represented in figure 38 is thought to clarify this aspect. The map includes the users, namely citizens, primary and secondary stakeholders, and space, identifying the information flows, the material and work flows, and financial flow that build up the system. Generally speaking the primary stakeholders are the local entities that will promote activities through the modules, that will give to the product-service-system the information about the message to share, receiving a tailored sponsorship and therefore visibility among users. To receive this sponsorship these entities will be asked to take part to

Figure 37
User journey map
elaborated by the author



initial phases events as staff members, or renting needed tools, or hosting the tools' installation in their space, or paying a fee. Secondary stakeholders are the Milan Municipality and RFI, to whom will be asked to validate the project and give permissions, in addition to a technical support for the construction site management. In the space layer are placed the single initiatives, the tools and materials needed to perform them and the impact they are supposed to have on citizens.

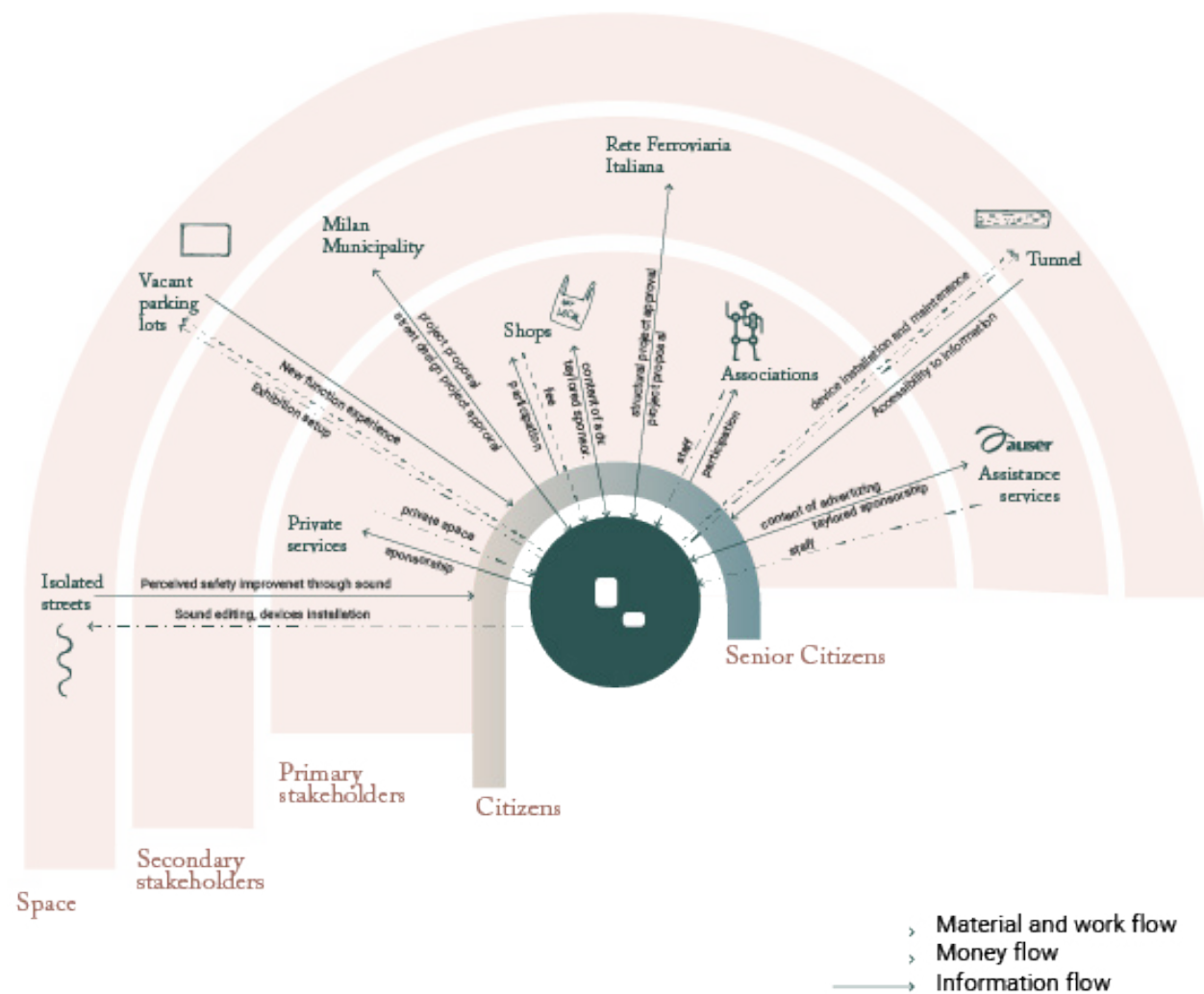


Figure 38
System map
elaborated by the author

10.1

Scaling impact

The literature (Moore et al., 2015) about strategies in social innovation define a new and far more complex picture about the concept of "scaling impact", depending on the type of scaling. Actually the authors define the scaling out, scaling up and scaling deep dimension to achieve a transformative impact. TurnMiOn project is thought to adopt scaling out and scaling up approaches.

Scaling out is meant as the attempt to involve greater numbers through the dissemination and replication of the initiatives, therefore increasing the number of people or communities impacted. On the other hand scaling up is defined as the impact on laws and policies, achieving a change on the institutional level.

Scaling out the TurnMiOn project means bringing it to other neighbourhoods in the city, therefore leveraging on different local initiatives for initiation and maintenance phase and adapting the modular device to other tunnels' characteristics.

From a visual analysis of possible cases, three variables have been identified (fig 39), namely length and height of the tunnel, available space around the tunnel, and traffic type under the tunnel. From these variables emerge potential intervention that the module will support. Tunnels with large spaces nearby are suitable to provide information and host a spot for public information, markedly long or tall tunnels

might need additional lighting systems to improve perceived safety, and tunnels for both car and pedestrian traffic might take advantage of acoustic solutions to absorb traffic sound and isolate from railway noise.

The last step to design scaling out strategy is to frame the growing complexity that modules must embed to fulfill their potential impact according to space variables.

As suggested before, the scale up approach

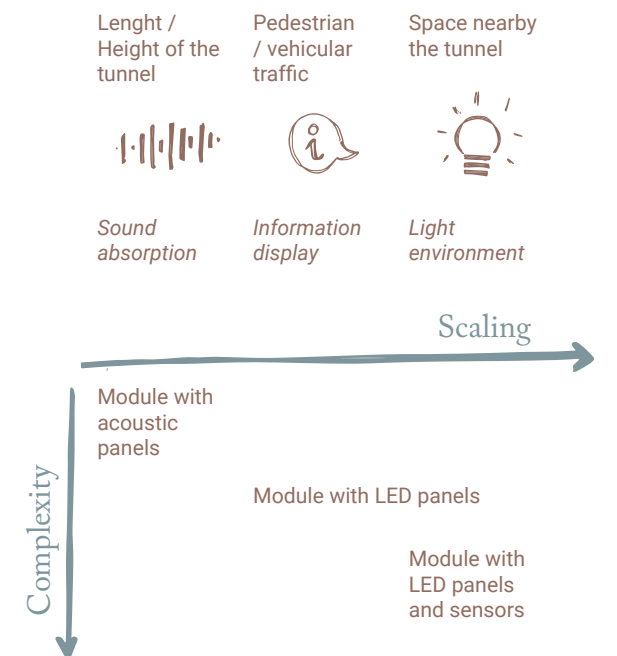


Figure 39
Scaling impact and complexity visualization
elaborated by the author

works on a policy level. In this thesis project the concept will be scaled up through the offered service, supported by a shift in policies regarding the use of public unused space nearby tunnels. Once the leavetaking phase is concluded the expected outcome is a care relationship established between the users, the stakeholders, and the space. This situation will allow citizens to assume an active role in the proposal of new functions for the space. The service system will therefore be able to sustain this impuls, by

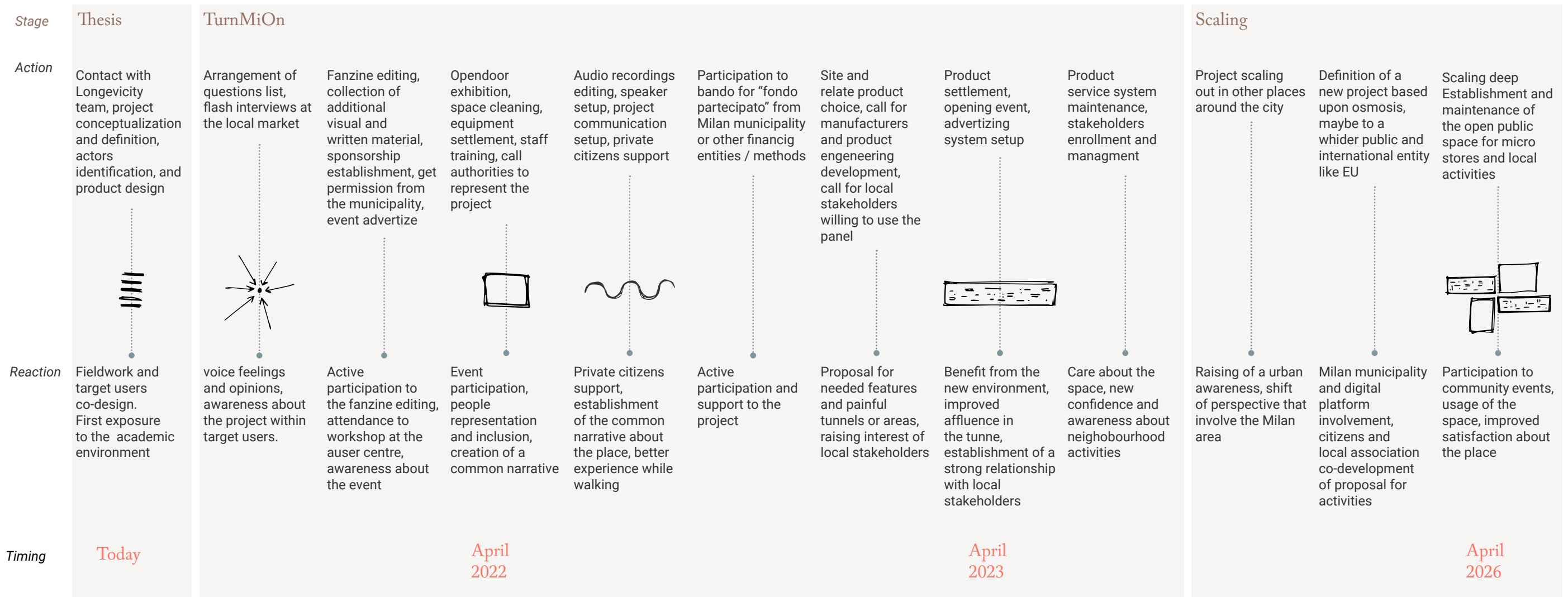
creating a stronger relationship with local authorities, leading the transition to policies supporting the temporary use of public space, and becoming a rent platform for local stakeholders. Through these initiatives the community will fully rediscover the value of the place, generating temporary and co-developed initiatives that will improve liveability and social inclusion.

The services that might take place around the tunnel are pop-up stores of local shops, or opendoor activities proposed by local

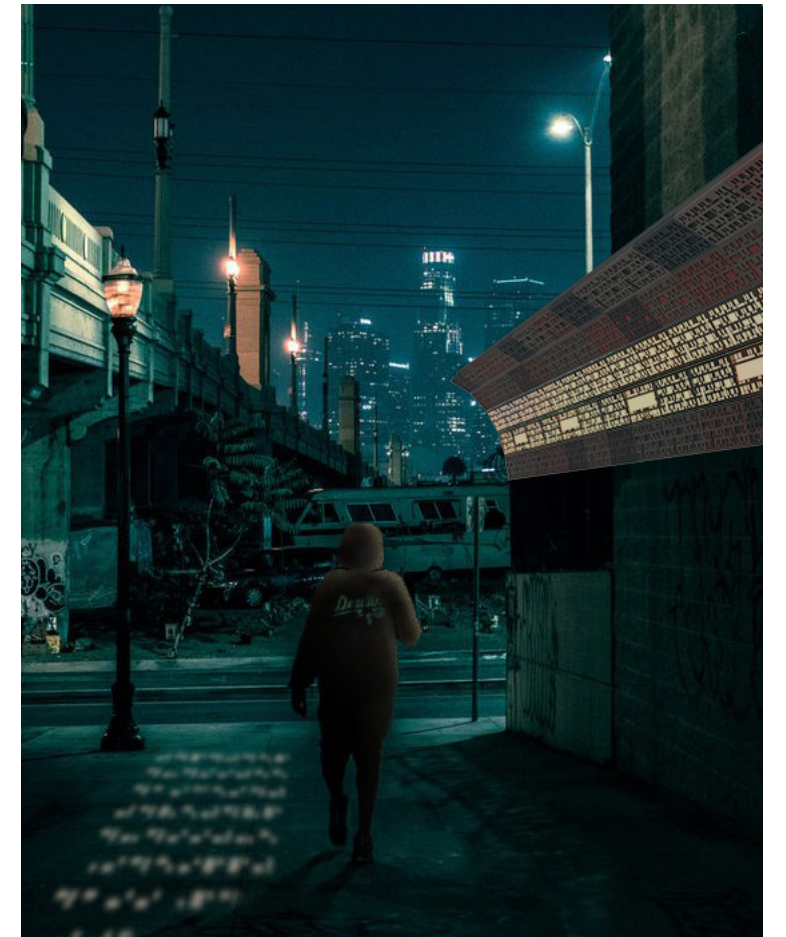
associations. The setting of the space and the private interest will help citizens in being able to imagine new uses and habits around the railway. This will lead to a new vision of the physical barrier generated by the train lines, turning it into a common space available for the community.

The timeline scheme reported in figure 40 represents the activities involved in the TurnMiOn project and how they will be displayed within a 5 years period.

Figure 40
Project timeline
elaborated by the author



Images
Other contexts' visualisation



10.2

Stakeholder partnerships

This paragraph widens the perspective of the user journey by defining for each project phase the role of users and the role of stakeholders. To visualize these relationship patterns and clarify the role of each stakeholder in the project, a service blueprint map has been reported in figure 41. The map emphasizes the users' action for each phase of the project and the derived reaction that will be performed by the stakeholders, clustering the activities into frontstage, backstage and support processes.

The map evidenced the need of a platform to allow an effective and flexible management of activities information between the local activities providers and the TurnMiOn product-service-system. The system represented with figure x will connect the local activities to the project, becoming an opportunity to sponsor events and services offered to the community. The sponsorship might include periodic events, new offered services, seasonal sales and similar activities, therefore the content of the information will include the provider entity, the type of sponsored activity, and its timing.

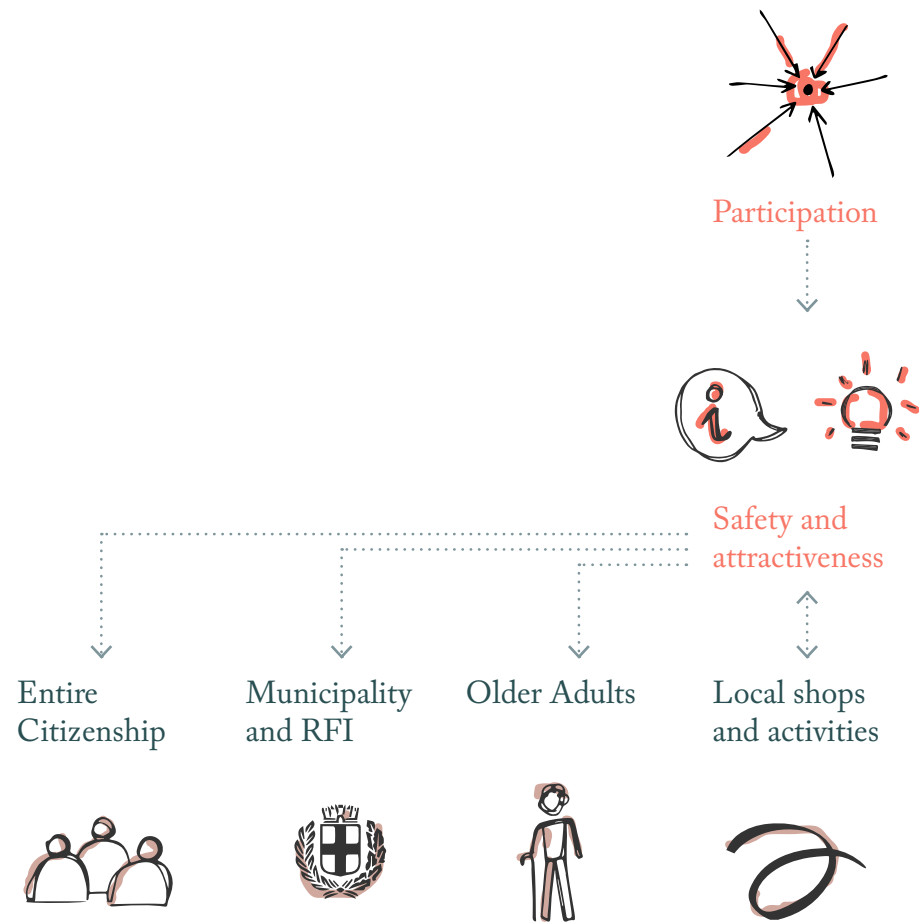
As shown in figure 42 the participation of local activities to this product-service-system will lead to a larger audience and participation to proposed activities and will include elder citizens in the social community through a direct and locally

rooted channel. Moreover the collaboration between the municipality and the project will enhance the relationship with citizens and will become a space of exchange of direct information from the neighbourhood municipality to the community and vice versa. As stated in previous chapters, even if the project targets older adults, the entire community will take advantage of the proposed initiative.

	<i>physical evidence stakeholders</i>	Info Gathering	Safe and Sound	Open Exhibition	Module Installation	Module Maintenance
<i>customer actions</i>	Citizens	go to the market, answer the questions	walk along the railway in via pontano, listen the narration	see the open air exhibition of the fanzine visual project	walking through a safer environment	walking through a more attractive environment
<i>on stage contact actions</i>	Project name Longevity / Auser	staff to make interviews and photographer to take pictures		onsite staff to explain the project, welcome visitors, and discourage vandalism	space renewal, lighting system and environmental condition improvement	information flow on panels
<i>backstage contact actions</i>	project name	prepare a draft of questions and print consent modules, collect equipment	audio loop editing	pictures / video editing, space cleaning and setup		information collection and software management
	Municipality RFI		project approval	project approval	project approval, worksite preparation	give information about services and events
	Local entities		engaged to host the speaker	engaged to host the projector	module maintenance	give information about events and advertizing messages
<i>support processes</i>	Other		speaker rental + installation, power supply, and secure		Product purchase and installation	

Figure 41
System blueprint
elaborated by the author

Figure 42
Offering map
elaborated by the author



10.3

Feasibility

This paragraph envisions the economical feasibility of the project, defining its targets, weakness and potentialities.

The *vision* of TurnMiOn is to

Give a new function to unused spaces to strengthen the connection between people and urban spaces, initiating a relationship based on participation and care.

On the other hand the mission to accomplish is The modular structure adapts to site-specific characteristics of the tunnel. It improves the walking-through experience through perceived safety and functionalizes the space turning it into a touchpoint with local activities and events.

The purposed buiseness model canvas (figure 43) describes costs and partnerships structure in the project.

The customer segment is composed of users, but also entities that are supposed to use the device to promote their activities, events, and services.

The goals of this product-service-system include the improvement of the quality of life of older adults through active ageing and their participation to social activities. The rise of confidence while walking would be a considerable achievement. Older adults are relatively sedentary and do not exploit the number of services dedicated to them. They are scarcely interested by external stimuli and new initiatives. Moreover their are fairful of crimes and feel they are sharing the space with people that do not care about it.

Therefore, the value proposition of this project is to relief users' pains through the improvement of environment lighting and to establish a care relationship between citizens and space.

The increase of overall ambient lighting and the the renewal of the space will lead to a better perceived safety. On the other hand, the gain creators are embedded in the whole process of the project, that brings out the narrative of the place, purposing new functions. The new meaning of the place

will raise care for the space and lead to new uses.

The distribution channels of the project are the tunnels that cross the train lines, while the communication channels are the events and activities performed before the installation of the product in unused spaces nearby the railway.

The customer relationship before the installation of the device.

The customer relationship before the installation of the product is established with the users, that co-create events and activities with the project team. Once the product is installed the customer relation is established also with the local activities that want to communicate informations to citizens. Through this relationship will be possible to modify users' behaviour.

Revenues comes from the fees of private local actors that sponzor their activities through the device. These fees will change according to the used surface and the duration of advertisement.

The key resources needed to perform the first two phases are the availability of material, space and people to create temporary experiments, that are usually made in partnership with local entities, both private and public. The key activities concern production, installation and maintenace of the modules that are done by external companies.

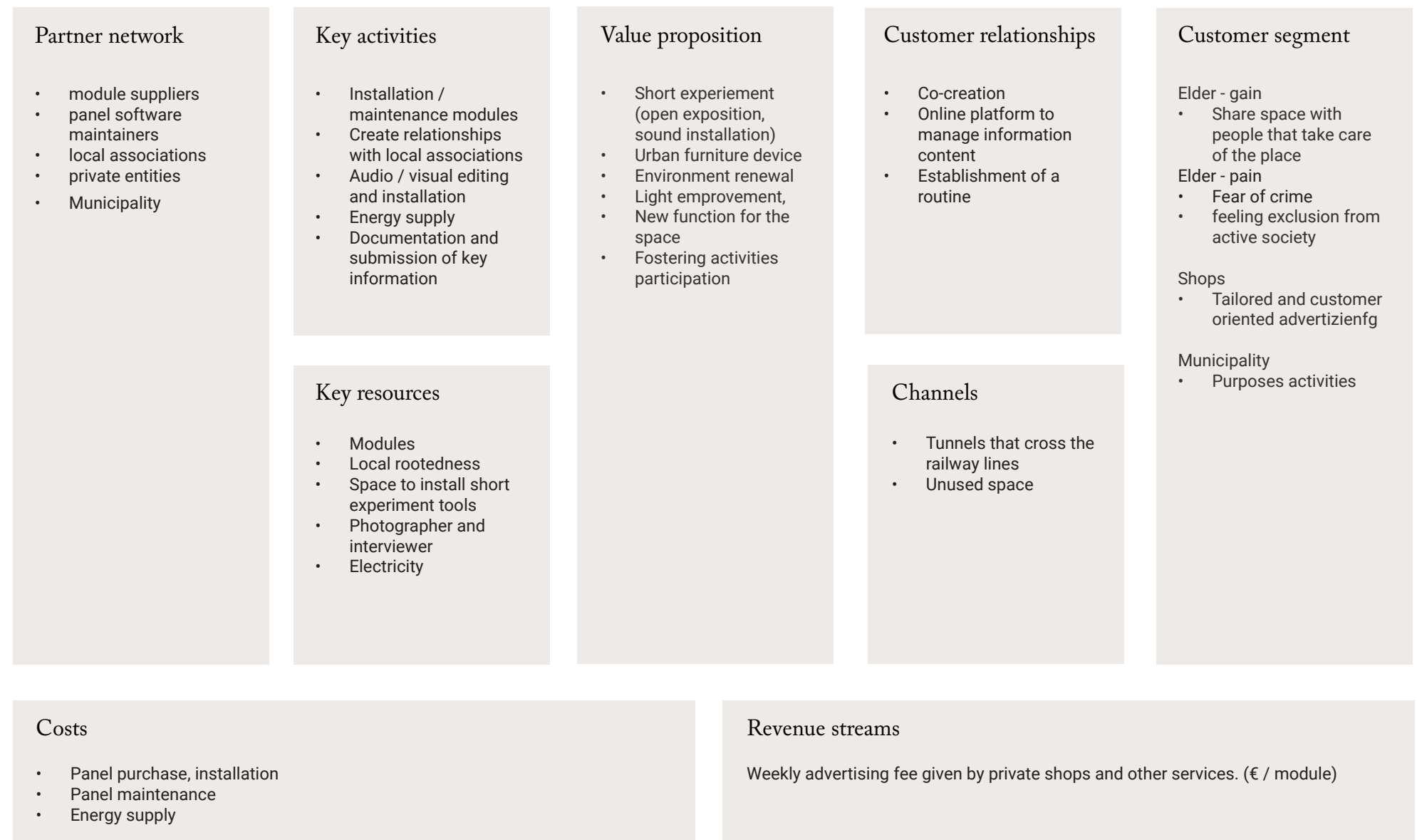
The partners network is therefore made of external suppliers and maintainers, local associations, private entities and the municipality. Costs refer to purchase, installation, and maintenance of the modules, and energy supply.

Usually projects as the one designed for this thesis are funded through the participation to local or regional call for tender.

As a reference has been chosen the "Creative Living Lab " that promotes projects of urban regeneration and is issued on an

annual base. TurnMiOn joins the constraints and parameters of the ban, therefore the participation to such financing mechanism would be an asset.

Figure 43
Business model canvas
elaborated by the author



Conclusions and limitations

This thesis project argued the possible impact of the built environment on the behaviour of elder citizens, leveraging on social inclusion and participatory approach in the generation phase.

The TurnMiOn project is aligned with the objectives and methods of the LONGEVICITY project, developed by University of Milano-Bicocca, Politecnico of Milano, AUSER Lombardia (Association for an Active Ageing), and Research Center for Advanced Science and Technology (The University of Tokyo, JAPAN). The project is based on a strongly cross-disciplinary research approach, integrating skills, methodologies and tools ranging from Social Sciences, Design of Services, Artificial Intelligence and Complex Systems Science.

The output is composed of different temporary interventions and a modular product aimed to improve attractiveness and safety in urban spaces. The place where the process will be performed is the railway infrastructure, with a focus on tunnels and other spaces that lead the users to a negative feeling of entrapment. The initiatives include a short interview session at the local market, an open exhibition in vacant spaces along the railway line, and a sound installation located in a road with poor perceived safety condition due to the built environment characteristics. The device is provided with LED panels to improve ambient lighting and share information with

the community. It is designed with attention to aesthetic and perceptive performances as well as to cost reduction and durability.

The expected outcome is a change in behavior and mindset of the senior citizens, the main target of this study. Indeed elder users first, and hopefully the entire community later, will reduce its fear of crime thanks to the improvement of built environment conditions in tunnels, and will start to consider that space as functional and community-centered infrastructure.

This change will lead the citizenship to the reappropriation of places that nowadays are unused, therefore neglected and dirty.

The limitations of this project are related to the lack of effective participation of users in the last phase of project generation, due to the ongoing pandemic situation. This occurrence also prevents the possibility to test the purposed solutions.

Despite this, the project is rooted and some of the activities have already started. The interviews and the pictures' collection at the local market have been successfully accomplished. The fanzine is expected to be published in April 2022. At that time, it will be possible to further develop the detail of the project and try to establish a stronger relation with external local actors and the municipality.

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