Chapter 5.
Smart mobility design guidelines

5.1. Design guidelines: a roadmap

Having discussed the aims and methodology of the study, we want to use this chapter to provide urban designers, planning practitioners, and local governments and organizations with a roadmap to put into practice smart mobility actions in small and mid-sized towns. Here guidelines are intended as a roadmap, a flexible approach open to the many ways in which smart mobility actions can be deployed in rural and suburban areas. This section is structured around a series of crucial steps that can be considered when planning a local smart mobility strategy. This chapter will feature the design tools illustrated in the literature review and in the applied research carried out within the context of our study.

Our roadmap consists of five steps that should eventually lead to a 'smart mobility vision'. First, every small and mid-sized town should define its own 'smart mobility vision' on the concept of proximity, a key element that links innovation, quality of life and urban identity [see section 5.2]. Next, we propose to match figure ground, urban service and network accessibility to find proximity patterns [see section 5.3] and to assess the current situation, provide feedback and capture the potential impact of the smart mobility vision and monitor the implementation of the strategy [see section 5.4]. Moreover, insights into the proximity pattern can help identify different typologies of spaces [see section 5.5] and thus select areas of need on which to focus [see section 5.6]. This design roadmap aims to lead to the creation of a tailor-made smart mobility vision for small and mid-sized towns and local action plans – with budgets, timelines, milestones, and monitoring – to implement the strategic actions locally. As indicated in chapter 2, residents and city users should be involved throughout the process in the areas where the measures are being implemented. This ensures the collection of key insights, which are essential for the creation of places and public spaces that will be utilized by people. Active participation is, therefore, a vital element of the strategy.

5.2. Step 1: promoting a ‘smart mobility vision’ in small and mid-sized towns

Before thinking about the implementation of a general urban strategy or about possible interventions in terms of infrastructure or means of transportation, small and mid-sized towns should determine how to best assess smart mobility as a concept in their geographical area. This is a fundamental step along the path to defining one’s idea of a city and taking a clear position out of all the possible versions of smart mobility as proposed by stakeholders, businesses, and public and private bodies. This vision will then define the main analysis parameters for the city, promote the main objectives of the urban strategy, and guide the selection criteria for possible solutions and interventions.

As discussed in sections 4.4.1 and 4.4.2, the smart mobility vision revolves around the concept of accessibility by proximity. This concept was chosen because it belongs to the field of mobility and is a useful indicator with respect to the themes of innovation, urban health and urban identity. Given the unique social, urban and environmental characteristics of these places, imagining a smart mobility vision in small towns means choosing from among the different types of proximity found locally, the one that can make the most positive change in environmental terms and in terms of the mobility user experience. In isolated centers it may be advantageous to promote physical proximity by organizing medium and long-distance transport, while in more connected cities the development of immediate or desirable proximity may be assessed. As in the X-minute city model, there is no one-size-fits-all solution that can be transferred simply from one place to another. The smart mobility vision must be tailored to the specific context, organizing the different levels of accessibility by proximity according to its priorities.

The selected accessibility by proximity value may be more or less in line with the local transportation needs and mobility culture. A radical choice can be an early indicator of the problems and potential conflicts of a specific mobility solution (e.g., the widespread use of CAVs, or excessively limiting car access in the town center). A more conservative choice may increase the initial consensus but offer limited results in terms of urban well-being and a better mobility experience for the local population. As a general rule, considering the average national modal split for towns with fewer than 10,000 inhabitants – i.e., 14.7% on foot; 3.5% by bike; 2.7% by motorbike; 74.1% by car, 5.1% with PT (ISFORT, 2022) – we believe it is necessary to reverse the current trend of car-based mobility.

Reflecting on the smart mobility vision can begin with the identification of relevant destinations and potentially disadvantaged groups, and the collection of data on the lack of walking and cycling infrastructure, low environmental quality, and high-density and low-density zones. Because we need to redistribute space, change the use of public spaces, and intervene in the existing transport infrastructure, it is crucial to build a consensus and involve different groups of people, especially vulnerable road users such as children and elderly.

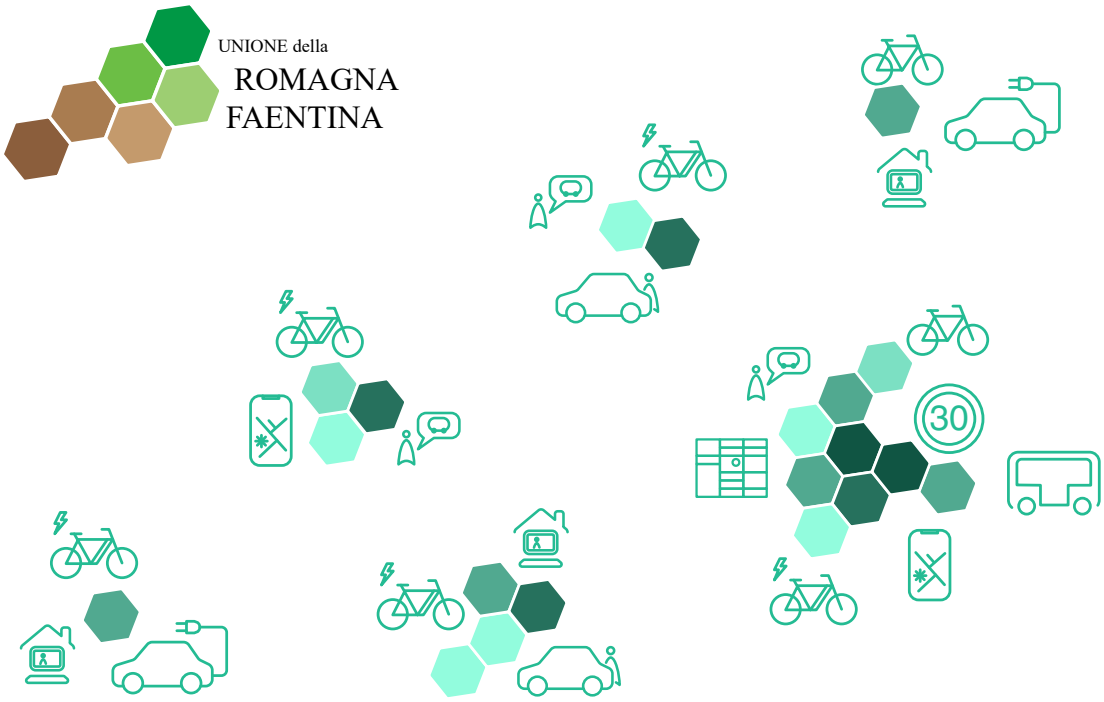

Figure 5.1. Diagram of the URF 'smart mobility vision'. (source: author)

In Faenza and CB, the smart mobility vision can be described as a 'proximity network' that extends throughout the land [Figure 5.1]. A network composed of 'proximity bubbles' that correspond to the different conditions of the mobility spaces. In the main town centers, it means the secondary use of private cars in favor of active mobility, to be implemented with car-free zones or LEZs. In secondary town centers and in consolidated clusters, it means sharply limiting the use of private cars in a people-first perspective, to be implemented with 20 or 30 km/h zones. These 'proximity bubbles' are then connected by several short and medium-distance routes (for example: home-school or cycle paths), and by a network of park&ride car parks to manage driven journeys that will still be relevant within the geographical area. A vision which is based on the Smart Mobility Network project for Faenza [see section 3.3.5] with the aim of strengthening the concept of accessibility by proximity, extending it to the surrounding area and strengthening local identities.

Among the different levels of accessibility by proximity, the distance-threshold of 800 m was selected as preferable. It's a choice based on the results of the urban service accessibility analysis [see section 4.3.4 and section 4.4.3], where the distance of 800 m falls into a challenging range, in which most of the urbanized areas, especially the residential ones, could potentially achieve good accessibility levels with a reasonable number of updates. Conversely, the distance of 400 m shows very low numbers that are therefore of limited general interest (the population should have access to

all services within 5' on foot, following the Swedish model of the one-minute city (VINNOVA, 2023), to date applied only in pilot areas), while for distances greater than 1,200 m, excessively high and homogeneous accessibility by proximity scores emerge. While this is a positive sign indicating good access to services within 20 to 30 minutes, it also highlights how reaching all the services considered essential throughout the territory is linked to the use of motorized vehicles.

A proximity of 800 m corresponds to 10' on foot and 5' by bike. An analysis of the literature shows that these trips have a good level of desirability, especially regarding those on foot for leisure activities and bicycle trips (Larsen, El-Geneidy and Yasmin, 2010). In addition, they correspond to the insights of the applied research illustrated in the previous chapter, which highlighted how the physical characteristics of Faenza and Castel Bolognese were very compatible with daily bike use.

The next steps will serve to verify this first smart mobility vision proposal in a non-linear path similar to the "double diamond" process used in Design Thinking (Bertolini, Clercq and Kapoen, 2005). The area will be mapped to investigate how accessible services and the road network are, to determine the size of the 'proximity network'; to define the main connections, and to enhance the design principles discussed in the previous section.

5.3. Step 2: matching service and network accessibility

Creating a smart mobility vision will result in the main guidelines on the idea of a city and the level of accessibility by proximity to be generated.

To highlight the benefits to the local area that can be generated with more 'smart' journeys, we consider it appropriate to combine the level of accessibility by proximity with the level of street accessibility [see section 4.3.4 and section 4.3.5]. As with the analysis of accessibility to services, this is also divided into different threshold-distances and for each of these it highlights the compatibility of the road network with the different types of travel. The findings in section 4.4 show that for distances of 400 and 800 m, the highest numbers correspond to more vibrant roads, while lower numbers correspond to more isolated or private roads; for greater distances (e.g. 6.7 km and 10 km), high numbers correspond to the main connecting arteries while low numbers correspond to street network areas with neighborhood, residential or commercial streets.

The choice of the street accessibility level to be combined with the accessibility by proximity level arose from a comparison of the chosen accessibility mapping and the different street network analyses. Each map highlights a different insight into the relationship between urban services and mobility spaces, and thereby differently guides the goals of the project. For example, the comparison with street network accessibility maps for low threshold distances (e.g., 400 or 800 m) analyses the potential of the road network for short and medium distance travel, and relates the density and

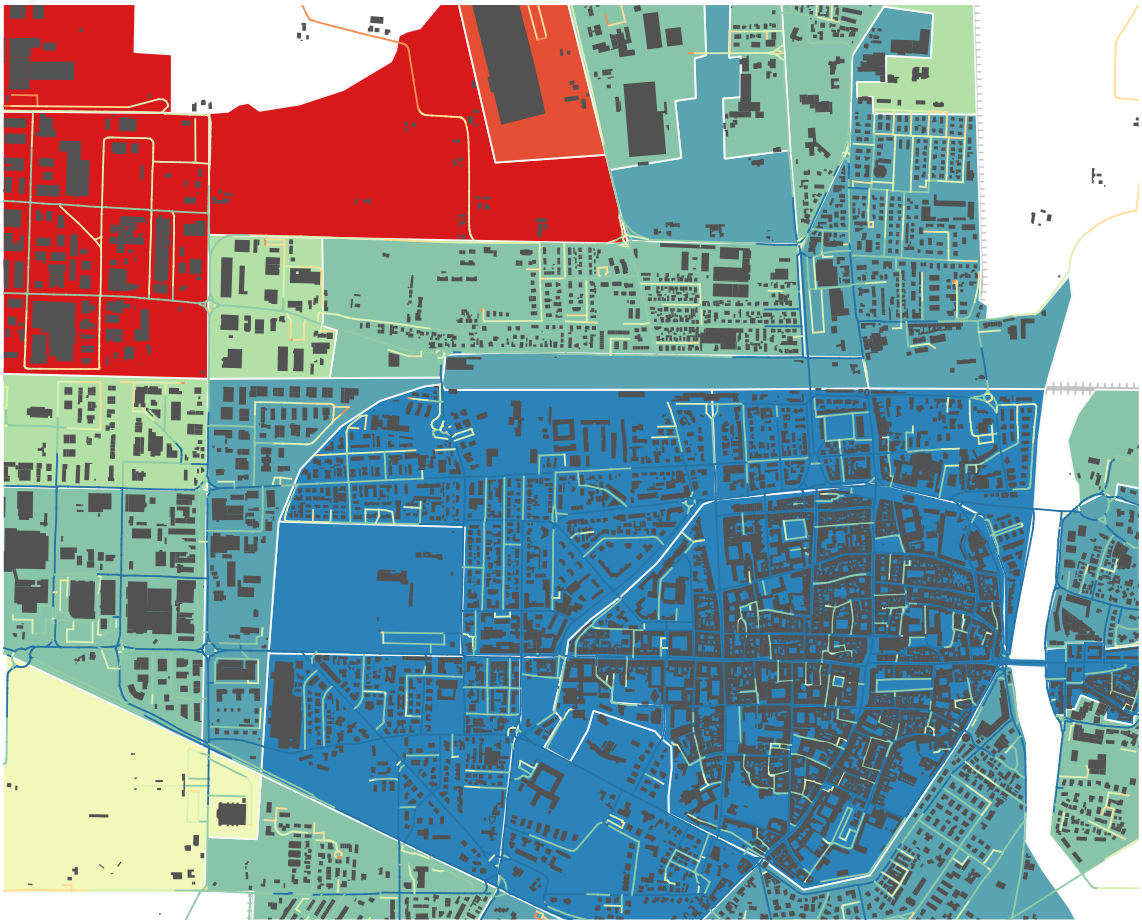

Figure 5.2. Extract of the accessibility map of Faenza using the threshold distance of 800 m. The map merges figure ground, service accessibility and network accessibility analysis. (source: author)

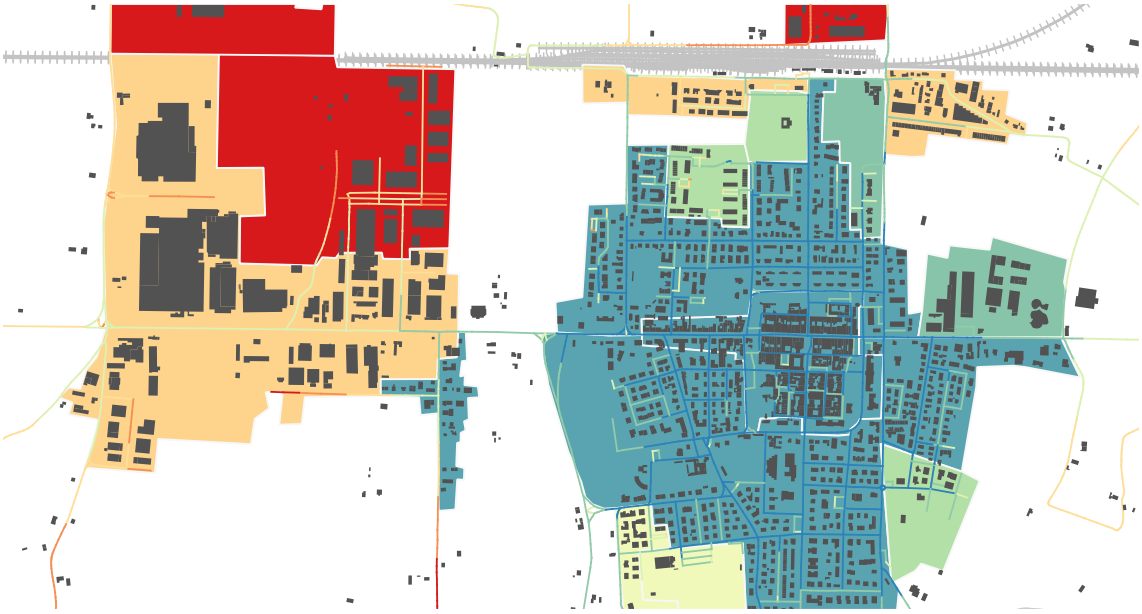

Figure 5.3. Extract of the accessibility map of Castel Bolognese using the threshold distance of 800 m. The map merges figure ground, service accessibility and network accessibility analysis. (source: author)

variety of urban services with the spatial characteristics of the network: more or less connected, more or less compatible with cycling and walking. In comparison with higher numbers (e.g., 6.7 km or 10 km), on the other hand, the potential of the road network for longer distances is investigated, highlighting the parts of it which are most compatible with this type of travel. Among the various possible options, we believe the comparison between service and network accessibility with the same threshold-distance is the most direct if we wish to verify the degree to which the mobility spaces are compatible with the smart mobility vision and the level of accessibility that it is designed to foster.

Although the choice of the street network accessibility level was presented for greater display clarity as subsequent to that of service accessibility, in reality it is a back-and-forth process in which both analyses influence each other. For example, while the results of street network analysis show that the topology of mobility spaces is more closely correlated to a different service accessibility level than initially thought, it can still be an important factor in evaluating other scenarios.

The combination in a unique map of service and street accessibility creates a hybrid pattern that involves streets and 'urban elementary units'. Among the several typologies found in the literature it can be classified as a contour-based accessibility analysis, which is a widely used measure characterized by its undemanding computation effort and the clarity of its representation on the map (Bertolini, Clercq and Kapoen, 2005; Geurs and Van Eck, 2001). More specifically, the choice of combining service and network accessibility aims to highlight the role of the physical dimension of the land and its urban services. The juxtaposition of ground figures, service accessibility and network accessibility [Figure 5.2, 5.3] creates a mapping of the area that synoptically highlights the range of urban services present in an area, the physical characteristics of mobility spaces and the urban fabric. It's a choice that goes against heatmaps or unique macro-indicators – often reported with gravity-based accessibility measures, maps that divide the territory into equal parts and associate an accessibility level to each – to maintain the physiognomy of the territory, in particular the 'urban elementary units' and mobility spaces.

The mapping of the land described above plays a fundamental role as a tool to support the town plan. In fact, the analyses make it possible to combine the consolidated interpretation of the urban morphology in terms of uses, density, and building types with a verification of the local accessibility conditions, the quality and quantity of the urban services present, and the main characteristics of the road network. It's an interpretation of the urban space which promotes innovation in the design of mobility spaces because it introduces indicators closely linked to the themes of innovation, urban identity, and urban well-being. Secondly, the representation of the urbanized territory by areas and accessibility networks makes it possible to connect the various cases, creating an 'accessibility grid'

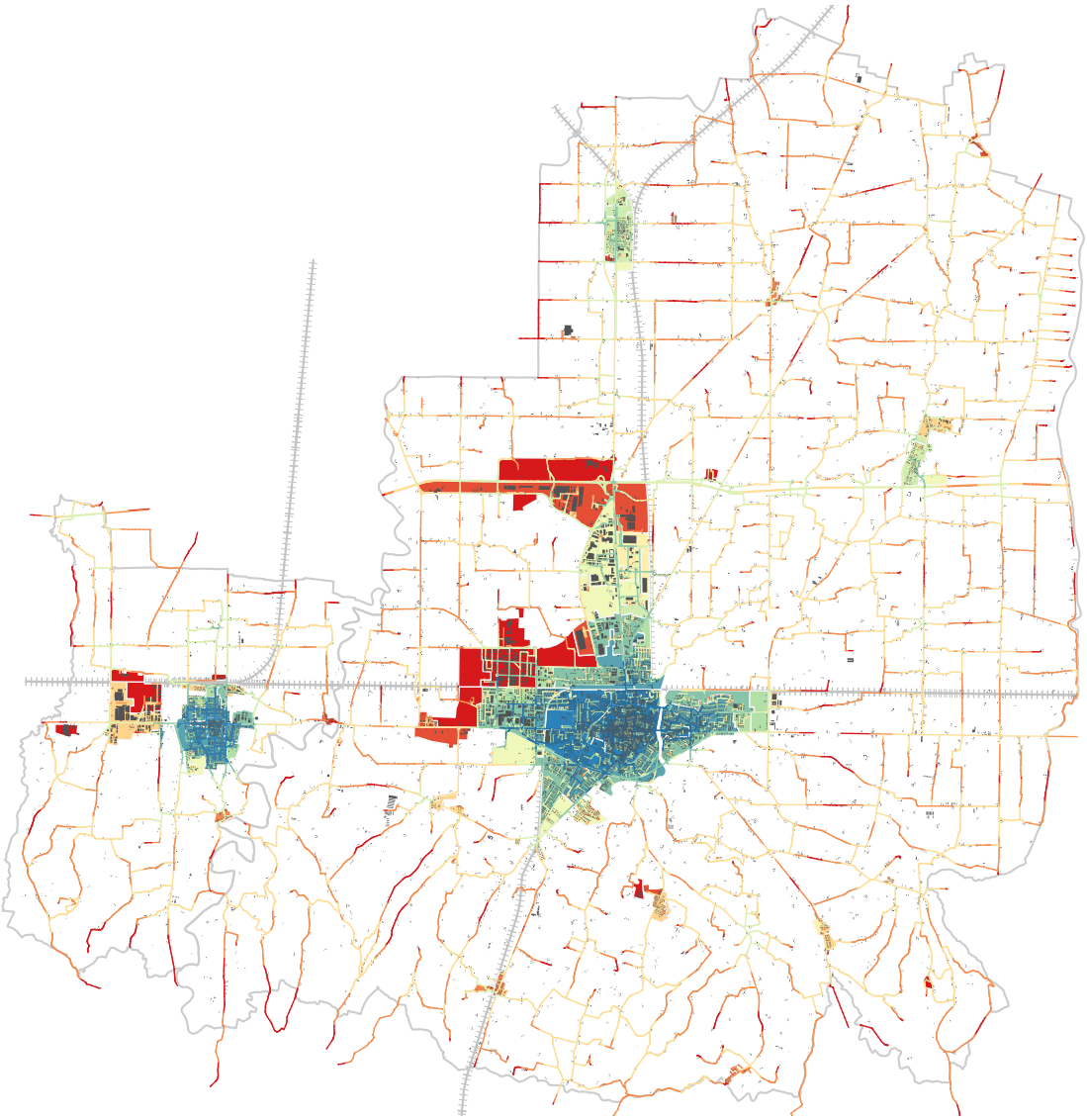

Figure 5.4. Service accessibility and network accessibility analysis in the whole municipal territory of Castel Bolognese (left) and Faenza using the threshold distance of 800 m. (source: author)

that classifies the various local areas by accessibility to services and their roads. This solution is similar to that proposed by the Road Task Force in London in 2012, which organized the roads considering the 'movement' and 'place' function of each road (Champion, 2016). Although both approaches need to combine a bottom-up and top-down perspective, the 'street type family' of London is linked to different sets of street functions (e.g., moving, living, unlocking, functioning, protecting, and sustaining). In this case, we preferred to refer to the physical characteristics of mobility spaces, in particular to the urban services offered and the topology of the road network, as they are more directly connected with the field of application of the town plan. Given the need to define a simple and flexible design roadmap, we believe that the theme of functions should be analyzed especially in the design phase, similar to what is documented in the case studies [see chapter 3].

In the relevant zones of Faenza and CB, street network analyses were carried out for the main threshold-distances, comparing them with the level of accessibility to the services chosen previously, i.e., 800 m. Street network analyses have made it possible to detect that the values associated with some road sections (e.g., the road that crosses the old town of Faenza from north to south, the section of Via Emilia that intersects the urban area of CB) remain high over several threshold-distances.
To understand the reasons behind these particularities, potential correlations with the characteristics of the urban fabric were sought. Comparing the sections with this value category and the urban fabric, in most cases they corresponded to elements of the road network that have played a central role in the development of these cities – e.g., Via Emilia, the cardo of Castrum Faentino – while in the other cases they correspond to fulcrum areas between different parts of the city – e.g., the entrance to / exit from the town center, passage from the old town to the well-established urban fabric. We infer that, for roads of this type, an assessment must be made on a case-by-case basis to correctly frame the values collected.

Based on the assessment of the data illustrated above, we went on to choose the street network analysis to be included in the service accessibility map. Among the various options, we have selected the one relating to a threshold-distance of 800 m because it investigates more in depth the degree to which the road network is compatible with trips similar to those chosen as priorities in the smart mobility vision. The map [see Figure 5.4] is fairly clear: very different situations arise between urban centers and hamlets.

– The urban centers of Faenza and Castel Bolognese have high values in terms of accessibility to services, with a road network which is quite compatible with proximity trips. In particular, the two old towns have the highest concentration of services and a road network connected with several vibrant streets;
– The industrial and service areas of Faenza and Castel Bolognese show different accessibility conditions. In the industrial areas, while presenting the entire range of values in the street network analysis, the service accessibility level is quite low; in tertiary areas different metrics are found, with medium-high values of accessibility both in terms of essential services and street networks;
– The hamlets on average rank low in terms of accessibility to services, and low or intermediate in terms of the street network analysis. The only exceptions are the much larger hamlets of Faenza, Granarolo and Reda. The first hamlet's ranking is intermediate in both indices with a slight increment in the old town; the second, smaller hamlet has intermediate and medium-low values in both indices;
– The undeveloped area, marked in white, is characterized on average by a low or poor level of

street network accessibility. The only exceptions are some areas mostly near the hamlets or outliers, such as those along the motorway axis.

These results clearly show the different relationships between immediate accessibility and territorial accessibility [see section 4.4.2] in small and medium-sized towns. The centers of Faenza and Castel Bolognese and the main hamlets can become areas where immediate accessibility by proximity can be experienced, with territorial accessibility models to be implemented for extra-municipal travel for study, work and leisure. Given that the shares of trips within the municipality are relevant – 43.4% for CB, 76.8% for Faenza – we believe that focusing on these trips can significantly change the current model of mobility. In the hamlets, where immediate accessibility to services is reduced, accessibility by proximity can aim to satisfy the main needs to be integrated with the use of motorized vehicles at a higher quotient than in the previous case. In undeveloped areas, it is worth noting the difficulty in fully achieving accessibility by proximity. Aware that this is a much smaller population share compared to the first two areas, we stress the possible perspective of these zones within the smart mobility vision proposed in terms of mobility. In these areas, we believe that the mobility model can hardly disregard the use of motorized vehicles, and that the first step to take is to organize these journeys in a more sustainable, safe and inclusive way.
In order to turn these observations into useful guidelines for the next steps, we have created a local accessibility grid which catalogues the main patterns highlighted in the mapping of the land. It's an analysis method already investigated in the literature (Marshall, 2005) to find possible common guidelines or directions among the many solutions available. In this case, the patterns highlighted in the mapping of the area were organized according to the level of accessibility to urban services and the road network, to represent the diversity of urbanized areas in small and mid-sized towns and to recognize the different functions of the broad domains indicated in both axes.

Figure 5.5 highlights the accessibility grid with its patterns. The patterns were chosen because they are representative or correspond to the most recurrent urban fabric, and aren't necessarily exhaustive. Indeed, we recognize the variety within a given accessibility pattern, considering a certain flexibility within the above mentioned parameters. The different patterns that make up the grid can be interpreted by their service accessibility level:

– Low service accessibility. In this range, urbanized areas are represented with access to a reduced number of services (>13 POIs, average: 20). These are mainly marginal areas, hamlets and industrial areas. In particular, areas with low street and service accessibility are marginal areas and isolated hamlets, while areas with an average level of street accessibility can be associated with hamlets close to larger centers or hamlets along the main connecting roads. Areas with a

medium-high level of street accessibility, much less than in the two previous cases, deviate from the previous cases, mainly indicating industrial or commercial areas. These are areas that are well connected to the road network even for short journeys but have limited accessibility by proximity. Interpretation of these patterns makes it possible to deduce a series of mobility needs. The first concerns the connection to services, with the first two patterns highlighting the need to increase the current offer, while in the third pattern it may not be considered necessary based on the intended use. The second concerns the characteristics of the road network in these areas. Compatibility with short trips, which in most cases is found on intermediate or low levels, can be increased through infrastructural changes, or it may bring out the need to be deployed on longer routes and consequent smart mobility solutions. A final topic of reflection concerns the urban identity of these places. While industrial areas are often labelled as non-places, hamlets are isolated places that may have their own urban identity, to varying degrees;

– Mid service accessibility. The patterns in this range represent urbanized areas in which an average number of services can be accessed (13-24 POIs, average: 20). They comprise most of the urbanized areas. As in the previous case, they differ in terms of street accessibility. Areas with mid-service accessibility and low street accessibility represent residential areas built by private entities, not directly connected to the road network but in areas with good access to services. Areas with a mid-service and street accessibility are areas close to different urban services, connected to the road network and potentially compatible with short routes. This setting is also home to tertiary areas, peripheral residential areas in Faenza and CB, and the main hamlets of the area analyzed. Finally, the areas with a high level of street accessibility, which are relatively few in the analyzed territory, are areas well connected to the center but not completely built. Even in this case, accessibility pattern analysis reveals different mobility needs compared to the previous case. Regarding the connection to services, the main need is to highlight in a timely manner the service type to be made more accessible or present, a fact that depends on the uses and type of urban fabric. In relation to this, the characteristics of the road network in these areas suggest different ways to intervene, depending on the level of accessibility. Roads with low accessibility scores can be viewed positively by residents, because they are safer. It is therefore necessary to strengthen this sense of security by promoting the street as a community space. Roads with intermediate accessibility scores, on the other hand, can correspond to the need to make it a real public space with more services and urban quality. These places also express different urban identities. Being peripheral areas, residential enclaves, and fractions, we infer that fragility can be a characteristic that these identities share, since the peripheral areas are subjected to transformations, the sense of security of the enclaves is induced, and the

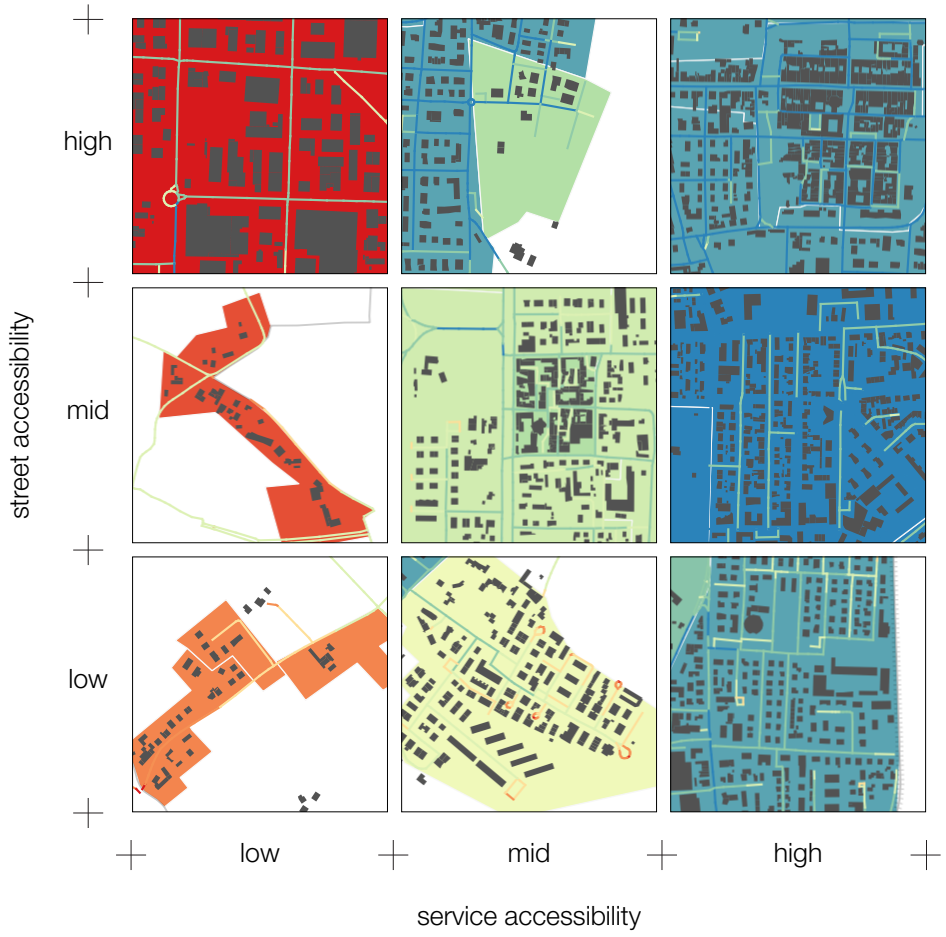

Figure 5.5. Accessibility grid with urban patterns of Castel Bolognese and Faenza. (source: author)

hamlets risk being crushed by comparison with larger towns;

– High service accessibility. This range includes the areas with the highest density of services (>24 POIs, average: 20). Articulating this area by levels of street accessibility, we find that areas with low values correspond to cul-de-sacs and recesses in residential settings and old towns, while areas with intermediate levels of street accessibility correspond to well-established urbanizations just next to old towns. The areas with the highest values in terms of road accessibility and services make up the old town; in the grid, Castel Bolognese was chosen instead of Faenza because the latter has some recesses next to roads with very high accessibility.

As in the previous two cases, the accessibility patterns in this case once again highlight specific mobility needs. In particular, design choices must be focused on maintaining and promoting the urban quality of these areas. Smart mobility solutions will enhance relationships between services and the road network, particularly in areas with high and intermediate values, promoting new mobility

models. Contrary to what has been found in other areas, here the roads with low accessibility scores are complementary to the urban fabric, as can easily be seen in the old town of Faenza, and we do not believe they should lose this feature. With the same level of accessibility, we can make out different urban identities. This includes old towns, symbols of a city's historical identity, and the residential areas which surround them.

From the above analysis, it is interesting to note that there is no urban fabric pattern with maximum values in all categories, a sign that to achieve high urban quality it is necessary to balance the level of accessibility to services and roads within the urban fabric. At the same time, it should be noted that the different patterns identified in the analysis correspond to different mobility needs in terms of urban services, the road network and local identity. The accessibility grid is therefore a useful design tool to help focus and classify the different types of urban fabrics and mobility needs, providing the first guidelines for the design of smart mobility solutions.

5.4. Step 3: assessing accessibility patterns

The comparative analysis of the level of accessibility to services and the road network has identified a series of accessibility patterns and the main mobility needs. To achieve the overall smart mobility vision, we expressed these findings in terms of smart mobility solutions. We then compared the design tools and smart mobility solutions already discussed in the previous sections with all the accessibility patterns to seize their respective field of application. The discussed tools and solutions include the most relevant street innovations [see section 1.2.1], the smart mobility solutions cited in the literature review and in the most relevant EU smart mobility programs [see section 2.5], and the selection of smart mobility applied research conducted in the URF [see section 3.3].

The selected interventions were divided into three main categories: those concerning the bicycle network, those concerning the road network more generally, and those involving the urban services network in the area. The interventions concerning the community, although present in chapter 3, have not been included because they do not directly relate to the scope of this section. These tools and solutions range from short-term affordable interventions to more cutting edge technologies and consistent economic investment. Many of them – especially the ones resulting from applied research – have been already tested or designed for this zone, and their application needs to be intensified or broadened in scope. Other tools have been tested in other contexts and may need to be assessed to match the specific needs of the research area. Thus, we would also stress the fact that all of the listed tools and solutions are not exhaustive. They do not include all street design solutions, cutting-edge technologies or mobility policies of the whole smart mobility panorama. Rather, these tools and

solutions are a selection from our literature review and our research experience in this field, aiming to provide well-tested key examples that can effectively improve smart mobility in small and mid-sized towns.

In order to associate the discussed solutions and design tools with accessibility patterns, we analyzed the scope of experimentation of the different measures (means of transport, behaviors, and infrastructure) and which of these actually had an impact on the accessibility grid. Given that the grid is based on the physical characteristics of the mobility spaces, such as the topological composition of the spaces and the position of the POIs, it was evident that the solutions regarding vehicles and services did not affect the accessibility grid. In order not to exclude them from the analysis while maintaining the attention on urban design issues, we have analyzed the interventions focusing on their potential impact on service and street accessibility, their synergy with innovative mobility options, and their compatibility with means of transport.

Impact on service accessibility checks whether the measure investigated can increase the number of services for each of the five categories indicated in the methodological framework [see section 4.3]. The findings highlight how the various actions can also have a significant impact on increasing the level of accessibility by proximity to urban services, provided that urban services such as walking bus stops, neighborhood bookstores, social care services, spaces for cultural events, green spaces and playgrounds, and smart lockers or spaces for e-commerce are created in mobility spaces.

Impact on street accessibility checks whether the investigated measure can effectively change the topological structure underlying the accessibility modifications [see section 4.3.5]. This can be done by changing the intersections in the selected area or by changing the road layout. The findings confirm what is intuitive, namely that only major structural interventions can change this indicator. In addition, modifications to the road layout or limitations on the number of vehicles (e.g. LEZs or shared streets) can only have an impact to the extent that they alter the road graph. This on the one hand highlights the importance of the choice and construction of the road graph (e.g., whether to consider roads for pedestrian use only, or whether to take the road axis or weigh it with the different destinations of use), yet on the other hand it gives a lot of importance to the design phase, serving as a preliminary analysis of the topography of the road.

Synergy with mobility services investigates whether these measures can promote the smart mobility solutions identified in the study. To make them easier to interpret and analyze, the solutions proposed in the previous sections have been grouped by macro-themes. The analysis criteria were as follows: if the measures can offer physical support for e-services, if they can be included in MaaS platforms, if they can be implemented with IoT solutions and generate useful data in this area, if they can be spots which increase local connectivity, if they encourage the adoption of smart parking solutions, if

they are measures that require a mobility app, and if they provide support for the creation of smart communities. The results highlight how smart communities, MaaS and IoT are the most recurrent solutions. To properly interpret this data, it is necessary to remember what has already been underlined in the literature review section: that is, while the economic investment can be limited in the first case, in the other two, the investment is more substantial and has limited its use. Another element of interest is that the field of connectivity and e-services is limited in its compatibility, although regional policies and the literature indicate them as an important element (Manzini, 2021). One reason for this lies in the structure of the analysis, designed to recreate the conditions of 'accessibility by proximity' rather than virtual proximity, which is more difficult to detect and promote through town planning.

Compatibility with means of transport detects which of the proposed infrastructural upgrades can expand the transit potential of the various transport systems. The findings highlight how road innovations do not exclude any vehicle types a priori, but rather reduce the importance of motor vehicles in favor of active mobility. On this last point, the measures designed to strengthen the cycling network highlight that the most recurrent solutions are those of shared mobility, micromobility and drones. Once again, these results must be framed in light of what is illustrated in the previous sections, i.e., how these solutions are promising but respectively do not belong to the local mobility culture, their widespread adoption is limited as they are easily replaced by privately-owned e-bikes, and their use is limited due to legal and technological constraints.

Lastly, for each of them, a qualitative analysis was carried out on the relationship between the individual measures and the main dimensions of civic identity. Similar to what was done in other sections of the study [see section 2.4.1], we considered physical settings, activities and meanings as the three overarching domains of our analysis. Despite the limitations of a qualitative analysis, the results show that the interventions, principally affecting to the physical aspects of the zone, mainly involve the 'physical settings' category. The second most frequent category is that of local needs, which can be activated if the measures meet the specific needs of the context. The 'meanings' category is the least common because it is more difficult to activate as some interventions are complex enough to require the involvement of technicians, stakeholders and the local community.

After analyzing the opportunities and limitations of design tools and smart mobility solutions, they were associated with accessibility patterns to verify the compatibility of the measures and urban fabrics and to draft design guidelines. Annex 3 illustrates the findings.

5.4.1. The LL LM patterns

LL LM patterns have a low average level of accessibility and correspond to the more or less isolated hamlets found in the area studied. The changes in the plan concerning the bicycle network, the road

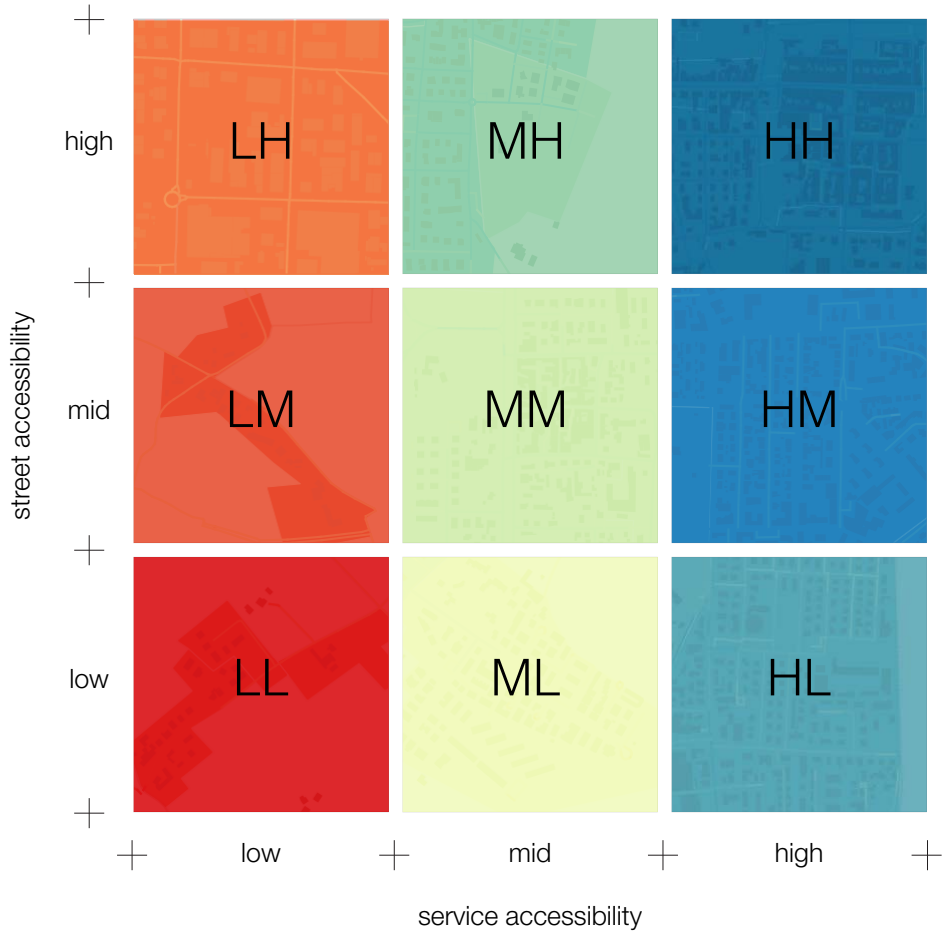

Figure 5.6. Accessibility grid and pattern names. (source: author)

network and the services selected for this area are designed to meet local mobility needs. Changes to the cycling network (soft trails, leisure cycling, cycle paths) create an active mobility-by-proximity network to offer an alternative to the use of private cars for leisure and work. Changes to the road network, to be applied to the roads considered most significant, improve connections to urbanized areas (the car park network) and social networks (shared roads, 20 km/h zones) to enhance local identity. Changes to urban services are designed to bring innovation to existing ones, transforming them into proximity hubs, and to implement them through urban micro-services compatible with different features, such as apps and sharing spots.

These changes update the existing mobility model by creating a different mobility user experience, one the hand increasing the number of local services available, and, on the other, altering a road network that is incompatible with proximity travel. Nevertheless, we note that a cost/benefit analysis of these interventions must consider the proportion of transit at stake and therefore the level of proximity to be promoted. On the basis of what has been highlighted in the previous sections [see section 5.3], we can deduce how the attempt to enhance mobility by proximity concerns a reduced

number of trips, mainly those pertaining to free time and short trips, leaving the main portion to longer trips to the main town centers. The crucial role of services (e.g., e-services) and vehicles (SMs, electronic bikes, DRT, CAVs) comes to the fore, while highlighting how the analysis of the case studies [see section 3.3] has shown that they can coexist in a mobility-by-proximity setting.

5.4.2. The LH pattern

The LH pattern, which is scarcely present in the zones analyzed, basically concerns industrial and service areas. Even in this case, the design actions are directly linked to local mobility needs. In particular, changes to the bicycle network aim to connect these areas (which are often poorly incorporated into the surrounding urban fabric) with the existing bicycle-pedestrian network. Smart parking updates the road network to reduce parking areas and to better align their reuse with the objectives of the smart mobility vision. Changes to the services offered are designed to complete what is currently provided, offering small, specific hubs to support the needs of city users (e.g., lockers, charging stations, etc.).

These changes are intended to update the existing mobility model mainly by increasing the level of reachable proximity services. No changes to road accessibility have been proposed, due in part to the medium-high numbers associated with this pattern and because we believe it is more effective to focus on mobility services or vehicles, as illustrated in chapters 2 and 3. It is also for this reason that there are fewer changes compared to the LL LM patterns. Applying these considerations to the smart mobility vision, we can see how selecting the project actions to adopt is motivated by the objective of reconnecting these areas to the service and active mobility networks to promote greater proximity where possible. As in the previous case, however, it should be underlined that the cost/benefit assessment must consider the share of travel potentially affected by these measures. Given that motorized transport will continue in these areas, we believe that the promotion of alternative means of transport to private cars (e.g., SM, electronic bikes, DRT, CAVs) will play a fundamental role, in addition to the infrastructural changes described above, if the smart mobility vision is to be achieved.

5.4.3. The ML pattern

The ML pattern corresponds to car-centered suburban developments disconnected from the main road network. As indicated in the analysis of mobility needs, the selected changes are designed to improve neighborhood quality. Modifications to the road network through lower speed limits, the incorporation of school transport and the road layout are designed to increase the sense of safety

and to make it easier to cross the street. Updates to the services provided are designed to respond in a timely manner to the possible lack of urban services with proximity service hubs. Given the type of urban fabric which has given rise to this accessibility pattern, we have tried to update these areas rather than alter the bicycle-pedestrian network.

These modifications improve the existing mobility model by incorporating the services currently provided and by encouraging a shared use of the road. We have tried to limit changes that might increase road accessibility as we believe that the relative isolation of these areas is a feature sought by the inhabitants, one that gives rise to greater privacy and safety. Changes to the roads mainly impact their layout, proposing solutions which are already proven, such as shared roads, which can in turn create improvements given their synergy with mobility services and vehicles. In particular, smart communities and shared mobility are solutions compatible with the specific needs of these areas, improving their street ecology. Applying these reflections to the broader framework of the smart mobility vision, we can envision these areas as places in which to generate a new sense of community based on values shared by residents and city users. The aim is to strengthen the sense of proximity, particularly in terms of social ties. In this sense, the cost/benefit analysis must consider how these results can be achieved through temporary actions or greater incorporation with the services and means of transport described above.

5.4.4. The MM pattern

In the area examined, the MM pattern identifies secondary towns and larger hamlets, the well-established residential areas within Faenza and CB, and tertiary areas. Their mobility needs, in particular the need to connect to services and public spaces, and the strategic nature of these areas have led to the selection of changes which concern both the cycling network and the road network and services.

Changes to the bicycle network (soft trails, and cycle paths of all types) strengthen infrastructure to promote active mobility for trips of different lengths, for both leisure and work. The updates to the road network are in-line with those discussed in the LM and ML patterns; they promote the creation of social networks (shared roads, 20 km/h zones, etc.) to enhance the local identity. Lastly, modifications of urban services concern both the enhancement of existing ones and the inclusion of targeted smart urban services. They can be integrated with those identified in the other patterns to improve service quality.

These modifications improve the mobility model both in terms of accessibility to services, incorporating what is not available and updating existing services, and in terms of accessibility to the road network

by promoting better connections with the existing network and a different road layout. With a view to a cost/benefit analysis, it should be stressed that the range of modifications proposed must be pared down to those most compatible with local mobility needs and the characteristics of the urban fabric. Within the smart mobility vision, these places can be seen as proximity centers, equipped with all the essential services and connected to each other by cycle paths or shared mobility, and can make a decisive contribution to reducing the use of private cars.
Compared to the other patterns considered above, the ability to strengthen the character of these centers is specific to the town plan, creating mobility spaces that, in addition to improving accessibility to roads and services, create identity-constituting, safe, and inclusive spaces.

5.4.5. The MH pattern

The MH pattern, though rare in the analyzed landscape, corresponds to areas which are currently being completed, well connected to the center but not yet fully built. The proposed modifications and the approach are in line with those of the ML pattern, designed to improve the existing mobility model by increasing the services provided through specific modifications and by promoting a road layout that privileges more vulnerable road users. Given that these areas are limited in number and not yet completely built, also in this case they can become places defined by a new relationship between roads and the urban system, similar to the experiments seen in chapter 1.

5.4.6. The HL pattern

The HL pattern mainly identifies the backroads within the historical urban fabric, those with lower urban intensity which counterbalance the most vibrant streets in these areas. As this pattern doesn't particularly affect the quality of mobility spaces and is closely linked to the HH pattern, it will be dealt with in that section.

5.4.7. The HM pattern

The HM pattern corresponds to well-established urbanized areas adjacent to old towns. The modifications proposed are designed to meet the identified mobility needs, mainly linked to the need to improve urban quality in these areas through smart mobility.
The actions selected concern the bicycle network, the road network, and services, and are not unlike what was outlined in the MM pattern. With regard to the cycling network, the prescribed actions are designed to reinforce and connect the existing network to boost active mobility for both leisure and work. Changes to the road network are intended, on the one hand, to reinforce civic decorum and

the identity of the neighborhood, and, on the other hand, to reorganize the rest areas by managing incoming journeys with ground-level car parks or park&ride locations. Finally, changes to urban services seek to broaden the current broad panorama by including targeted smart urban services. Also here, they can be incorporated with those mentioned in the other patterns to improve service quality.

These changes upgrade the current mobility model to improve the level of road accessibility and the quality of the street layout and of services. Compared to the areas previously analyzed, improvement here does not arise from a quantitative point of view but from a qualitative one. Accessibility to services is improved with new services (e.g., smart walking buses, smart benches, etc.) or existing ones (e.g., stands for children) which better meet the needs of the local community and city users. Road accessibility is not substantially modified, since this pattern corresponds to well-established built areas, though changes to the street layout are proposed to reorganize road user priority rankings. A cost/benefit analysis will need to consider the above elements and the number of residents and city users potentially affected by the changes. With a view to the smart mobility vision, these places are of strategic importance as they can already be redirected, with a few changes, to accessibility by proximity. On the one hand, this makes it possible to promote models of mobility by proximity which already exist (at least in part), given that bike use is already widespread in these areas [see chapter 3]. Secondly, the density of buildings and dwellings can make it possible to implement weightier solutions from a technological and organizational point of view. The means of transport and mobility services to be implemented, from shared mobility to CAVs, from the smart community to MaaS, play a strategic role and must not be the end but the means through which to create neighborhoods with widespread accessibility by proximity.

5.4.8. The HH pattern

The HH pattern corresponds to the central areas of Faenza and Castel Bolognese or the two old towns. The former, which is more extensive and complex, alternates high road accessibility scores in the main streets and low scores in the secondary streets, while being characterized by high accessibility in all service categories. The latter, which is less expansive, has medium-high scores in the various road branches and a high level of accessibility to services compared to the average, although much lower than the center of Faenza (54 v. 170 POIs).

How can we upgrade this type of urban fabric, which is already characterized by a high degree of accessibility to services and the road network? As in the previous case, the objective is to reinforce the quality of these scores through interventions involving the cycle network, the road network, and services. While for this last point the focus is similar to that of the previous pattern, it is also

true that the relationship between these types of built areas and the road network presents some differences. The main one is the possibility of limiting the number of cars which can enter the town center, to enhance active mobility on the one hand and on the other to regulate parking with a series of park&ride car parks arranged along the perimeter of the old town. The regulation of access to the old town can be pursued in a more targeted way, with a law that doesn't exclude the entry of motorized vehicles into the center a priori, or in a more radical way by introducing a car-free zone in the old town. We can also note that the historical urban fabric is structurally compatible with mobility by proximity and at the same time has enough flexibility to adapt to means of transport and services which are completely different from those of the era in which its urban layout was defined.
Bringing these ideas back into the broader framework of the smart mobility vision, we can see these areas as exemplary places, places where we can even try out radical solutions that foster reflection on the current mobility model. As in the HM pattern, the cost/benefit analysis will have to consider an increase in urban quality and also the number of citizens and city users potentially affected by the changes. Another is the exemplary nature of the plan which, by modifying the image of the old town, affects the urban memory of the city and its civic identity. Again, reflection on the means of transportation and mobility services to be promoted must be based on the values expressed in the smart mobility vision.

Further examination of the compatibility between the selected measures and accessibility patterns reveals interesting elements regarding the applicability of the smart mobility vision, the impact on road accessibility and services, and potential set-ups of mobility spaces.
The various interventions proposed differentiate the roles of the various patterns in the smart mobility vision. The objective is to identify and enhance the different forms of accessibility by proximity within the area under consideration. The central areas (HH patterns) exploit the density of housing and services to propose bolder changes both from a technological point of view (IoT) and from a behavioral point of view (LEZs). Well-established built areas and secondary centers (MM, HM patterns) enhance the existing accessibility conditions with upgrades that combine digital technologies and physical interventions to complete the services provided and to improve the street layout. The most reserved or to-be-completed areas (MH, ML patterns) reinterpret their character in light of the proposed changes, becoming places in which to try out community mobility or implement a different relationship between roads and the build environment. The industrial zones (LH pattern) are reconnected to the service and active mobility networks. Hamlets and peripheral areas (LL, LM patterns) promote accessibility by proximity for short routes and leisure time while also helping to reorganize private road mobility. In this way, the 'proximity network' described in section 5.2 is characterized, indicating changes which will help develop the various areas and the connections

to be reinforced. Compared to the X-minute city model of urban areas, there is a greater variety of contexts and a vision of technological innovation linked to the objectives of the overall vision.

The framework of the proposed interventions has a different degree of impact on accessibility to roads and services represented by the accessibility grid. The improvement of accessibility to services is present in different forms in almost all the patterns investigated. While in the hamlets and peripheral areas the interventions are designed to reconstitute adequate services so as to reduce unnecessary travel, in the more central areas they are designed to bring existing services closer to the specific mobility needs and help create even more efficient services. Conversely, interventions that affect accessibility to the road network are more limited. This may be due to the type of analysis conducted which, for the reasons indicated in the methodology [see section 4.3], detects the topological compatibility of the road network with the different transit classes rather than investigating the micro-layout of the roads. Another reason is that, especially in small and medium-sized towns, the main levers which can affect the road network are particularly linked to regulation (e.g., car-free zones, 20 km/h zones) rather than to changes to the network itself. While on the one hand this makes it possible to detect only part of the proposed interventions, on the other hand we consider it useful to an initial analysis of the road network, which can be explored more in detail in the town plan.

5.5. Step 4: from patterns to mobility spaces

By comparing the interventions chosen for the individual patterns, a few useful guidelines on possible mobility spaces arise.

Firstly, the need to strengthen the active mobility system, through means of transport, infrastructure, and behaviors – especially for easily accessible journeys on foot and by bike (<1 km). The selected interventions offer an overview of the main solutions, from bicycle paths to connect the most distant or busy areas, to the promotion of leisure and fitness routes and itineraries, to the creation of routes with smart road signs to increase the safety and quality of the mobility experience in the busiest or central areas. The urban fabric itself has influenced the interventions chosen, confirming the close correlation between cyclability and historical built areas.

Changes to the active mobility system are combined with those pertaining to the road network, which embody in greater detail the proposal made in the smart mobility vision [see section 5.2]. The aim is to make urbanized areas compatible by creating widespread accessibility by proximity. Inclusive and people-centered roads, which in the central areas improve people's sense of security through the creation of LEZs or 20 km/h zones, are transformed in nearby areas to accommodate new types of vehicles, urban services or school transport; in the hamlets and peripheral areas, they reinforce the local identity through timely interventions to redevelop the roadway. Most of them

propose changes the current street layout, promoting traffic calming solutions or testing little-used layouts at the national level such as shared streets. Despite the results of the trial described in chapter 3, the data from the literature confirm how it can be useful to focus on this area to promote accessibility by proximity.

Interventions to existing networks are combined with those of parking management and the optimization of parking spaces. The main areas concerned are the peripheral and central areas. While in peripheral areas the proposal is to optimize vehicular traffic through a reduction in the necessary journeys and parking management systems in sensitive areas, in central areas, the creation of multi-modal car parks is proposed, combining them with smart parking solutions to promote intermodal transit. These considerations take into account a short-term evolution of the means of transport, with the limited replacement of travel from private cars to active mobility. The spread of EVs and CAVs may radically change these considerations and will require additional research in the future. However, as indicated in section 3.3.8, to play an active role in innovation, the meshing of the urban fabric and new means of transport must always be in dialogue with the city identity and development vision.

All these design choices are combined with urban services and smart mobility solutions. In urbanized areas, they are implemented similarly in terms of quantity, maintaining different characteristics in relation to the specific conditions of each individual pattern. In areas with specific needs (LH, ML, MH patterns), the number of modifications is limited to those which are strictly necessary. In all cases, the role of urban services is fundamental in small and medium-sized towns, both in physical terms (e.g., mobility hubs, ride-sharing benches), because it constitutes a network of services that qualifies mobility spaces, and in intangible terms (in particular, e-services, mobility platforms and smart communities), because it favors relationships in zones with low population density and services.

5.6. Step 5: implementing the roadmap

5.6.1. Identifying areas of need

Identifying the areas where design actions are more needed is an essential step because it allocates available resources, which are more limited than in urban areas, to areas considered most appropriate reducing inequalities in accessibility. Local communities, designers and administrations, usually have a deep knowledge of the most relevant locations.

The territory map in terms of service and street accessibility [see section 5.3] can offer quantitative support to comments and observations, helping us better understand the specific needs of different areas and select the places which should have a higher priority.

A map of the zones which includes urban services, roads, and travel distances makes it possible to more accurately identify the accessibility gaps of different locations. These gaps may be related to a

Figure 5.7. Design concept for a future “slow route” connection between Castel Bolognese and Faenza that runs along the Via Emilia and the surrounding rural road system. (source: author)

specific service domain, or their street condition may be related to the selected level of accessibility by proximity. For instance, a few urban services compared to the nearest urban areas or a street pattern that does not match short trips.

In addition to helping to identify specific areas, this gap analysis provides further guidelines on the level of accessibility and urban character when compared with the 'accessibility grid'. The accessibility grid can be used as a valuable support when identifying the most compatible measures in similar contexts, assisting designers and acting as a first basis for discussion for local communities and stakeholders.

With regard to the geographical areas covered by this study, most of the industrial areas and hamlets have a low level of accessibility to services (>13 POIs, average: 20) with the latter characterized by a medium-low level of road accessibility. Another possible interpretation concerns street accessibility in residential areas, checking the parts less compatible with proximity services. Or, one could investigate the central areas, detecting the places where, whilst performing well in terms of accessibility, an adequate street layout is lacking. The analyses presented above offer different interpretations of the landscape and possible strategies for change, to be contextualized in the smart mobility vision and in constant dialogue between stakeholders, public authorities and the local community.

5.6.2. Creating an action plan

After identifying the areas of need, an action plan should be created. The Action Plan should indicate the different actions to be performed in the relevant planning cycle. Given the examples of the previous point, an Action Plan can concern the improvement of accessibility to services in industrial areas, trial implementations of e-services in hamlets, or the modification of the street layout in central areas. Each project associated with the Action Plan should indicate the current conditions of the site in terms of accessibility and mobility needs, a description of the proposed design actions, and their impact to achieve the smart mobility vision goals. According to Büttner et al. (2022), 'Action plans usually include "what", "who" and "when". After identifying the areas of need in your city, the action plan should consider: actors' responsibilities, a timeline for activities and measures, and budgets to achieve the main vision objectives that would be depending on each city context and needs. Additionally, it should include a citizen's engagement process and evaluation plan that runs even before and after street interventions are implemented.' In the following, the objective is to coordinate the various actions on the ground in the Action Plan with a specific focus on a single need of the smart mobility vision.

5.6.3. Design phase and implementation

The timeline of the Action Plan indicates the single design actions. With this as a starting point, the projects address the double challenge to contribute to the Action Plan goals while providing a visible change in the city in a shorter time span.

Since they are mostly brand-new solutions in this territory, every design action is often divided into multiple steps according to tactical urbanism principles. The design pipeline does not examine a measure's implementation just once, but instead adds immediate measures such as street experiments and localized street interventions that prove to have positive outcomes in a shorter period of time. This method of intervention, in a long-term strategic vision, can allow stakeholders and local communities to monitor, gather feedback, analyze, and obtain useful insights for the next design steps. This makes it possible to optimize resources for the project and monitor the various design actions within the Action Plan.

Regarding the relationship between the accessibility patterns and the single smart mobility solutions analyzed in section 5.4, we can see how the project consists of adding, incorporating, and hybridizing the various solutions, bringing them back to the urban scale to concretely realize the smart mobility vision. In this process, we believe that the key design principles illustrated in section 3.4 can remain the same even in the context of the smart mobility vision. This is because the key design principles refer to interventions proposed for small and mid-sized towns and are based on the key elements of the smart mobility vision. Among these we point out the role of proximity to essential services, indicated as the main element when creating physical relationships and generating a sense of community and urbanity, and walkable and cyclable streets, an important factor even in small and medium-sized towns where many journeys can be replaced by cycling or walking. In addition to achieving the smart mobility vision, the key design principles are crucial factors for the improvement of urban quality.

In addition to the key design principles, the smart mobility project connects mobility domains – vehicles, infrastructures, and behaviors. Just think of two of the applied researches mentioned in Chapter 3: a smart community for home-school transport that creates an opportunity to invest in infrastructure and reduce the use of private cars, or the creation of experimental shared roads to promote a new business model and greater road safety. In this perspective, we can see how the 'smartness' of these projects lies above all in the ability to incorporate the different ways in which the city is 'smart', and grasp how these relationships affect mobility spaces. The use of technological solutions (CAVs, MaaS, AI) is a powerful accelerator of innovation, though it is not a necessary condition for their activation, especially in small and medium-sized towns.

Finally, we want to emphasize that these projects have an impact not only quantitatively (for example, by improving accessibility or creating new services), but also qualitatively, affecting the urban identity of the geographical area. Being a fundamental area but difficult to describe fully in an analytical way, we have noted how the analyses of accessibility to services and the road network illustrated above come to identify the areas potentially involved (the physical setting, meanings, activities), while the design action has the ability to concretely shape local urban identity. The choice of materials and shapes, the relationship with the context and historical memory, the involvement of all or part of the local population, and the degree to which technological solutions are incorporated are just some of the factors that can change the inner character of the place.

5.7. Chapter bibliography

Bertolini, L., Clercq, F.L. and Kapoen, L.L. (2005) 'Sustainable accessibility: a conceptual framework to integrate transport and land use plan-making. Two test-applications in the Netherlands and a reflection on the way forward,' Transport Policy, 12(3), pp. 207–220. https://doi.org/10.1016/j.tranpol.2005.01.006.

Büttner et al. (2022) Urban Mobility Next 9. ±15-Minute City: Human-centred planning in action Mobility for more liveable urban spaces. Available at: https://www.eiturbanmobility.eu/wp-content/uploads/2022/11/EIT-UrbanMobilityNext9_15-min-City_144dpi.pdf (Accessed: 16/12/2023).

Champion, C. (2016) A new way of mapping London's roads. Available at: https://www.ifmeworld.org/blogs/chris-champion/2016/04/05/a-new-way-of-mapping-londons-roads (Accessed: 03/02/2024).

Geurs, K.T. and van Eck, R. (2001) Accessibility Measures: Review and Applications. No. RIVM Report 408505 006. Available at: https://rivm.openrepository.com/handle/10029/259808 (Accessed: 03/02/2023).

ISFORT (2022) 19th Report on the Italian Mobility "Audimob". Available at : https://www.isfort.it/progetti/19-rapporto-sulla-mobilita-degli-italiani-audimob/ (Accessed: 27/03/2023).

Larsen, J., El-Geneidy, A. and Yasmin, F. (2010) 'Beyond the Quarter Mile: Re-examining Travel Distances by Active Transportation,' Canadian Journal of Urban Research, 19(1), pp. 70–88. ISSN 1188-3774.

Manzini, E. (2021) Abitare la prossimità. Idee per la città dei 15 minuti. Milan: Egea.

Marshall S. (2005) Streets and patterns, New York: Spon Press.

VINNOVA (2023) Street Moves 2. Available at: https://www.vinnova.se/en/p/street-moves-2/ (Accessed: 03/02/2023).

Chapter 6.
Conclusions and further research

6.1. Conclusions

This reseach showed how promoting Smart Mobility projects in small and mid-sized towns can improve the service and street accessibility of territories, and build innovative scenarios capable of leveraging the opportunities of the ongoing environmental, social, and technological revolution. In the Italian context, this need is even more pronounced because the territory is predominantly composed of small municipalities. Activating these processes can have a significant impact on managing shrinking phenomena and population aging processes that characterize these areas.

To address this need, we have proposed design tools - case studies, analyses, guidelines - that bound the physical dimension of the territory, its service accessibility, and the most effective smart mobility solutions in small and mid-sized towns. An inclusive approach based on a careful analysis of the current state of the art, main findings in literature, and a series of applied research conducted in our study field.

In the first chapter, besides framing the research context, a series of international experiences congruent with the thesis' aims were identified. The second chapter conducted an extensive literature review, acquiring adequate knowledge of the European state of the art regarding smart rural mobility and identifying a series of case studies already tested in similar contexts, highlighting threats and opportunities of these solutions. The third chapter illustrated a series of applied researches resulting from the author's experiences related to smart mobility projects in the study area. A series of urban and architectural projects that promote a different mobility paradigm through the use of innovative urban resources, such as digital technologies. Furthermore, these applied researches take advantage of the design of public spaces and street layout as tools that trigger this change.
The various sources used and the conducted analyses allowed for a critical evaluation of different smart mobility solutions and consciously integrating them into the research. In particular, each of these solutions was analyzed in relation to the others to frame it correctly and highlight its potential contributions to achieving research objectives.
The fourth and fifth chapter explains how, starting from the knowledge acquired in the previous

chapters, it is possible to formulate a series of guidelines on smart mobility for small and mid-sized towns. The adopted perspective aims to enhance proximity and accessibility, using available technological, design, and social resources to improve these fundamental dimensions of the city. A theme considered essential as it is deeply connected to the level of innovation, urban health, and urban identity in relation to mobility spaces.

The smart mobility guidelines illustrated in the fifth chapter develop a five-steps roadmap to put in practice a 'smart mobility vision' in small and mid-sized towns:

– The first point, in our opinion the most important, is the promotion of an innovative vision of the town's future mobility, here called 'smart mobility vision', to understand the priorities and values from which to start.
– The second point is the analysis of the current level of accessibility, and the assesment with the future mobility vision. In this way, the territory is analyzed in relation to existing accessibility and urban form to understand how compatible it is with the smart mobility vision.
– The third point is the assessment of this accessibility map, identifying recurring patterns within the analysis perimeter. This generates an accessibility grid that orders different areas based on the smart mobility goals to promote.
– The fourth point is the definintion of smart mobility interventions starting from the accessibility patterns previously identified. The research already provides a series of smart mobility solutions to start from, resulting from the described researches and analyses. These interventions are not to be understood as ready-made solutions but as references to adapt and shape based on the characteristics of the context and local mobility needs.
– The fifth point concerns the design and management of the smart mobilty solutions, pointing the need to organize them over time and space to make them more effective and increase their economic and technical feasibility.

We believe that the main objectives outlined in the first chapter have been achieved. In our opinion, the most original elements of the research are described in the third, fourth, and fifth chapter. In the third chapter, a series of brand new applied researches are presented in relation to the territorial context, illustrating the importance of a combined use of design tools with technological solutions and social issues. The projects, besides increasing regional knowledge of the state of the art, represent a series of interesting case studies of a 'controlled' innovation capable of generating territorial value and influencing the quality and identity of places. The analyses in the fourth chapter illustrate in a series of maps the conceptual models and operational tools already present in the literature. The accessibility maps are based on the needs of small and mid-sized towns, limiting the extensive use of data and

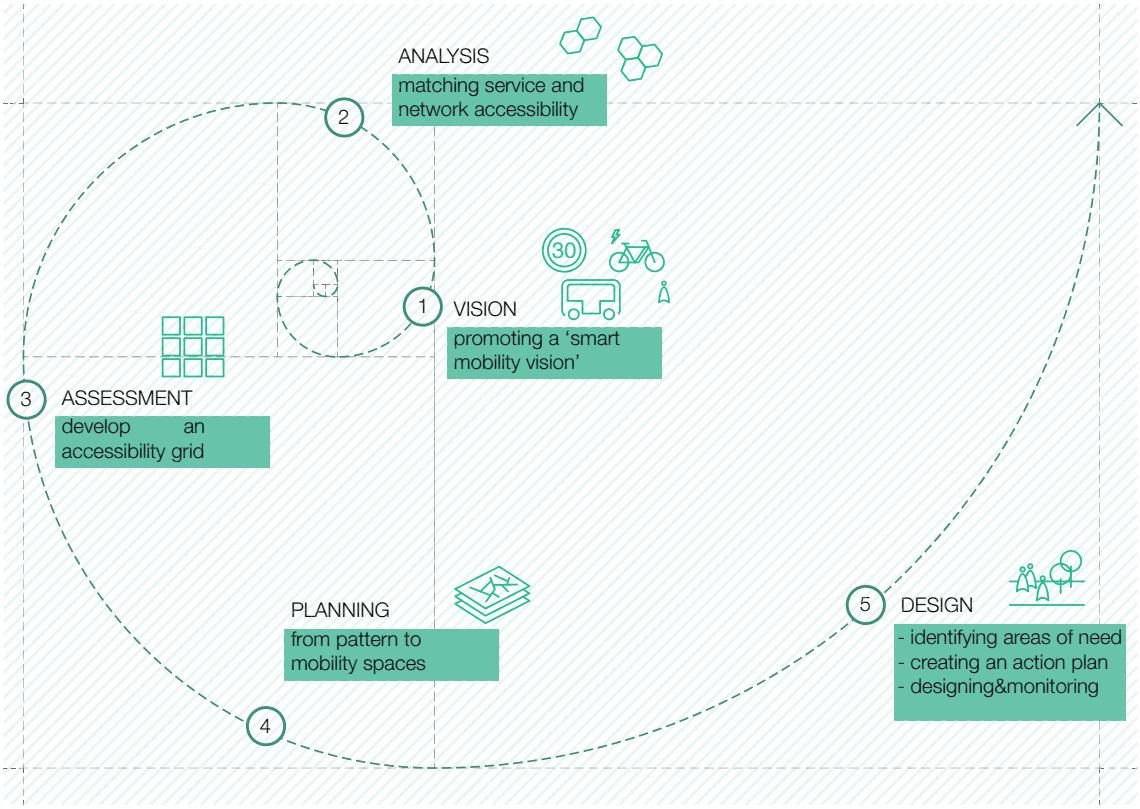

Figure 6.1. Diagram of 'Smart mobility design guidelines' main steps. (source: author)

elaborations often not present in these contexts, to promote the production of effective decision support tools for these territories. In particular, the combined mapping of accessibility to the road network and accessibility to urban services represents, despite all due abstractions, an interesting evolution in the landscape of accessibility analyses present in the literature, especially in small-scale contexts like the one studied.

Another element of originality in the research is the constant reference to the theme of urban identity. An elusive issue, that we have tried to address based on consolidated literature references and using qualitative analyses. We used this approach to do not trivialize the importance of this topic and its relevance in urban design.

6.2. Limitations and further research

At the same time, we can identify a series of limitations and recommendations for future research. Firstly, the possibility of investigating in more detail the classification of services, differentiating analyses on the different added value to each types of services. Secondly, future researches could further develop the relationship between accessibility and the impact it has on climate change.

An aspect that has dramatically presented itself in these areas with the 2023 flood. An event that has highlighted how the considerations proposed here cannot ignore the need for adequate risk management derived from events of this territorial scale. The last aspect we recommend to develop is the possibility of creating synergy with DESIER, the indicator that measures the level of digitization of municipalities in the Emilia-Romagna Region. This indeed contains several indicators linked with those studied in our research, such as those concerning connectivity, and can serve as a starting point to identify a regional 'smart mobility readiness' indicator based on DESIER and this research.

Moreover, we believe that the results of this research can be useful for public administrations, stakeholders, and designers involved in smart mobility. For public administrations, especially those in the Emilia-Romagna Region, this research represents a first attempt to arrange the activities carried out, a valuable contribution to the existing state of the art with the presentation of a series of applied researches in the field of smart mobility, and a proposal for design tools and guidelines useful for developing innovative projects and policies in small and mid-sized towns. For stakeholders, this research can provide interesting analyses and documents on the implementation of smart mobility at the European level, with the possibility of developing solutions focused on promoting smart mobility and territorial accessibility. For designers, it provides a more detailed understanding of the contribution that urban design can provide to smart mobility and the potential impacts of these solutions on accessibility and urban identity.

The journey continues.

Final Acknowledgements

To stay on the topic of research, this PhD has been a rather long journey. Like all journeys, it has been made up of good and challenging times, and finally, it has coming to an end. These few lines express my heartfelt gratitude to all those who have contributed to this research, even those not explicitly mentioned.

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Annexes

Annex 1

This annex provides a comprehensive breakdown of every stage of the literature review and best practice analysis outlined in Chapter 2. The tables included here offer a more in-depth perspective on the various literature sources and facilitate a wider understanding of the research methodology and its results.

literature research - results phase 1 and 2

title	issues	WoS reference
Impact assessment of rural PPP MaaS pilots	*SM*	*https://www.webofscience.com/wos/alldb/full-record/WOS:000572737100001*
"Smart settlements" : the development concept in a new socio-economic and informatiologic conditions	*SM*	*https://www.webofscience.com/wos/alldb/full-record/WOS:000446160800050*
The Use of IoT Technology in Smart Cities and Smart Villages: Similarities, Differences, and Future Prospects	*SM*	*https://www.webofscience.com/wos/woscc/full-record/WOS:000557720000001*
Smart Age-Friendly Villages: Literature Review and Research Agenda	A	https://www.webofscience.com/wos/woscc/full-record/WOS:000881681700157
Sustainable and Community-Centred Development of Smart Cities and Villages	*SM*	*https://www.webofscience.com/wos/woscc/full-record/WOS:000543421400019*
Using multi-layer nested network to optimise spatial structure of tourism development between urban and rural areas based on population mobility	T SM	https://www.webofscience.com/wos/woscc/full-record/WOS:000765417600001
Smart Cities Evaluation A Survey of Performance and Sustainability Indicators	N	https://www.webofscience.com/wos/woscc/full-record/WOS:000450238900075
Smart Card Mobile Data Collection System Concept for Health and Medical Data Collecting Activities in Rural Area	A	https://www.webofscience.com/wos/woscc/full-record/WOS:000330049600084
A Smart Rural Project for Tourism of Madeira Island	T	https://www.webofscience.com/wos/woscc/full-record/WOS:000465811804063
The Concept of a Smart Village as an Innovative Way of Implementing Public Tasks in the Era of Instability on the Energy Market-Examples from Poland	E	https://www.webofscience.com/wos/woscc/full-record/WOS:000833301000001
Planning Digital Transformation of Care in Rural Areas	A	https://www.webofscience.com/wos/woscc/full-record/WOS:000718365000135
Digitalisation and Future Challenges in Rural Areas: An Open Innovation based Research	A	https://www.webofscience.com/wos/woscc/full-record/WOS:000571433400012
Introduction of emerging mobility services in rural areas through the use of mobile network data combined with activity-based travel demand modelling	SM	https://www.webofscience.com/wos/woscc/full-record/WOS:000941072400001
Unlocking the Joint Potential of Electric Mobility and Rural Electrification - A Concept for Improved Integration using Modular Batteries	SM	https://www.webofscience.com/wos/woscc/full-record/WOS:000886199600100
Smartphones support smart labour		https://www.webofscience.com/wos/woscc/full-record/WOS:000393878700006
Rural Community Development Click-by-Click. Processes and dynamics of digitally supported social innovations in peripheral rural areas	P	https://www.webofscience.com/wos/woscc/full-record/WOS:000822529100006
Sustainable Mobility in Smart Cities: The Key Role of Gamified Motivational Systems for Citizens' Engagement and Behavior Change	*SM*	*https://www.webofscience.com/wos/woscc/full-record/WOS:000664932700010*
Implications of Mobility as a Service (MaaS) in Urban and Rural Environments: Emerging Research and Opportunities Preface	SM	https://www.webofscience.com/wos/woscc/full-record/WOS:000664932700001
Supporting Mobility Planning in Small Cities and Communities with Low-power, Machine Learning Based Sensing	*SM*	*https://www.webofscience.com/wos/woscc/full-record/WOS:000681039400013*
Energy Modelling in Rural Areas with Spatial and Temporal Data in Germany and Czech Republic	E	https://www.webofscience.com/wos/woscc/full-record/WOS:000570535400024
A Demand-Side Approach for Linking the Past to Future Urban-Rural Development	*SM*	*https://www.webofscience.com/wos/woscc/full-record/WOS:000656056300003*
Public Transport Versus Demand Responsive Transport Services in (Extremely) Low Demand Areas: The Case of the Sicilian Hinterland	*SM*	*https://www.webofscience.com/wos/woscc/full-record/WOS:001000789400090*
The role for carsharing in medium to small-sized towns and in less-densely populated rural areas	*SM*	*https://www.webofscience.com/wos/woscc/full-record/WOS:000442713400005*

title	issues	WoS reference
Smart Land: Regeneration and Sustainability in Lost Scenarios and New Performances		https://www.webofscience.com/wos/woscc/full-record/WOS:000444332000003
Sustainable design of rural roads with 2+1 road design: Levels of service and traffic flow performance		https://www.webofscience.com/wos/woscc/full-record/WOS:000372244200005
SMART VILLAGE AS A DIRECTION FOR RURAL DEVELOPMENT	P	https://www.webofscience.com/wos/woscc/full-record/WOS:000526397500002
Smart Age-Friendly Villages: Literature Review and Research Agenda	A	https://www.webofscience.com/wos/woscc/full-record/WOS:000881681700157
It's Not a Fad: Smart Cities and Smart Villages Research in European and Global Contexts		https://www.webofscience.com/wos/woscc/full-record/WOS:000446767700143
Connecting the Smart Village: A Switch towards Smart and Sustainable Rural-Urban Linkages in Spain	P N A	https://www.webofscience.com/wos/woscc/full-record/WOS:000983149300001
Development and Implementation of the Smart Village Concept as a Challenge for the Modern Power Industry on the Example of Poland		https://www.webofscience.com/wos/woscc/full-record/WOS:000758719600001
User Acceptance of Automated Shuttle Buses-Results of a Passenger Survey in Stolberg	*SM*	*https://www.webofscience.com/wos/woscc/full-record/WOS:001000789400089*
DELIVERING ON THE CONCEPT OF SMART VILLAGES - IN SEARCH OF AN ENABLING THEORY	*SM*	*https://www.webofscience.com/wos/woscc/full-record/WOS:000505079600009*
How Do Smart Villages Become a Way to Achieve Sustainable Development in Rural Areas? Smart Village Planning and Practices in China	C	https://www.webofscience.com/wos/woscc/full-record/WOS:000603273800001
The Smart Village Model for Rural Area (Case Study: Banyuwangi Regency)	T	https://www.webofscience.com/wos/woscc/full-record/WOS:000617209100011
IS ICT SMARTNESS POSSIBLE DEVELOPMENT WAY FOR HUNGARIAN RURAL AREAS?		https://www.webofscience.com/wos/woscc/full-record/WOS:000805412200069
Smart Village Planning Framework Using Extenics Theory		https://www.webofscience.com/wos/woscc/full-record/WOS:000403599100017
XMART VILLAGE MATURITY ASSESSMENT MODEL		https://www.webofscience.com/wos/woscc/full-record/WOS:000400168100008
Smart Villages - New Concept of Rural Development of the EU		https://www.webofscience.com/wos/woscc/full-record/WOS:000462093400045
Smart villages, rural development and community vulnerability in Indonesia: A bibliometric analysis		https://www.webofscience.com/wos/woscc/full-record/WOS:000998523700001
Systematic Review and Meta-Analysis of Proposed Smart Village Conceptual Model: Objectives, Strategies, Dimensions, and Foundations	P E N	https://www.webofscience.com/wos/woscc/full-record/WOS:000468880500024
Smart and Climate-Smart Agricultural Trends as Core Aspects of Smart Village Functions	N	https://www.webofscience.com/wos/woscc/full-record/WOS:000593462100001
IoT in smart villages. digitization is only possible if a reliable and robust network and communication infrastructure is installed in the village area		https://www.webofscience.com/wos/woscc/full-record/WOS:000772078400005
THE CONCEPT OF SMART VILLAGES (SMART PLACES) IN EU POLICIES		https://www.webofscience.com/wos/woscc/full-record/WOS:000471959900026
The Smart Village		https://www.webofscience.com/wos/woscc/full-record/WOS:000520068800010
SMART VILLAGE DEVELOPMENT PRINCIPLES AND DRIVING FORCES: THE CASE OF LITHUANIA	P E	https://www.webofscience.com/wos/woscc/full-record/WOS:000505079600002
Towards a Scalable Architecture for Smart Villages: The Discovery Phase		https://www.webofscience.com/wos/woscc/full-record/WOS:000584263000001
HEALTHY AGEING IN SMART VILLAGES? OBSERVATIONS FROM THE FIELD	A	https://www.webofscience.com/wos/woscc/full-record/WOS:000505079600008
A Novel Approach in Information and Communication Technology combined with traditional practices for Smart Villages		https://www.webofscience.com/wos/woscc/full-record/WOS:000405948000067
Development of Smart Rural Village Indicators in Line With Industry 4.0		https://www.webofscience.com/wos/woscc/full-record/WOS:000564224900001
Smart Village as a Model of Sustainable Development. Case Study of Wielkopolska Region in Poland		https://www.webofscience.com/wos/woscc/full-record/WOS:000649678500022

title	issues	WoS reference
Framework for Data Analysis in the Context of the Smart Villages		https://www.webofscience.com/wos/woscc/full-record/WOS:000769447500003
Sustainable Smart Cities and Smart Villages Research: Rethinking Security, Safety, Well-being, and Happiness		https://www.webofscience.com/wos/woscc/full-record/WOS:000521955600215
The potential of smart development of urban-rural communes in peripheral region (a case study of the Lublin Region, Poland)		https://www.webofscience.com/wos/woscc/full-record/WOS:000470061300003
Unequal futures of rural mobility: Challenges for a "Smart Countryside"	*SM*	*https://www.webofscience.com/wos/woscc/full-record/WOS:000598428400001*
Smart villages		https://www.webofscience.com/wos/woscc/full-record/WOS:000363213400001
Increased Attention to Smart Development in Rural Areas: A Scientometric Analysis of Smart Village Research		https://www.webofscience.com/wos/woscc/full-record/WOS:000845718500001
Connecting smart cities and smart villages providing safe, reliable energy delivery	E	https://www.webofscience.com/wos/woscc/full-record/WOS:000842739800013
SMART VILLAGES AND INVESTMENTS TO PUBLIC SERVICES AND ICT INFRASTRUCTURE: CASE OF THE CZECH RURAL DEVELOPMENT PROGRAM 2007-2013		https://www.webofscience.com/wos/woscc/full-record/WOS:000505079600006
Smart and Age-Friendly Communities in Poland	A	https://www.webofscience.com/wos/woscc/full-record/WOS:000535739300146
Rural digital geographies and new landscapes of social resilience	P	https://www.sciencedirect.com/science/article/pii/S0743016718310969
Smart Villages: Where Can They Happen?	$	https://www.webofscience.com/wos/woscc/full-record/WOS:000542144200021
NEW DIMENSIONS OF RURAL COMMUNITIES' DEVELOPMENT IN ROMANIA - SMART VILLAGE CONCEPT		https://www.webofscience.com/wos/woscc/full-record/WOS:000823117400049
Smart street lighting solution for remote rural areas of India		https://www.webofscience.com/wos/woscc/full-record/WOS:000417466800019
What makes a smart village smart? A review of the literature		https://www.webofscience.com/wos/woscc/full-record/WOS:000759950300001
Opportunities and threats of digital transformation for village shops: Coronavirus pandemic as a catalyst?	$	https://www.webofscience.com/wos/woscc/full-record/WOS:000822529100008
Public Participation as a Tool for Solving Socio-Spatial Conflicts of Smart Cities and Smart Villages in the Sustainable Transport System	P	https://www.webofscience.com/wos/woscc/full-record/WOS:000734629100001
Adaptation of smart city models in rural areas		https://www.webofscience.com/wos/woscc/full-record/WOS:000920486300006
Smart Villages Policies: Past, Present and Future		https://www.webofscience.com/wos/woscc/full-record/WOS:000624770100001
Social media mining for smart cities and smart villages research	P	https://www.webofscience.com/wos/woscc/full-record/WOS:000538983900004
(Re)thinking smart in rural contexts: A multi-country study	P E N T A	(Re)thinking smart in rural contexts: A multi-country study
THINKING TOGETHER DIGITALIZATION AND SOCIAL INNOVATION IN RURAL AREAS	P	https://www.webofscience.com/wos/woscc/full-record/WOS:000548811300003
Smart Cities and Charming Villages: New Heritage Processes in the Twenty-first Century		https://www.webofscience.com/wos/woscc/full-record/WOS:000418900000003
Perspectives on Smart Villages from a Bibliometric Approach		https://www.webofscience.com/wos/woscc/full-record/WOS:000851898700001
Smart Eco-Villages and Tourism Development Based on Rural Revitalization with Comparison Chinese and Polish Traditional Villages Experiences	N	
A low-cost web-based smart street lighting		https://www.webofscience.com/wos/woscc/full-record/WOS:000599508100001v
Smart Silver Villages as part of Social Infrastructure for Older Adults in Rural Areas	A	https://www.webofscience.com/wos/woscc/full-record/WOS:000652593600587
The climate-smart village approach	N	https://www.webofscience.com/wos/woscc/full-record/WOS:000432464800012
Collaborative Approach Towards a Smart Sustainable District: The Real Case of Roveri BOLOGNA	P	https://www.webofscience.com/wos/woscc/full-record/WOS:000816142500010
Intelligent Rural Tourism under Digital Background	T	https://www.webofscience.com/wos/woscc/full-record/WOS:000496806800006
DeCASA in AgriVerse: Parallel Agriculture for Smart Villages in Metaverses	N	https://www.webofscience.com/wos/woscc/full-record/WOS:000894969600004

title	issues	WoS reference
Living Labs for Rural Areas: Contextualization of Living Lab Frameworks, Concepts and Practices	P	https://www.webofscience.com/wos/woscc/full-record/WOS:000482261800042
Rescaling and refocusing smart cities research: from mega cities to smart villages		https://www.webofscience.com/wos/woscc/full-record/WOS:000438388000002
Smart City Projects in the Small-Sized Municipalities: Contribution of the Cohesion Policy	*SM N*	*https://www.webofscience.com/wos/woscc/full-record/WOS:000891619100012*
SEEKING AUTHENTICITY: HERITAGE AND VALUE WITHIN THE INTANGIBLE ECONOMY		https://www.webofscience.com/wos/woscc/full-record/WOS:000537816900001
A Low-cost Flexible IoT System Supporting Elderly's Healthcare in Rural Villages	A	https://www.webofscience.com/wos/woscc/full-record/WOS:000475845000024
Achieving universal energy access and rural development through smart villages	E	https://www.webofscience.com/wos/woscc/full-record/WOS:000427817300013
Indicators for the Smart Development of Villages and Neighbourhoods in Baltic Sea Coastal Areas	*SM*	*https://www.webofscience.com/wos/woscc/full-record/WOS:000550152400001*
Barriers to the Implementation of Smart Projects in Rural Areas, Small Towns, and the City in Brno Metropolitan Area		https://www.webofscience.com/wos/woscc/full-record/WOS:000911614000005
Analysis of the needs of small towns and municipalities in the field of SMART services		https://www.webofscience.com/wos/woscc/full-record/WOS:000672800000062
The Role of the Sharing Economy in Rural Areas: A Case Study in Sardinia (Italy)	$	https://www.webofscience.com/wos/woscc/full-record/WOS:000472632200009
Smart Rural Communities: Action Research in Colombia and Mozambique		https://www.webofscience.com/wos/woscc/full-record/WOS:001017872000001
ECOLOGICAL SETTLEMENT AS A SELF-GOVERNMENT MODEL IN RURAL AREAS	N	https://www.webofscience.com/wos/woscc/full-record/WOS:000445502500012
Transforming Communication Channels to the Co-Creation and Diffusion of Intangible Heritage in Smart Tourism Destination: Creation and Testing in Ceuti (Spain)	$	https://www.webofscience.com/wos/woscc/full-record/WOS:000482261800093
Increasing use of mental health services in remote areas using mobile technology: a pre-post evaluation of the SMART Mental Health project in rural India	A	https://www.webofscience.com/wos/woscc/full-record/WOS:000406192700018
Transforming Communication Channels to the Co-Creation and Diffusion of Intangible Heritage in Smart Tourism Destination: Creation and Testing in Ceuti (Spain)	T P	https://www.webofscience.com/wos/alldb/full-record/WOS:000482261800093
SMART MOBILITY AND ELDERLY PEOPLE CAN ICT MAKE THE CITY MORE ACCESSIBLE FOR EVERYBODY?	A SM	https://www.webofscience.com/wos/woscc/full-record/WOS:000454527000003
Solar PV Smart Microgrid for Sustainable Rural Electrification	E	https://www.webofscience.com/wos/woscc/full-record/WOS:000701690400521
How to Establish the Wisdom of Rural Tourism Based on "Internet plus ": Taking Coastal Areas in Shandong Province for Example	T	https://www.webofscience.com/wos/woscc/full-record/WOS:000543720600218
A Systematic Literature Review of Blockchain Technology for Smart Villages	$	https://www.webofscience.com/wos/woscc/full-record/WOS:000712480800002
Bioregioning: Pathways to Urban-Rural Reconnection		https://www.webofscience.com/wos/woscc/full-record/WOS:000668995100003
Alive in Smart Countryside	P	https://www.webofscience.com/wos/woscc/full-record/WOS:000783452900002
Poverty alleviation of "smart countryside": an empirical study on mechanism, innovation model and guarantee systems	P	https://www.webofscience.com/wos/woscc/full-record/WOS:000461167900023
Planning and Implementing Smart Shrinkage of Rural China		https://www.webofscience.com/wos/woscc/full-record/WOS:000465348200005
A Smart and Multifaceted Mobile Health System in china	A	https://www.webofscience.com/wos/woscc/full-record/WOS:000476927500001
More than smart technology: a conceptual framework for Smart Countryside	P	https://www.webofscience.com/wos/woscc/full-record/WOS:000822529100005
SMART CITY-STUPID COUNTRYSIDE Social and Political Implications of the Urban/Rural Split in Japanese Education		https://www.webofscience.com/wos/woscc/full-record/WOS:000371740700015
INTELLIGENT LIGHTING - NEW DIRECTION OF RURAL AREAS DEVELOPMENT IN POLAND		https://www.webofscience.com/wos/woscc/full-record/WOS:000380531200077
The Future of the Countryside	$	https://www.webofscience.com/wos/woscc/full-record/WOS:000529386000071
Experiences and Shared Lessons		https://www.webofscience.com/wos/woscc/full-record/WOS:000672601700014

title	issues	WoS reference
Rural co-working: New network spaces and new opportunities for a smart countryside	$	https://www.webofscience.com/wos/woscc/full-record/WOS:000921058000001
Digitalization and Civic Participation in Rural Areas. A Systematic Review of Scientific Journals, 2010-2020	P	https://www.webofscience.com/wos/woscc/full-record/WOS:000822529100002
Role of Drone Technology in Sustainable Rural Development		https://www.webofscience.com/wos/woscc/full-record/WOS:001003469100022
INTELLIGENT LIGHTING - NEW DIRECTION OF RURAL AREAS DEVELOPMENT IN POLAND		https://www.webofscience.com/wos/woscc/full-record/WOS:000380531200077
BASIC FACTORS OF SMART RURAL DEVELOPMENT CONCEPT FOR THE ANALYSIS OF REGIONAL DEVELOPMENT AND DECISION MAKING IN VIDZEME, LATVIA		https://www.webofscience.com/wos/woscc/full-record/WOS:000395727100018
Countryside Elder Care System	A	https://www.webofscience.com/wos/woscc/full-record/WOS:000298656800048
Social, innovative and smart cities are happy and resilient': insights from the WHO EURO 2014 International Healthy Cities Conference	P	https://www.webofscience.com/wos/woscc/full-record/WOS:000349051600001
Defining 'Smart Rural' in the Framework of Regional Digitalisation		https://www.webofscience.com/wos/woscc/full-record/WOS:000860714900021
Analysis of Preventive Behaviors of Rural Tourism Hosts in the Face of COVID-19 Pandemic: Application of Health Belief Model	T	https://www.webofscience.com/wos/woscc/full-record/WOS:000744994700001
Challenges and Opportunities for Coping with the Smart Divide in Rural America	$	https://www.webofscience.com/wos/woscc/full-record/WOS:000513004400022
Revitalization of Rural Areas of the Carpathian Region in the Context of EU Macro-Regional Strategy		https://www.webofscience.com/wos/woscc/full-record/WOS:000846833100003
Toward the "Smart Polis": methods, tools and strategies of intervention for the sustainable regeneration of historic urban centres.		https://www.webofscience.com/wos/woscc/full-record/WOS:000380548200182
2013 THE ROLE OF LANDSCAPE ARCHITECTURE IN RURAL DEVELOPMENT	E	https://www.webofscience.com/wos/alldb/full-record/WOS:000366464800089
Telemedicine Assessment for the Mental Health of Rural Residents Based on the Safety Degree of Housing in Seismically Active Regions	A	https://www.webofscience.com/wos/woscc/full-record/WOS:000686216700001
Multifunctional spatial management as a chance for smart rural development. A case study from Poland		https://www.webofscience.com/wos/woscc/full-record/WOS:000503758100040
Cloud service for rural tourism management based on human-computer interaction system and internet of things	T	https://www.webofscience.com/wos/woscc/full-record/WOS:001005873600005
"People in Stockholm are smarter than countryside folks" - Reproducing urban and rural imaginaries in film and life		https://www.webofscience.com/wos/woscc/full-record/WOS:000278926000001
Research on promoting innovation in the countryside of Romania	N	https://www.webofscience.com/wos/woscc/full-record/WOS:000410252700085
SEnTINEL - INtELligent Transport SystEm for Urban Mobility Management in Smart Cities	SM	https://www.webofscience.com/wos/woscc/full-record/WOS:000502738800079
Monitoring and Path Selection of Rural Public Service Environment Based on Data Mining Technology in the New Era	$	https://www.webofscience.com/wos/woscc/full-record/WOS:000869960500007
COUNTRYSIDE MICROFINANCE OPPORTUNITY FOR SUSTAINABLE RURAL DEVOLPMENT	$	https://www.webofscience.com/wos/woscc/full-record/WOS:000360508700142
The Innovative Development Path of Financial Media Based on Mobile Edge Computing Technology from the Perspective of Rural Revitalization	$	https://www.webofscience.com/wos/woscc/full-record/WOS:000766932400006

title	issues	WoS reference

literature research method
phase 1: Literature research on Clarivate WoS using 'Smart Village,' 'Smart Countryside,' and 'Smart rural mobility.' as keywords: 971 results
phase 2: Records phase 1 screened by title and abstract: 130 results
phase 3: Records phase 2 screened by full-text and included in qualitative analysis with other relevant literature: 14 results (highlighted in italics)

smart villages issues	abbreviation
participation /social	P
energy	E
tourism	T
nature/climate/environment	N
aging / health	A
smart mobility	SM
economy	$

literature research - results phase 3

general informations					identity			mobility solutions		mobility gap assessment	
author	**year**	**short description**	**link**	**area**	**physical setting**	**meanings**	**activities**	**soft tech**	**hard tech**	**density**	**accessibility**
Naldi et al.	2015	Discusses smart growth and smart specialization from the perspective of rural regions.	https://www.sciencedirect.com/science/article/pii/S0743016715300024#sec5	EU	X	X					X
Mounce et al.	2020	This paper looks at the role of governments in institutional, organisational, regulatory and financial frameworks in supporting rural transport services at a level that enables this access.	https://www.sciencedirect.com/science/article/pii/S0739885920301542?via%3Dihub	UK	X		X	shared mobility, DRT, e-services		X	X
Bosworth et al.	2020	Current transport strategy in the UK is strongly urban-focused, with assumptions that technological advances in mobility will simply trickle down into rural areas. This article challenges such a view and instead draws on rural development thinking aligned to a “Smart Countryside” which emphasises the need for place-based approaches.	https://journals.sagepub.com/doi/10.1177/0269094220968231	UK	X	X		e-mobility, micromobility, drones, e-services	MaaS, CAVs		X
Slee	2019	This paper explores the concept of smart villages in relation to Scottish rural development, wherethere has been a marked shift of emphasis from regional or sub-regional partnership asthe primary means of support for integrated rural development towards a much more community-centred approach.	https://sciendo.com/article/10.2478/euco-2019-0035	UK			x				
Zerrer et al.	2020	The article seeks to better understand the different actors responsible for the rural digitalization processes in order to design governance processes.	https://www.cogitatiopress.com/urbanplanning/article/view/3183	DE	X		X	shared mobility, app			
Renukappa et al.	2022	the aim of this paper is to investigate strategies for adoption of smart villages to upkeep, restore and improve local services that are deteriorating and improve their quality of life.	https://wlv.openrepository.com/handle/2436/624976	UK	X		X	shared mobility, DRT, car pooling		X	
Schaefer et al.	2022	The objective was to show whether the potential exists to initiate traffic turnaround with the help of Shared Mobility Services.	https://www.mdpi.com/2624-6511/5/4/62	DE				shared mobility			
Agriesti et al.	2022	This paper, following the principles of responsible innovation, tries to build the case for a renewed research effort about smart mobility in low density areas.	https://etrr.springeropen.com/articles/10.1186/s12544-022-00557-y	EE	X	X	X	shared mobility	X	X	

Butler et al.	2020	Technological innovations in the field of smart mobility have been identified as a potential solution to help individuals overcome issues associated with transportation disadvantage. This paper aims to provide a consolidated understanding on how smart mobility innovations can contribute to alleviate transportation disadvantage.	https://www.mdpi.com/2076-3417/10/18/6306	-	X			DRT, ITS, e-mobility		X	
Davidenko et al.	2018	The purpose of research is determining the principles of functional-planning settlements organization in compliance with «Smart City» concept. The paper defines the «Smart settlement» idea as a new concept of developing urban/rural settlements and surroundings. The main components of «Smart Settlement» were selected, such as Smart Economy, Smart People, Smart Mobility, Smart Environment, Smart Government and Smart Living.	https://iopscience.iop.org/article/10.1088/1757-899X/365/2/022050	RU							
Cvar et al.	2020	By providing an overview of technical solutions that support smart solutions in Smart Cities and Smart Villages this research paper will evaluate how, with IoT empowered Smart Villages and Smart Cities, an overall improvement of quality of life of their inhabitants can be achieved.	https://www.mdpi.com/1424-8220/20/14/3897#B65-sensors-20-03897	SI	X	X		sharing mobility	MaaS		
Lam et al.	2021	Our study argued that transit oriented development (TOD) and ICT could simultaneously fulfill some essential physio-psychological needs with digital ruralism. Structural equation modeling (SEM) was adopted to test the indicator-based MHN theory developed by literature, urban quality of life (Uqol) evaluation between the developing and developed countries, and backed by digital-ruralism success in developing China.	https://www.cogitatiopress.com/urbanplanning/article/view/3798/3798	CN					TOD, ICT		X
Smékalová et al.	2020	The paper focuses on the smart city concept implementation in the Czech Republic during 2007-2013 in small sized cities. Mobility is one of the main smart city dimension.	https://editorial.upce.cz/1804-8048/28/2/1067	CZ				transportation infrastructure			
Flipo et al.	2023	This research explores the modalities of distributional and procedural justice in the mobility sector through a qualitative research carried out among institutional and non-profit actors in the mobility sector in the Drôme and Ardèche departments.	https://hal.science/hal-04131989/file/Transport%20Policy.pdf	FR						X	

Brovarone et al.	2020	the paper sheds light on the issue of rural accessibility, exploring the accessibility challenges of rural areas and proposing a multilayer policy approach aimed at supporting decision-makers in improving rural accessibility across Europe.	https://www.mdpi.com/2071-1050/12/7/2876	IT							X
Adamowicz et al.	2020	The aim of this paper is to present the smart village concept as a means to achieve the sustainability and resilience of rural areas, relying on the analysis of basic theories of sustainable and persistent growth.	https://www.mdpi.com/2071-1050/12/16/6503	PL	X	X				X	
Gross-Fengels et al.	2018	This chapter explores how Smart Mobility can help to align improved job and service accessibility conditions, as well as entrepreneurial initiatives, with environmental, economic, and societal sustainability goals.	https://www.sciencedirect.com/science/article/abs/pii/S2543000918300271?via%3Dihub	DE	X		X	micromobility, DRT			X
Porru et al.	2019	Framed within the context of the Interreg Central Europe project RUMOBIL, this study tries to shed light on how the deployment of smart mobility solutions for PT within the rural context compare to that within the urban context.	https://www.sciencedirect.com/science/article/pii/S2095756419301898?via%3Dihub	IT				PT	MaaS	X	X
Billones et al.	2021	This research study focused on the development of the smart region mobility framework for an island region group in the Philippines.	https://www.mdpi.com/2071-1050/13/11/6366	PH				PT	MaaS		X
Tollis et al.	2019	A multidisciplinary research project focused on smart suburbs project, showing how resident participation discredited the hypothesis that technologies were essential to trigger mobility transition in periurban areas.	https://hal.science/hal-03234865/document	FR			X	participatory actions		X	
Bruzzone et al.	2021	This paper describes the potential integration of an electric bike-sharing system and a semi-flexible demand-responsive transport system to effectively solve this issue. Additionally, general guidance is provided for transit systems with low travel demand.	https://www.sciencedirect.com/science/article/pii/S2210539520301085?via%3Dihub	SI	X		X	shared mobility, DRT			X
Eckhardt et al.	2020	The purpose of this paper is to present the impact assessment results of Mobility as a Service pilots based on public-private collaboration.	https://etrr.springeropen.com/articles/10.1186/s12544-020-00443-5	FI			X	DRT	MaaS		X
Zavratnik et al.	2020	The article highlights the need to rethink and reconceptualise the accepted concepts of smart cities and villages by shifting the attention from technology and technological solutions and moving it towards understanding the significance of communities and sustainability.	https://www.mdpi.com/2071-1050/12/10/3961	SI	X		X	DRT, shared mobility, e-hitchhiking and volunteer lift		X	

Franco et al.	2023	This paper describes how policy interventions for introducing NMS in rural areas should be guided by big data to capture real and accurate travel behaviours, therefore avoiding perceived biases and potentially underestimating demand.	https://ietresearch.onlinelibrary.wiley.com/doi/10.1049/itr2.12339	UK	X		X	DRT, community services, shared mobility		X	
Marconi et al.	2020	The chapter presents two successful cases of gamified systems aiming at promoting a more sustainable mobility, Play&Go and Kids Go Green; investigates the potential of gamified systems, in combination with MaaS solutions, in terms of citizens' engagement and behavior change; and discusses current limitations and future challenges.	https://www.igi-global.com/gateway/chapter/246902	IT		X			MaaS		
Aráuz	2021	This article presents the work in the design, test and performance evaluation of a low-cost, machine learning based, solution for distributed monitoring of the use of public transit in small communities.	https://www.sciencedirect.com/science/article/pii/S1877050921010929?via%3Dihub	US	X			Machine Learning			
Campisi et al.	2023	This paper presents a comparison of the current public transport service connecting the train station with the area of the historic centre and the expansion areas with a hypothetical DRT service in the Sicilian hinterland.	https://link.springer.com/chapter/10.1007/978-3-031-23721-8_90	IT			X	DRT			X
Rotaris et al.	2018	We discuss whether there is a potential role for CS in medium to small-sized towns and in less-densely populated rural areas.	https://www.sciencedirect.com/science/article/pii/S0965856417308091?via%3Dihub#section-cited-by	IT				shared mobility		X	
Beckmann et al.	2023	This paper makes a further contribution to the acceptance, control and performance of automated shuttle buses focusing on the future permanent use of them.	https://link.springer.com/chapter/10.1007/978-3-031-23721-8_89	DE					CAVs		
Kalinka et al.	2020	The objective of the present research was to explore the local territory planning at the Baltic Sea Region in the context of using a geographic information system (GIS) as well as to highlight the topicality for the smart and sustainable development of a local needs-based planning approach in coastal areas.	https://www.mdpi.com/2071-1050/12/13/5293	LV				GIS	Data		X
Bosworth et al.	2023	The research highlights strategies to promote collaboration as well as methods of adapting to meet new demands from rural workers in a range of rural settings.	https://www.sciencedirect.com/science/article/pii/S0743016723000037?via%3Dihub#bib96	UK				ICT and transportation networks			

case study analysis

case study						mobility solutions domain			specific user target			
programme/guideline	solution	environment	description	country	discussed mobility solution	vehicles	behaviour/services	infrastructures	vulnerable people	students	commuters	tourists
SMARTA project SMARTA project 2 2018-2020	Ring a Link	lowland	Community-based local transport services Rural bus network + DRT with focus on combatting social exclusion	IE	DRT	X	X		X		X	
	ProntoBus	lowland	Transportation software to better direct on-demand bus services to customer needs	IT	DRT		X					
	Rural Transport Program	lowland	The program provides a mix of services, including Rural bus network + DRT to enable community-based groups and overcome social exclusion	IE	MP	X	X		X		X	
	Alpine Bus	mountains	Rural bus network e to promote the regional tourist destinations offering a sustainable way to visit them	CH	SM	X	X					X
	SmartMove project - "Personalized" PT marketing campaign	hills	personalized PT marketing campaign to overcome behavioural barriers	GR	PT		X					
	Smart Move	lowland	Rural bus network	RO	PT	X						
	Muldental in fahrt	lowland	Rural bus network redesigned, optimized and extended network providing whole area coverage	DE	PT	X						
	Autonomous shuttle in Bad Birnbach	hills	autonomous shuttle service operated in the rural area of Bad Birnbach	DE	SM	X						
	Burgerbus	hills	volunteer-based community transport service	DE	SM		X					
	Badenoch and Strathspey	lowland	Rural bus network	UK	HYB		X		X			
	Community Transportation Pilot Grant Program		Community Transportation Pilot Grant to optimise existing resources allocated for transportation services	CAN	MP		X		X			
	Suffolk links	lowland	Demand Responsive Transport (DRT) service which provides connections to bus and train links in rural areas	UK	DRT	X	X					
	Demand Responsive Transport in Middle Tejo	lowland	Demand responsive services by taxis integrated with the conventional PT services	PT	DRT	X	X					
	Flexitech	lowland	DRT for people with no access to a car	BE	SM		X		X			
	Regiotaxi	lowland	DRT - door-to-door regional taxi service	NL	DRT		X					
	Demand Responsive Transport in Castille y Leon	mountains	DRT feeder for conventional services which serves the connections among main towns	ES	DRT		X					
	On demand pooling service in low demand areas of Catalunya	mountains	DRT - car pooling	ES	DRT		X					
	Local link Donegal	lowland	fixed route and DRT services for community health services	IE	PT	X	X		X			
	Bummelbus	mountains	on-demand transport service training unemployed	LX	DRT		X				X	
	Badenoch and Strathspey community transport company	hills	Community Transport for the elderly and less physically able	UK	HYB		X		X			
	Go-mobil – demand-based rural transportation service	mountains	Door-to-door access to local bus stops and a number of amenities (local shops, doctors, post offices, etc)	AT	HYB	X	X					
	ArrivaClick – on-demand public transport service	lowland	Flexible and efficient minibus service	UK	HYB		X				X	
	Flexible mobility services in Byala	lowland	alternative transport methods for tourists	BL	DRT	X	X					X

case study						mobility solutions domain			specific user target			
programme/guideline	solution	environment	description	country	discussed mobility solution	vehicles	behaviour/services	infrastructures	vulnerable people	students	commuters	tourists
	Western region DRT		Regional Transport Plan to create DRT service	AUS	DRT		X		X			
	Ecovolis– community bike sharing system	mountains	Dedicated transportation from the city suburbs to the centre	AL	SM	X	X					
	Shared Use Mobility Agency – SUMA in Elba Island	island	Transport agency to provide a seamless mobility offer	IT	SM		X					
	Talybont energy	lowland	Community car sharing of low emissions vehicles	UK	SM	X						
	Rezopouce	hills	Hitch-hiking service app	FR	SM		X					
	Sopotniki	mountains	Free transport for elders in rural areas	SI	SM	X	X		X			
	ITNAmerica		non-profit making senior transportation network	USA	MP		X		X			
	National MAAS framework	lowland	National MaaS Framework designed to encourage new digitally-led business models	FI	MP		X					
	fare-free public transport, Tallinn	lowland	Free public transport policy for all residents	EE	MP		X		X	X	X	
	Texelhopper, smart successful public transport on a Dutch island	island	rethinking of the previous PT system with lots of small services for target groups	NL	HYB	X	X		X	X	X	
MAMBA project 2018-2020	Digital Mobility Centre in North Karelia	lowland	public transport portal which combines transport and mobility data of buses, trains, ToD services, taxi and carpooling groups	FI	SM		X					X
	Transport-on-Demand service in Vidzeme Region	lowland	ToD of small bus or car with mobility coordination centre and sw	LV	DRT	X			X			
	Mobility Solutions in Bielsko	lowland	ToD as a non-profit ride-pooling scheme	PL	SM	X						
	Non-Commercial Ride-pooling in Bielsko-Biała	lowland	smartphone app to facilitate selforganised and non-commercial ride-pooling in Bielsko-Biała	PL	SM		X			X		
	Rural Car-Sharing and Mobility Centre in Cuxhaven	lowland	cooperative-based carsharing scheme and voluntary shuttle service	DE	SM	X						
	Transport-on-Demand service “ALFA” in Plön	lowland	ToD that replaces conventional buses when demand is low, mainly in the evenings and at weekends	DE	DRT	X	X					
	Interactive map in Plön	lowland	An interactive map of the local transport network to provide reliable information about mobility services and inter-modal mobility	DE	MP		X					
	Creative mobility and accessibility solutions in Trelleborg	island	Connect e different council departments to discuss mobility challenges and plan appropriate solutions	SE	MP		X					
	Digital Mobility Centre in Trelleborg	island	Digital Mobility Centre that provide maps and information on both traditional PT and innovative transport (es. ride sharing)	SE	MP		X					
	Co-working hub in Trelleborg	island	Co-working hub to reduce commuting and also organises shared rides and could includes even more services	SE			X	X				
	Ride-sharing Application in Vejle	lowland	Development of a ride-sharing app and mobility centre for commuting to the nearest centre	DK	SM		X					
	Service-to-people Accessibility Solution in Hallig Hooge	lowland	In-house Mobility Centre to provide in site consuelling and social services	DE	SM		X	X	X			
	Regional Steering Group for Mobility Services in South Ostrobothnia	lowland	A Cooperative Mobility Centre to coordinate and manage social service and healthcare-related transport options	FI		X	X		X			

case study						mobility solutions domain			specific user target			
programme/guideline	solution	environment	description	country	discussed mobility solution	vehicles	behaviour/services	infrastructures	vulnerable people	students	commuters	tourists
Smart rural 21 - thematic area connectivity and mobility	Green Railways	lowland	Rehabilitating former railway infrastructure to create a network of hiking and cycling trails	LV				X				
	Smart Parking	lowland	The use of sensors and monitoring devices to better monitor and manage the use of different types of parking space around the community.	IE				X				
	Municipal Payment Gateway	hills	An online tool hosted on the municipal website to make it easier for citizens to pay municipal fees and rent municipal inventory	CZ	MP		X					
	Tools & Talent App	lowland	A smartphone application enabling villagers to find, book and borrow shared resources	DK	SM		X					
	Health in the Forest App	mountains	A smartphone app that provides up-to-date information for patients on doctors' opening hours and other health services in rural areas	AT			X		X			
	DorfFunk	lowland	DorfFunk is a smartphone app to support information exchange and communication in rural communities	DE			X					
	Citizen bus scheme	lowland	A non-commercial on-demand shuttle service for rural communities	DE	SM	X						
	Happy rural app	lowland	A free smartphone app which provides locals and visitors to rural areas with information on local public services, commercial activities and recreation	BE			X					X
	Children's Bike Library	lowland	A children's bike lending and swapping service, through which parents with young children get access to children's bicycles at a very low cost	BE		X	X			X		
	Ride-sharing Benches	lowland	Ride-sharing benches are equipped with signs of destinations that local people can hold up in order to get a free ride from a passing vehicle heading in the same direction	DE	SM			X				
	Open Food Hub	lowland	A community-led initiative enabling access to local produce through an open-source digital farmers-market platform – provided by the Open Food Network (OFN)	IE			X	X				
	Scattered Hotel (Albergo Diffuso)	mountains	Offering a range of local housing as accommodation for tourists through a shared online platform, together with local produce and activities	IT			X	X				X
	Grow Remote	lowland	A not-for-profit, volunteer driven community project supporting remote working opportunities at local level in rural areas	IE			X				X	
	Accessible Village	mountains	Adapted village infrastructure, ICT tools and branding to become an 'accessible village' for people with disabilities as an engine for cultural, social and economic growth	IT			X	X				
	Local Fibre-Optic Network	lowland	The creation by villagers of their own fibre-optic network for high-speed data transfer	FI				X				
	Ostana smart rural mobility actions	mountains	Smart village on sustainable mobility actions i.e. park&ride, carpooling system plan	IT	SM			X			X	X
Soluzioni e tecnologie per i piccoli comuni e le aree montane	Rezo Pouce	-	Carpooling service	FR			X					

case study						mobility solutions domain			specific user target			
programme/guideline	solution	environment	description	country	discussed mobility solution	vehicles	behaviour/services	infrastructures	vulnerable people	students	commuters	tourists
2022	Auting	-	Peer-to-peer car sharing platform	IT			X				X	X
	Scuola@BIS	-	School carpooling	IT			X			X		
	Linking Valdera	-	Reorganization of a multimodal and integrated mobility system	IT		X	X	X	X		X	X

discussed mobility solutions - typologies	abbreviation
demand responsive transport	DRT
mobility program	MP
shared mobility	SM
public transport	PT
hybrid (solutions combining above mentioned categories)	HYB
other mobility solutions	-

Annex 2

This annex contains excerpts from the final research dossiers pertaining to the applied research projects outlined in Chapter 3. It is provided here to facilitate a more thorough understanding of each individual research task and its primary design outcomes, particularly the adopted smart mobility design solutions. The analyses included aim to provide a more comprehensive view of the research context.

CASTELLO^{++}

SMART TOWN PLANNING

STRATEGIE PER L'INNOVAZIONE URBANA IN UN COMUNE DI 10.000 ABITANTI
CASTEL BOLOGNESE (RA)

CFR Consorzio Futuro in Ricerca

MD Next City Lab

DA - Dipartimento di Architettura
Università degli Studi di Ferrara

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Ferrara, giugno 2017

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INDICE

CASTELLO++

00. INDICE

CASTELLO^{++} SMART TOWN PLANNING

SMART COMMUNITY

COOPERAZIONE
VALORE
IDENTITÀ

+

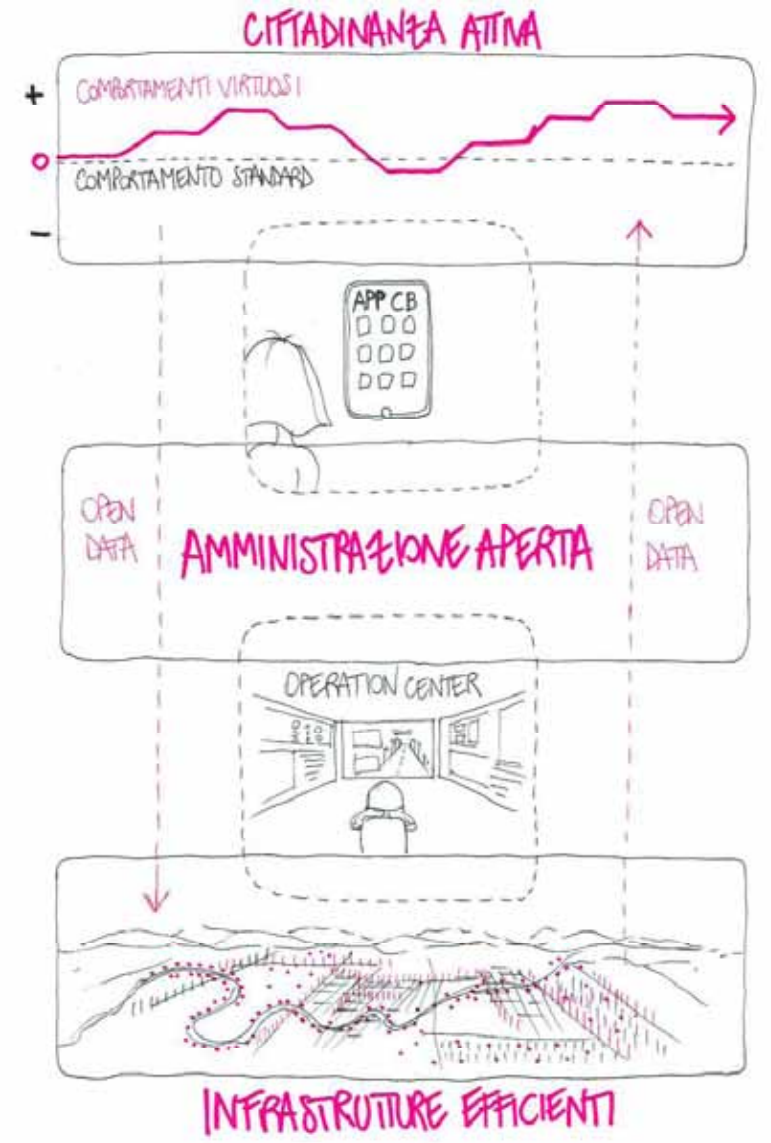
SMART GOVERNANCE

TRASPARENZA
SEMPLIFICAZIONE
SUSSIDIARIETÀ

+

SMART CITY

OTTIMIZZAZIONE
EFFICIENZA
SOSTENIBILITA



04. SALUTE

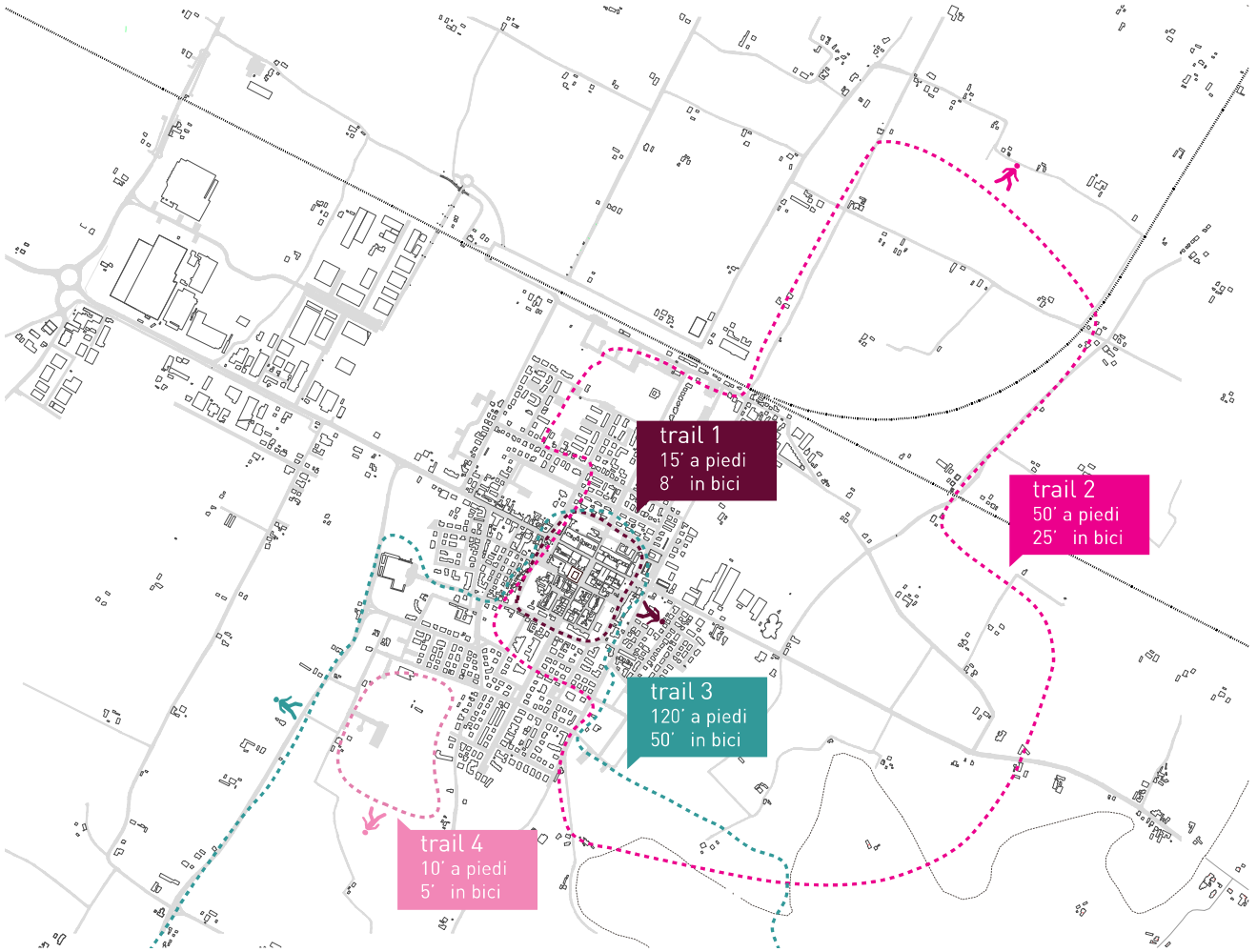
FASE I

SOFT TRAIL CB
2017 - 2018

FASE II

SINGLE 70+ CB
2017 - 2018

MONITORING CB
2017 - 2018



04. SALUTE

PRINCIPI E AZIONI

Il tema della salute è sviluppato in accordo con le linee guida del piano nazionale 2014/2018 del Ministero della Salute e riguarda la prevenzione, attraverso la riduzione del carico di malattia; l'investimento sul benessere dei giovani; l'attenzione nei riguardi delle fasce più deboli della popolazione e la considerazione del benessere della persona strettamente legato alla qualità dell'ambiente che la circonda.

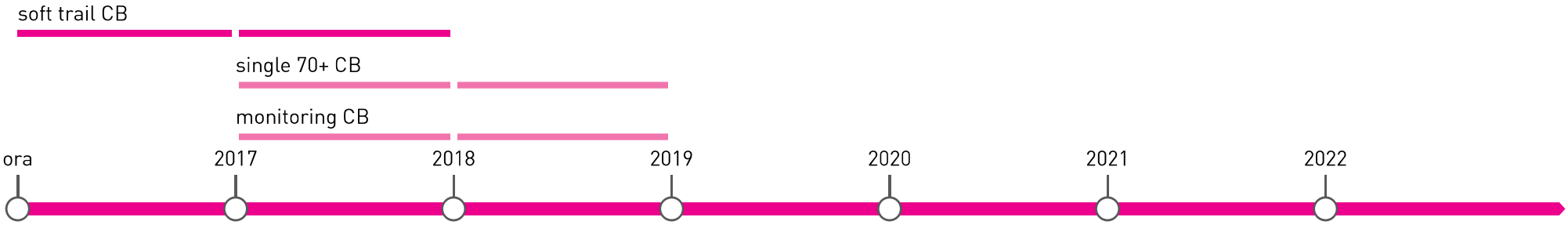
AZIONI IN ATTO

I Comuni dell'Unione hanno individuato nell'ASP (Azienda di Servizi alla Persona) lo strumento operativo attraverso il quale costruire un modello sperimentale di accoglienza dei cittadini stranieri richiedenti protezione internazionale, attraverso piccoli nuclei, strutturati nella forma del gruppo appartamento.

AZIONI FUTURE

Le azioni proposte nel campo della salute si possono riassumere in:

- programmi per la prevenzione, attraverso l'aumento della consapevolezza individuale su questi temi e la creazione di convenzioni per visite diagnostiche
- promozione di stili di vita sani, con particolare ad alimentazione (autoproduzione e gruppi di acquisto prodotti km0) e movimento (soft trail CB)
- progetti per il miglioramento delle condizioni ambientali, attraverso nuovi programmi per i settori mobilità, energia, rifiuti, industria, agricoltura al fine di ridurre gli agenti inquinanti aria-terra-acqua
- programmi di assistenza in chiave cooperativa e comunitaria come integrazione al welfare tradizionale (Single 70+ CB)
- monitoraggio delle condizioni di salute della popolazione e dell'ambiente urbano (WHO-Health Cities Project e URBES)
- digitalizzazione servizi sanitari tramite adesione alla nuova piattaforma digitale della sanità regionale (sistema centralizzato di prenotazione, cartella sanitaria elettronica, database cittadini)



04. SALUTE

AZIONI FUTURE - FASE I

SOFT TRAIL CB
2017 - 2018

Progetto per la realizzazione di un sistema di percorsi-vita, a carattere naturalistico, caratterizzato da differenti gradi di difficoltà, presenza di attrezzi per esercizi e da una comunicazione integrata degli effetti benefici che il movimento ha sulla salute, al fine di aumentare la consapevolezza dei fruitori.

CHE COSA?

- Percorso naturalistico misto integrato ad un sistema informativo per i fruitori

COME?

- Progetto e realizzazione attraverso specialisti dei settore medico-sportivo, al fine di calibrare i tragitti con vari gradi di benefici fisici, in base alle condizioni di forma e di salute dei fruitori

CHI?

- Amministrazione CB (assessorato alla Politiche Sanitarie e allo Sport) con operatori specializzati

06. FLUSSI

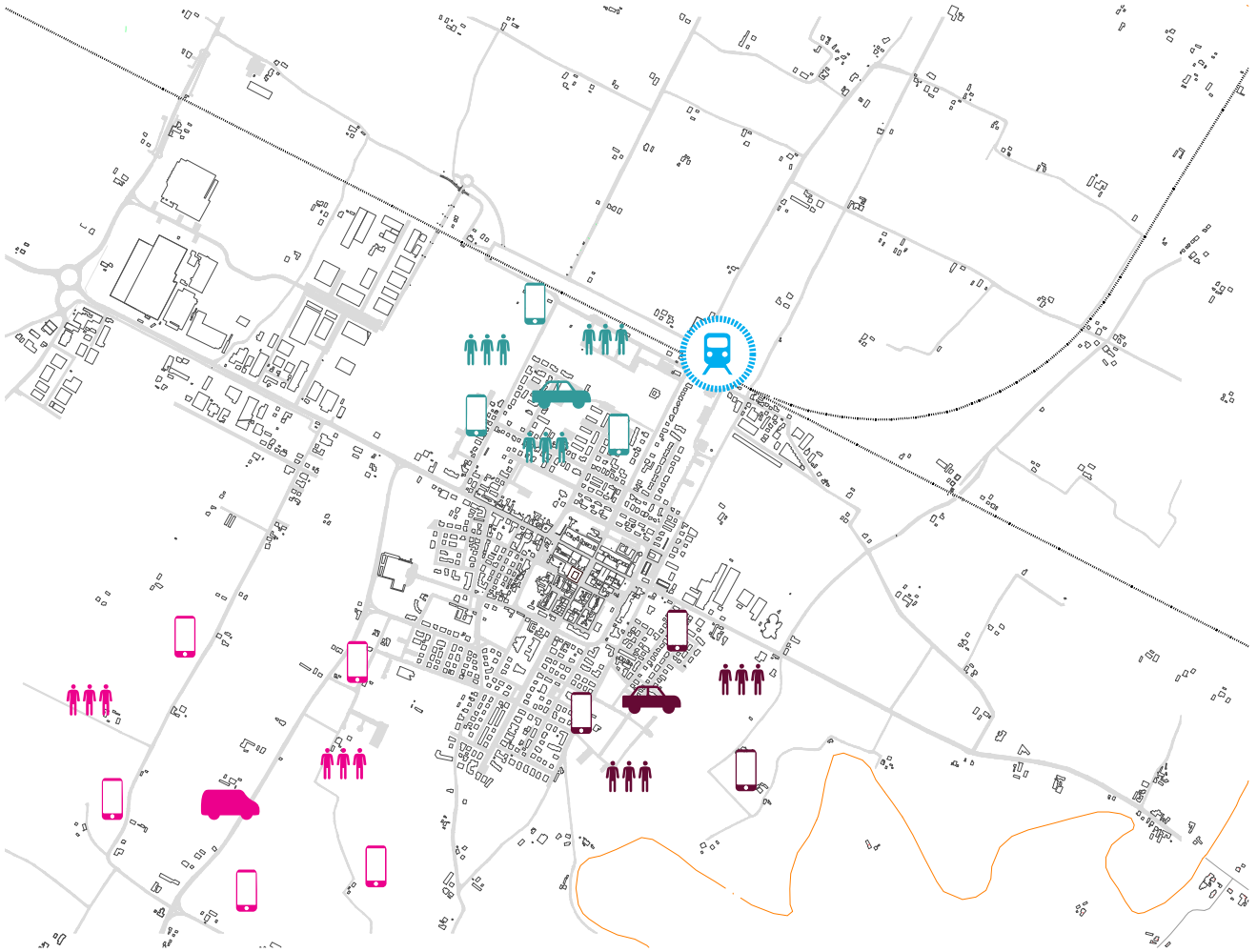
FASE I

SCHOOL&WORK CB
2017 - 2018

FASE II

SMART STATION CB
2018 - 2019

PIANO MOBILITÀ SOSTENIBILE
2017 - 2018



06. FLUSSI

PRINCIPI E AZIONI

La mobilità è uno dei settori con maggiore impatto sulla vita dei cittadini e sull'ambiente e, per essere in grado di integrare i nuovi strumenti tecnologici, ha bisogno di visioni innovative e azioni coraggiose con orizzonti a medio e lungo termine. Si deve preparare il campo ad una mobilità più condivisa, sostenibile, dolce, che non abbia più l'automobile a combustibile fossile come unico modello di riferimento.

Si deve partire innanzitutto dall'introduzione di nuove pratiche come la condivisione della propria auto con altre persone (car pooling) per tragitti comuni, o l'introduzione di mezzi a chiamata (car on demand) in grado di ottimizzare il percorso in funzione della dislocazione geografica delle prenotazioni.

In seconda battuta, le nuove pratiche sono rese possibili grazie ai sistemi di connessione e di gestione in tempo reale per mezzo di piattaforme digitali abilitanti, che mettono in relazione le persone in base alle loro esigenze.

Un terzo aspetto da innovare riguarda l'adozione di nuovi mezzi di spostamento, come le auto elettriche - caratterizzate da sempre maggiore efficienza e sostenibilità, rispetto ai mezzi tradizionali a combustione - e la promozione della mobilità ciclo-pedonale ad emissioni zero.

Un ruolo importante per garantire una mobilità sicura lo rivestono le infrastrutture – piste ciclabili, marciapiedi, attraversamenti, strade – che devono essere ammodernate e integrate per facilitare gli spostamenti con i vari mezzi a disposizione.

Castel Bolognese punta ad essere un comune completamente accessibile, eliminando le barriere presenti negli spazi pubblici e progettando le nuove infrastrutture con un'ottica rivolta all'inclusione dei soggetti con mobilità ridotta.

AZIONI IN ATTO

Le azioni in atto riguardano il potenziamento della rete ciclabile/pedonale per promuovere la mobilità sostenibile, la realizzazione di nuove infrastrutture (completamento di Via Lughese al confine con la zona industriale, la nuova rotonda sulla strada Casolana, la ristrutturazione dei viali principali e la progettazione della pista ciclabile che colleghi Faenza a Castel Bolognese), l'implementazione delle infrastrutture per la mobilità elettrica con installazione di colonnine per la ricarica degli autoveicoli e la temporizzazione dei semafori per ottimizzare i flussi di traffico in particolare sulla via Emilia.

Per quanto riguarda le nuove infrastrutture è in corso la progettazione definitiva da parte di ANAS della circonvallazione, una nuova strada a scorrimento veloce per deviare verso nord buona parte del traffico sulla via Emilia.

06. FLUSSI

PRINCIPI E AZIONI

AZIONI FUTURE

Le azioni per lo sviluppo di una strategia innovativa sulla mobilità a misura di cittadino necessitano di una progettualità per gradi che coinvolga abitudini e nuove pratiche delle comunità, un ripensamento dei mezzi con i quali avvengono gli spostamenti e degli strumenti con cui si gestiscono, per finire con gli interventi di ammodernamento delle infrastrutture.

Per innovare vi deve essere un cambio di paradigma rispetto all'atteggiamento tradizionale, che inizia dalla definizione delle onerose infrastrutture, senza considerare nuovi modelli possibili di mobilità partendo dalle persone.

La prima azione può essere il progetto di RFI per la riqualificazione della stazione attraverso un programma di interventi e sviluppo che la renderanno un importante snodo intermodale dell'area.

06. FLUSSI

PRINCIPI E AZIONI

GRADO 1 - COMUNITA' & PROGETTO

L'avvio riguarda sia lo sviluppo e la verifica sul campo di nuove abitudini legate alla mobilità da parte dei cittadini (car pooling, car on demand, mobilità a emissioni zero), sia la progettazione integrata di un Piano per la Mobilità Sostenibile attraverso esperti del settore.

Il primo grado di intervento è leggero, lavora sul piano comportamentale e culturale, sulla condivisione dei mezzi già in possesso dei cittadini e sulla progettualità strategica a lungo termine.

Sintesi azioni:

- Definizione nuove pratiche di mobilità condivisa e sostenibile di comunità
- Utilizzo di una piattaforma digitale che abiliti la comunità alle nuove pratiche
- Condivisione dei mezzi di trasporto attuali in una fase pilota
- Redazione di un Piano integrato per la Mobilità Sostenibile - PMS CB

GRADO 2 - STRUMENTI & GESTIONE

Il secondo grado integra nel sistema nuovi strumenti per di abilitare e ottimizzare la situazione esistente dal punto di vista della sicurezza, della sostenibilità ambientale e della fruizione da parte del cittadino.

Sintesi azioni:

- Introduzione di una segnaletica stradale smart (condizioni notturne, attraversamenti, gestione dinamica del traffico, integrazione con il sistema di videosorveglianza) per aumentare l'efficienza e la sicurezza
- Adozione di nuovi mezzi elettrici (mini-bus, auto, scooter, bici) in condivisione e programma di agevolazioni per la sostituzione dei mezzi privati
- Ottimizzazione dell'intermodalità nei nodi tra mezzi pubblici, privati e condivisi
- Progetto Smart Park attraverso l'inserimento di telecamere e sensori nei parcheggi

GRADO 3 - INFRASTRUTTURE & ACCESSIBILITA'

Il terzo grado di sviluppo riguarda le infrastrutture vere e proprie, dalle modifiche e integrazioni per la completa accessibilità nel territorio comunale, alla definizione della nuova porta di Castel Bolognese in funzione dell'inserimento del nuovo casello autostradale, fino alle nuove connessioni viarie, con la predilezione per i percorsi ciclo-pedonali.

Sintesi azioni:

- Raggiungimento dell'accessibilità totale per gli spazi pubblici
- Nuovi scenari in seguito all'inserimento del casello autostradale
- Miglioramento e integrazione di strade e percorsi

06. FLUSSI

AZIONI FUTURE - FASE I

SCHOOL&WORK
2017 - 2018

Un progetto pilota per iniziare dal basso nuove pratiche da parte della comunità di cittadini nel campo della mobilità. Un gruppo di cittadini – Smart Community - si attiva scegliendo di condividere alcuni i tragitti casa-scuola-lavoro e ritorno, prendendo a turno la propria auto (car pooling), il tutto organizzato attraverso una piattaforma digitale abilitante sotto forma di social network. Il circolo virtuoso che si crea ha effetti sull'ambiente, riducendo l'inquinamento, sulla socialità delle persone e sull'economia dei singoli cittadini coinvolti. Il valore che deriva dalla condivisione rimane all'interno della comunità e ricade sul territorio stesso, creando un circolo virtuoso che ottimizza le risorse a disposizione. Un secondo grado della sperimentazione riguarda la disponibilità di alcuni cittadini nel fornire servizi di trasporto a chiamata (car on demand), sempre attraverso la piattaforma digitale abilitante.

CHE COSA?

- Creazione di un gruppo (Smart Community) che sperimenti una modalità condivisa di spostarsi nel quotidiano tra casa, scuola e lavoro

COME?

- Call per individuare il campione di cittadini (attraverso l'associazione genitori) e un'azienda all'interno della zona industriale che voglia sperimentare la nuova pratica con un gruppo di dipendenti; abilitazione di una piattaforma social digitale con un sistema di ripartizione di crediti e debiti tra utenti; monitoraggio della sperimentazione.

CHI?

- Amministrazione CB con l'associazione genitori, i dipendenti di un'azienda selezionata e operatori specializzati

06. FLUSSI

AZIONI FUTURE - FASE II

SMART STATION CB
2018 - 2019

CHE COSA?

- Riqualificazione dello scalo ferroviario di Castel Bolognese.

COME?

- La stazione ferroviaria di Castel Bolognese è oggi uno snodo importante in ambito regionale con quasi 1300 passeggeri quotidiani.

Il restyling proposto da RFI e attualmente in corso, prevede una riqualificazione che renda più bella e accessibile la stazione. Ci saranno spazi rinnovati e disponibili anche a ospitare nuovi servizi socio-culturali e commerciali . Si procederà anche alla riqualificazione del sottopassaggio e all'innalzamento del primo e del secondo marciapiede (55 cm - standard europeo per i servizi ferroviari metropolitani) con la posa di nuovi percorsi tattili a terra per non vedenti. Si affiancheranno, inoltre, interventi di manutenzione delle pensiline, rinnovo delle aree aperte al pubblico.

Agli interventi edili si affiancheranno altri interventi di natura tecnologica nell'ambito di un progetto FS denominato "smart station" finalizzato al miglioramento della affidabilità degli impianti, della sicurezza, dei servizi offerti in un ottica anche di sostenibilità ambientale.

Tale progetto prevede:

· Illuminazione a led

· Telegestione e telecontrollo da remoto degli impianti tecnologici;

· Up grading della informazione sonora e variabile dedicata alla clientela;

· Strumenti di controllo degli accessi alla stazione ;

La completa riqualificazione dello scalo ferroviario si inserisce quindi perfettamente all'interno dello Smart Planning del Comune.

CHI?

- RFI e Ammistrazione di Castel Bolognese.

06. FLUSSI

AZIONI FUTURE - FASE II

PIANO MOBILITÀ SOSTENIBILE - PMS CB 2017 - 2018

CHE COSA?

Redazione di un Piano integrato della Mobilità Sostenibile nel comune di Castel Bolognese (PMS CB) per affrontare in modo strategico e partecipato le problematiche presenti e avviare progetti pilota di mobilità alternativa e condivisa all'interno della comunità.

Tre sono i principi guida su cui si fonda il piano:

- Inclusione sociale e territoriale. Garantire un livello di accesso alla mobilità sia per le classi sociali svantaggiate, sia per le aree geografiche difficilmente raggiungibili.
- Responsabilità ambientale. I flussi di persone e di oggetti devono utilizzare mezzi e modalità che adottino alti standard ambientali per puntare all'impatto zero degli inquinanti derivati dai combustibili fossili.
- Creazione di valore. Le nuove modalità di mobilità condivisa sono in grado di generare valore che si ridistribuisce nel territorio, oltre a posti di lavoro per i nuovi servizi.

COME?

Il Piano si articola nelle seguenti macro-fasi con la costante partecipazione della comunità locale:

1) Mappatura delle problematiche e delle opportunità presenti nel territorio

2) Definizione della carta di valori delle buone pratiche; degli indicatori di valutazione e delle aspirazioni del nuovo modello in base ai seguenti temi: accessibilità, sicurezza, esperienza, sostenibilità, salute, affidabilità, economicità)

3) Verifica e coordinamento delle politiche e delle strategie sulla mobilità con l'Unione dei Comuni e con la Regione Emilia Romagna

4) Comunicazione della visione generale attraverso la redazione del masterplan per fasi incrementali

5) Definizione degli elementi che compongono i vari scenari (rapporto mobilità pubblica-privata; piattaforme abilitanti; inter-modalità; nuovi mezzi

06. FLUSSI

AZIONI FUTURE - FASE II

sostenibili; infrastrutture e sinergie tra i vari componenti)

6) Cronoprogramma per la realizzazione degli interventi del masterplan e definizione della governance per individuare le modalità di attuazione (bandi, convenzioni, agevolazioni, premialità, etc.) e i soggetti da coinvolgere (sinergia pubblico-privato, aziende, specialisti, Smart Community, etc.)

7) Individuazione dei progetti pilota, valutazione della fattibilità e avvio della fase di test attraverso Smart Community

8) Costante monitoraggio e valutazione dei risultati a scala sociale, ambientale, economica

CHI?

Amministrazione CB con cittadini e operatori specializzati

INFRASTRUTTURE

CASTELLO^{++}

INFRASTRUTTURE

PRINCIPI E AZIONI

In coerenza con l'Agenda Europea 2020, il Governo, attraverso la strategia italiana per la banda ultralarga, intende coprire, entro il 2020, l'85% della popolazione con infrastrutture in grado di veicolare servizi a velocità pari e superiori a 100Mbps garantendo al contempo al 100% dei cittadini l'accesso alla rete internet ad almeno 30Mbps.
Su questa infrastruttura di base si innestano molti dei sistemi legati alla rivoluzione digitale, in grado di ottimizzare i processi, rendere disponibili i dati generati nel territorio, erogare servizi, connettere cittadini e istituzioni per ridurre la burocrazia e migliorare la governance, permettere la collaborazione attiva tra le persone al fine di creare valore.

AZIONI IN ATTO

- Banda Ultra Larga

Finanziamento ottenuto dalla Regione Emilia Romagna per dotare di fibra ottica l'intero territorio comunale

- Illuminazione Pubblica

Piano regolatore illuminazione comunale, per l'ammordernamento della rete di illuminazione pubblica

- Wi-fi

Progetto di estensione della rete wifi comunale tramite la partecipazione al bando della Regione Emilia Romagna "Emilia Romagna Wifi"

10. RISCHIO

AZIONI FUTURE - FASE I

RISCHIO SISMICO CB
2017 - 2018

il 20 febbraio 2017 il Cslp (Consiglio superiore dei lavori pubblici) ha approvato le "Linee Guida per la classificazione di rischio sismico delle costruzioni".
Le linee guida forniscono una metodologia per definire le classi di rischio sismico degli edifici esistenti, prima e dopo gli eventuali interventi antisismici.
Grazie alla valutazione del rischio sismico è possibile comprendere quali sono gli interventi e i costi per consentire alla struttura di avvicinarsi al grado di sicurezza previsto dalla norma. Inoltre, grazie alla classificazione del rischio sismico, i proprietari degli immobili vengono dotati degli strumenti per valutare quali modalità attuare per l'adeguamento antisismico.
L'obiettivo è quello di migliorare la resilienza al rischio sismico in tutta l'area comunale.

CHE COSA?

- Programmazione interventi di adeguamento antisismico per edifici pubblici ed edifici privati

COME?

- Mappatura condizioni strutturali degli edifici, a partire da quelli pubblici; redazione di una graduatoria in funzione del tipo di condizione strutturale; definizione degli interventi in relazione alla normativa nazionale; programmazione economica per gli interventi di adeguamento.

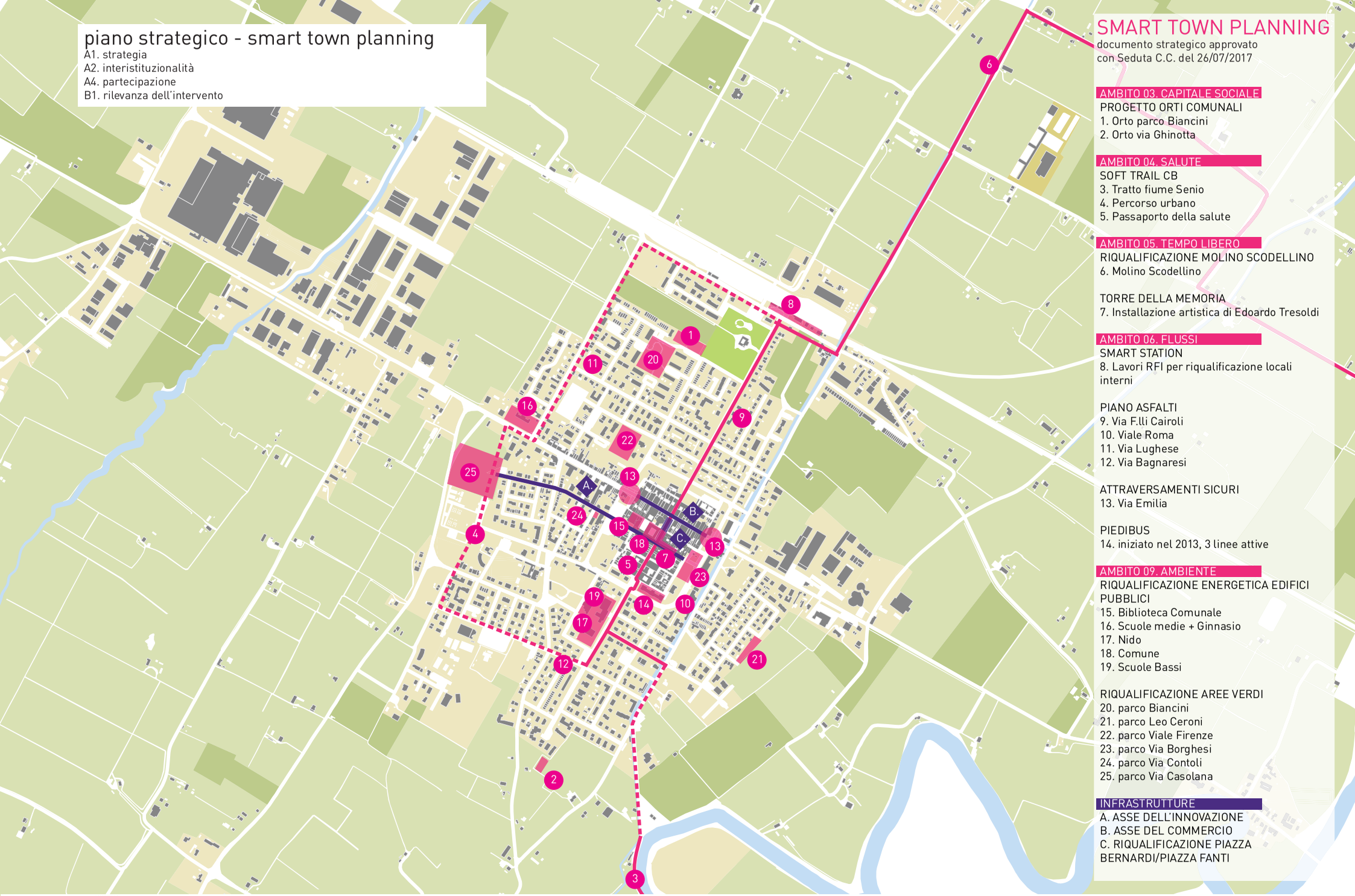
CHI?

- Amministrazione CB con operatori specializzati

BC/CB
UNA RETE DI PERCORSI CICLABILI INNOVATIVI A CASTEL BOLOGNESE

BANDO PER LA REALIZZAZIONE DI CICLOVIE DI INTERESSE REGIONALE E PROMOZIONE DELLA MOBILITÀ SOSTENIBILE
FSC 2014-2020 Asse tematico E, Legge 23/12/2014 n. 190 art. 1 c. 703
delibera CIPE 10/08/2016 n. 25, delibera CIPE 1/12/2016 n. 54 Cassa Depositi e Prestiti

Soggetto Proponente: COMUNE DI CASTEL BOLOGNESE



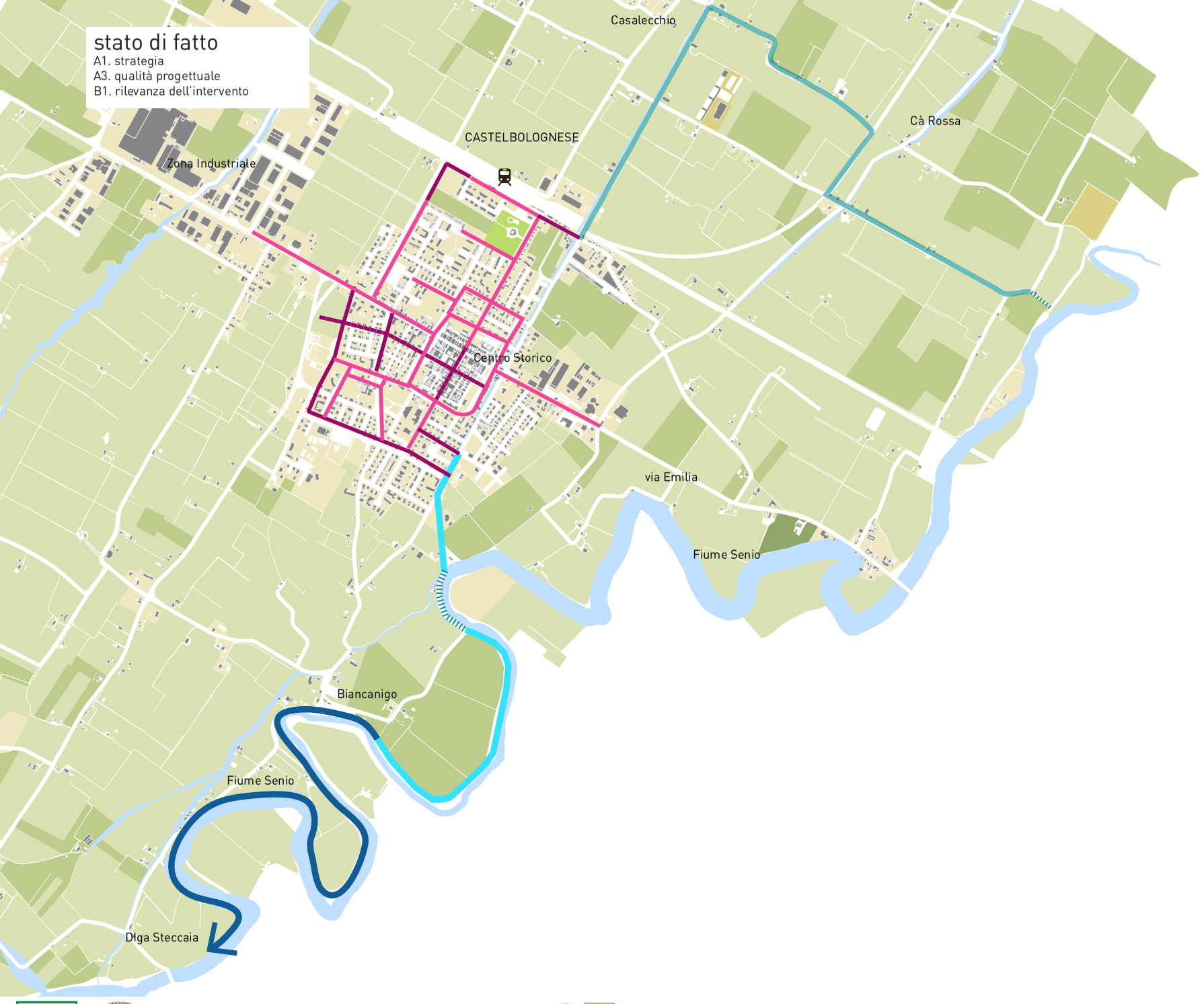
BANDO PER LA REALIZZAZIONE DI CICLOVIE DI INTERESSE REGIONALE E PROMOZIONE DELLA MOBILITÀ SOSTENIBILE
Elaborati di progetto (art. 7 c.4 Allegato A)

Soggetto proponente: COMUNE DI CASTEL BOLOGNESE

MD Next City Lab — progetto strategico e coordinamento progetto di ciclovia urbana innovativa

GEA progetti — progetto tratto extraurbano

tavola 3.
progetto strategico / 1



BANDO PER LA REALIZZAZIONE DI CICLOVIE DI INTERESSE REGIONALE E PROMOZIONE DELLA MOBILITÀ SOSTENIBILE
Elaborati di progetto (art. 7 c.4 Allegato A)
Soggetto proponente: COMUNE DI CASTEL BOLOGNESE

MD Next City Lab — progetto strategico e coordinamento; progetto di ciclovia urbana innovativa
GEA progetti — progetto tratto extraurbano

tavola 7.
stato di fatto

stato di progetto

A1. strategia
A3. qualità progettuale
B1. rilevanza dell'intervento

Casalecchio
CASTELBOLOGNESE
Zona Industriale
Cà Rossa
via Emilia
Fiume Senio
Biancanigo
Diga Steccaia

tratto 2. ciclovia del Senio
tratto 1. rete ciclabile urbana
tratto 2. ciclovia del Senio

attraversamenti sicuri safe&smart
hotspot
ciclabile in argine
ciclovia panoramica
promiscuo
ciclovia urbana

BANDO PER LA REALIZZAZIONE DI CICLOVIE DI INTERESSE REGIONALE E PROMOZIONE DELLA MOBILITÀ SOSTENIBILE
Elaborati di progetto (art. 7 c.4 Allegato A)
Soggetto proponente: COMUNE DI CASTEL BOLOGNESE

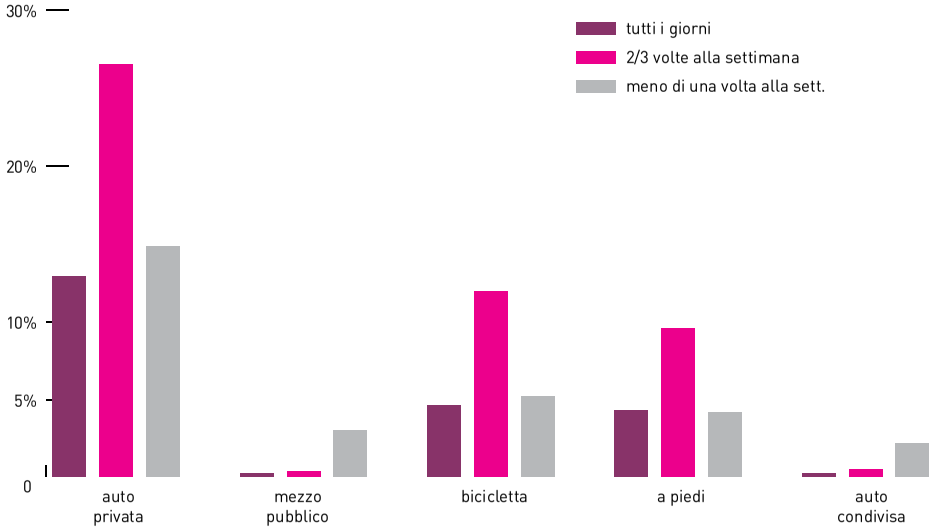
MD Next City Lab — progetto strategico e coordinamento, progetto di ciclovia urbana innovativa
GEA progetti — progetto tratto extraurbano

tavola 8.
stato di progetto

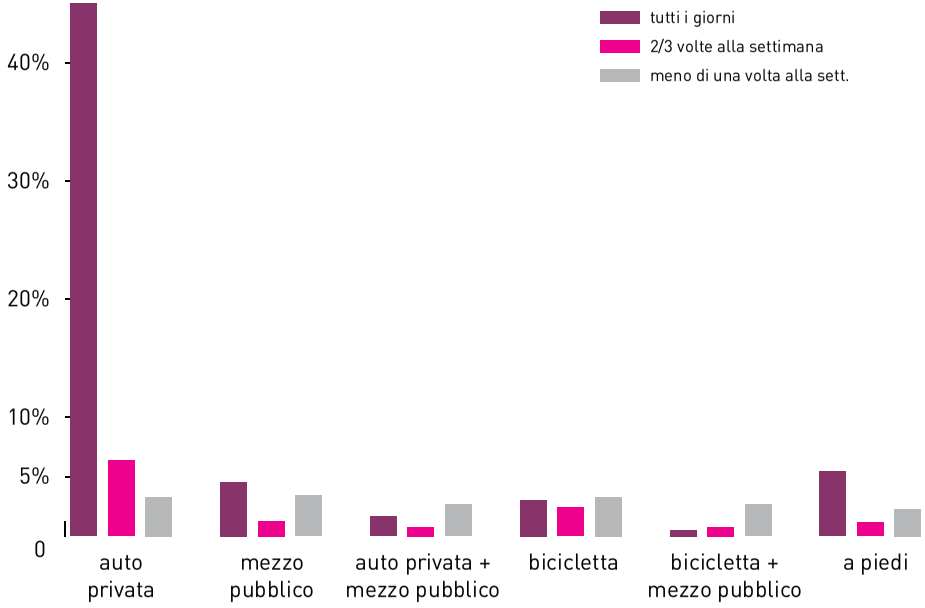
analisi flussi di traffico

A1. strategia
A3. qualità progettuale
B1. rilevanza dell'intervento

CON CHE MEZZO TI RECHI ABITUALMENTE A FARE ACQUISTI NEL PERIODO AUTUNNO-INVERNO?
fonte: questionario smart town planning 2017

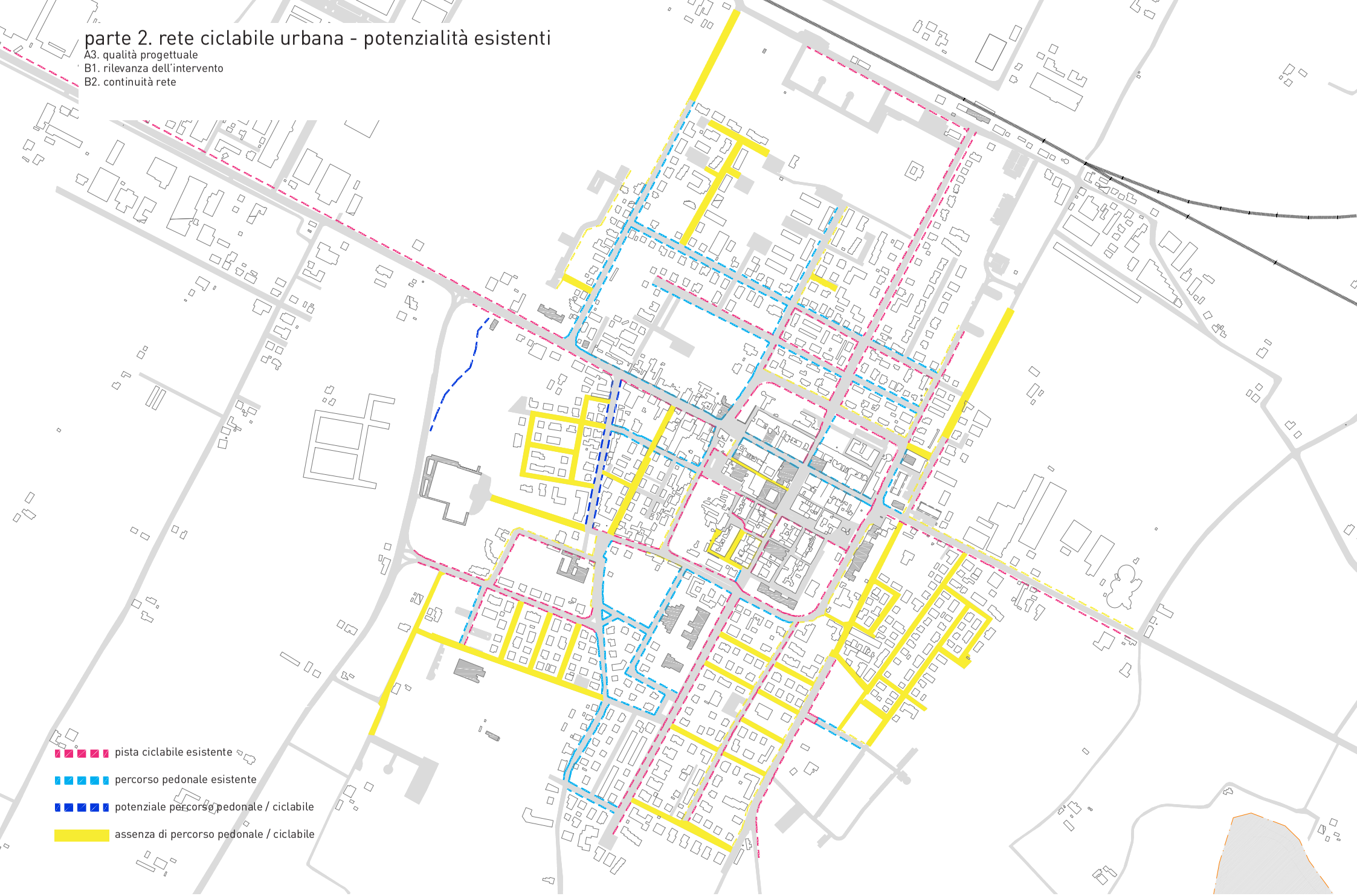


CON CHE MEZZO TI RECHI ABITUALMENTE AL LAVORO?
fonte: questionario smart town planning 2017



parte 2. rete ciclabile urbana - potenzialità esistenti

A3. qualità progettuale
B1. rilevanza dell'intervento
B2. continuità rete



BANDO PER LA REALIZZAZIONE DI CICLOVIE DI INTERESSE REGIONALE E PROMOZIONE DELLA MOBILITÀ SOSTENIBILE
Elaborati di progetto (art. 7 c.4 Allegato A)

Soggetto proponente: COMUNE DI CASTEL BOLOGNESE

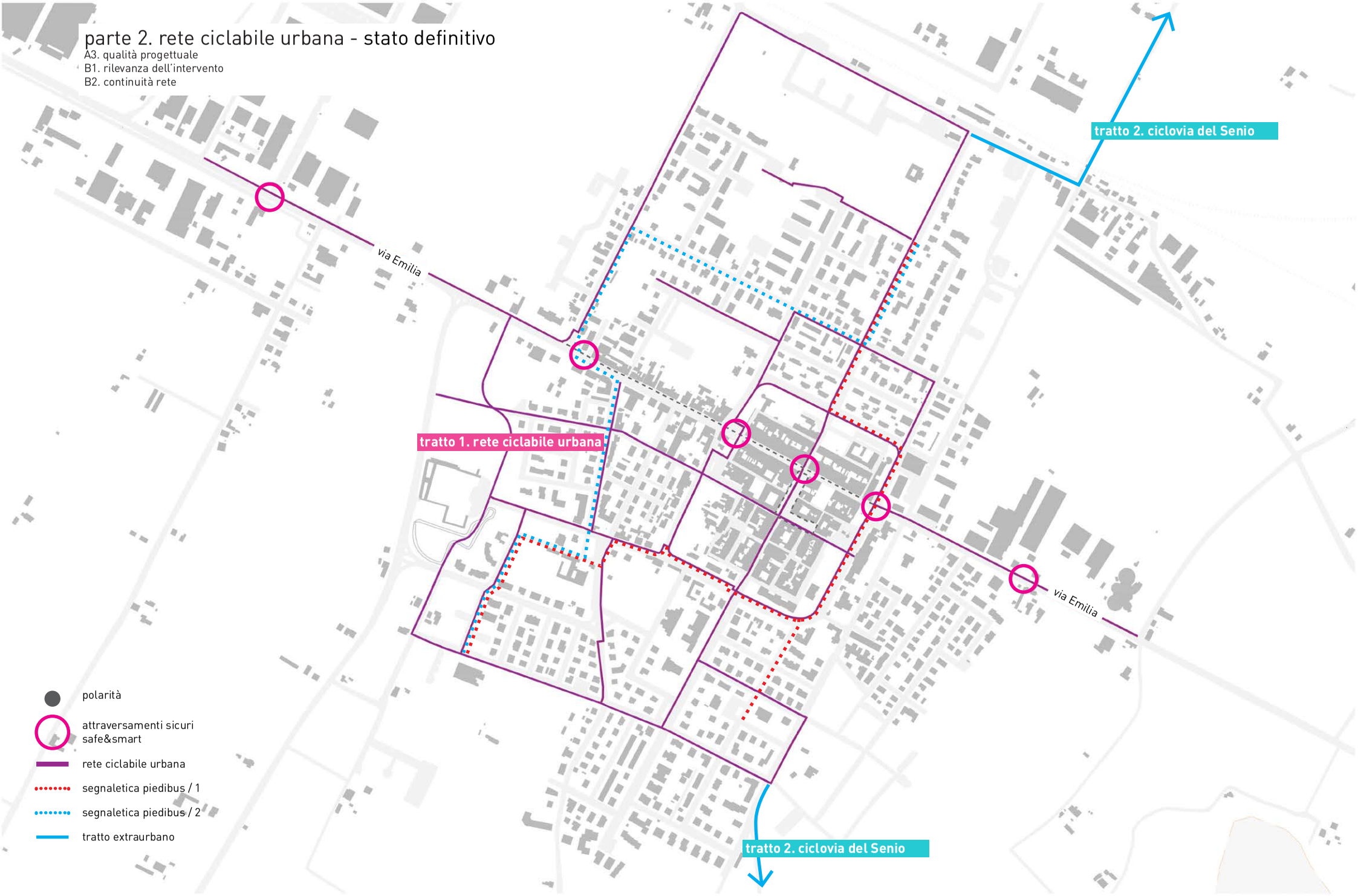
MD Next City Lab — progetto strategico e coordinamento
progetto di ciclovia urbana innovativa

GEA progetti — progetto tratto extraurbano

tavola 13.
progetto parte 2. rete ciclabile urbana

parte 2. rete ciclabile urbana - stato definitivo

A3. qualità progettuale
B1. rilevanza dell'intervento
B2. continuità rete



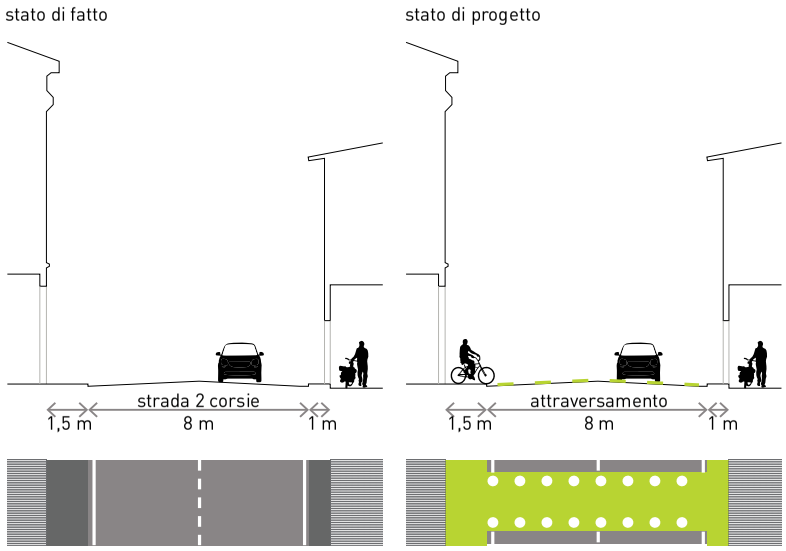
BANDO PER LA REALIZZAZIONE DI CICLOVIE DI INTERESSE REGIONALE E PROMOZIONE DELLA MOBILITÀ SOSTENIBILE
Elaborati di progetto (art. 7 c.4 Allegato A)
Soggetto proponente: COMUNE DI CASTEL BOLOGNESE

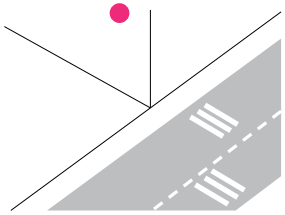
MD Next City Lab — progetto strategico e coordinamento, progetto di ciclovia urbana innovativa
GEA progetti — progetto tratto extraurbano

tavola 15.
progetto parte 2. rete ciclabile urbana

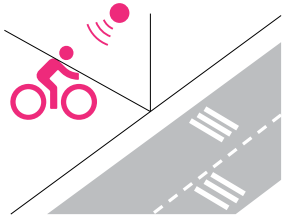
diagrammi
B3. sicurezza

attraversamenti sicuri safe&smart
A3. qualità progettuale



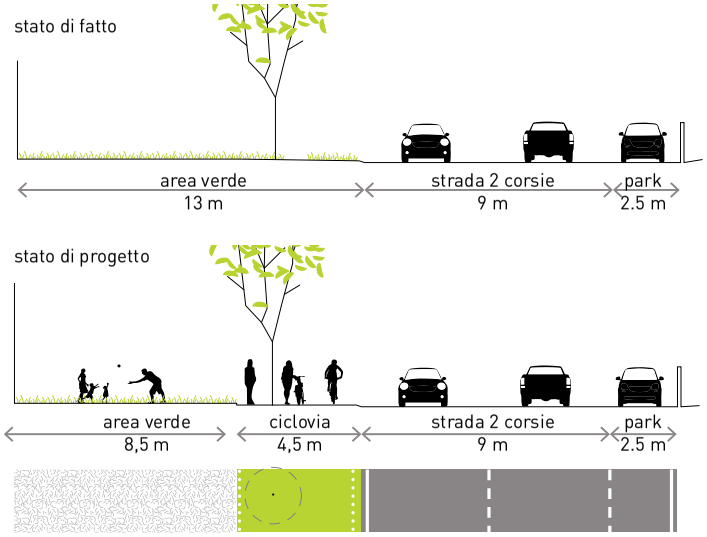


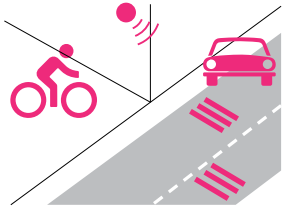
l'attraversamento smart viene installato in un incrocio nel centro storico con angoli ciechi



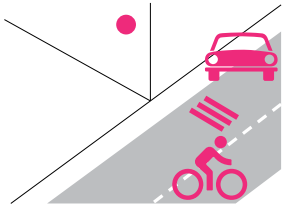
un sensore rileva la presenza di un ciclista o pedone in avvicinamento

piste ciclabili di progetto
A3. qualità progettuale





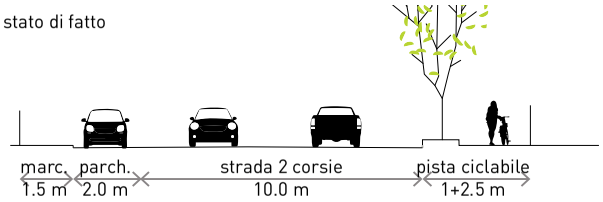
a seguito del rilevamento il sensore attiva la segnaletica luminosa sulla strada principale



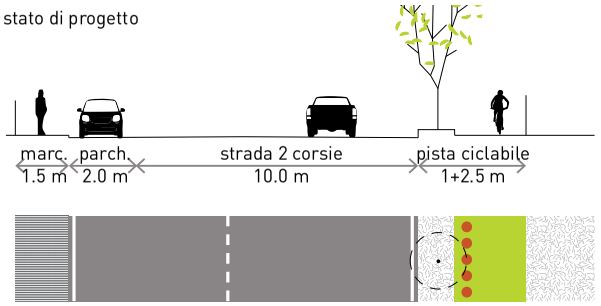
il ciclista può attraversare l'incrocio in sicurezza grazie alla segnaletica preventiva

riqualificazione piste ciclabili
A3. qualità progettuale

stato di fatto

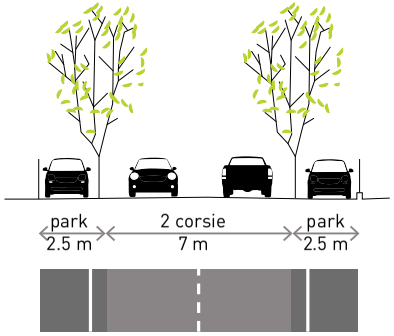


stato di progetto

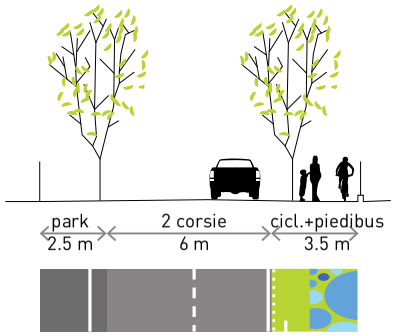


segnaletica percorsi piedibus
A3. qualità progettuale

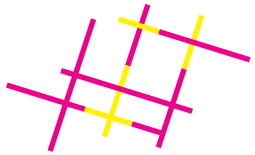
stato di fatto



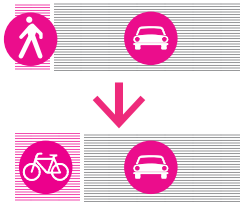
stato di progetto



diagrammi
B3. sicurezza

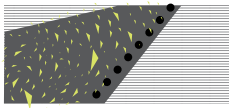


ricucitura della maglia infrastrutturale esistente per creare itinerari ciclabili sicuri



aumento sede stradale dedicata a bici e pedoni

segnalazione luminosa sul ciglio stradale



tratti luminosi con pigmenti fotoluminescenti

riduzione cordoli per una migliore accessibilità

BANDO PER LA REALIZZAZIONE DI CICLOVIE DI INTERESSE REGIONALE E PROMOZIONE DELLA MOBILITÀ SOSTENIBILE
Elaborati di progetto (art. 7 c.4 Allegato A)
Soggetto proponente: COMUNE DI CASTEL BOLOGNESE

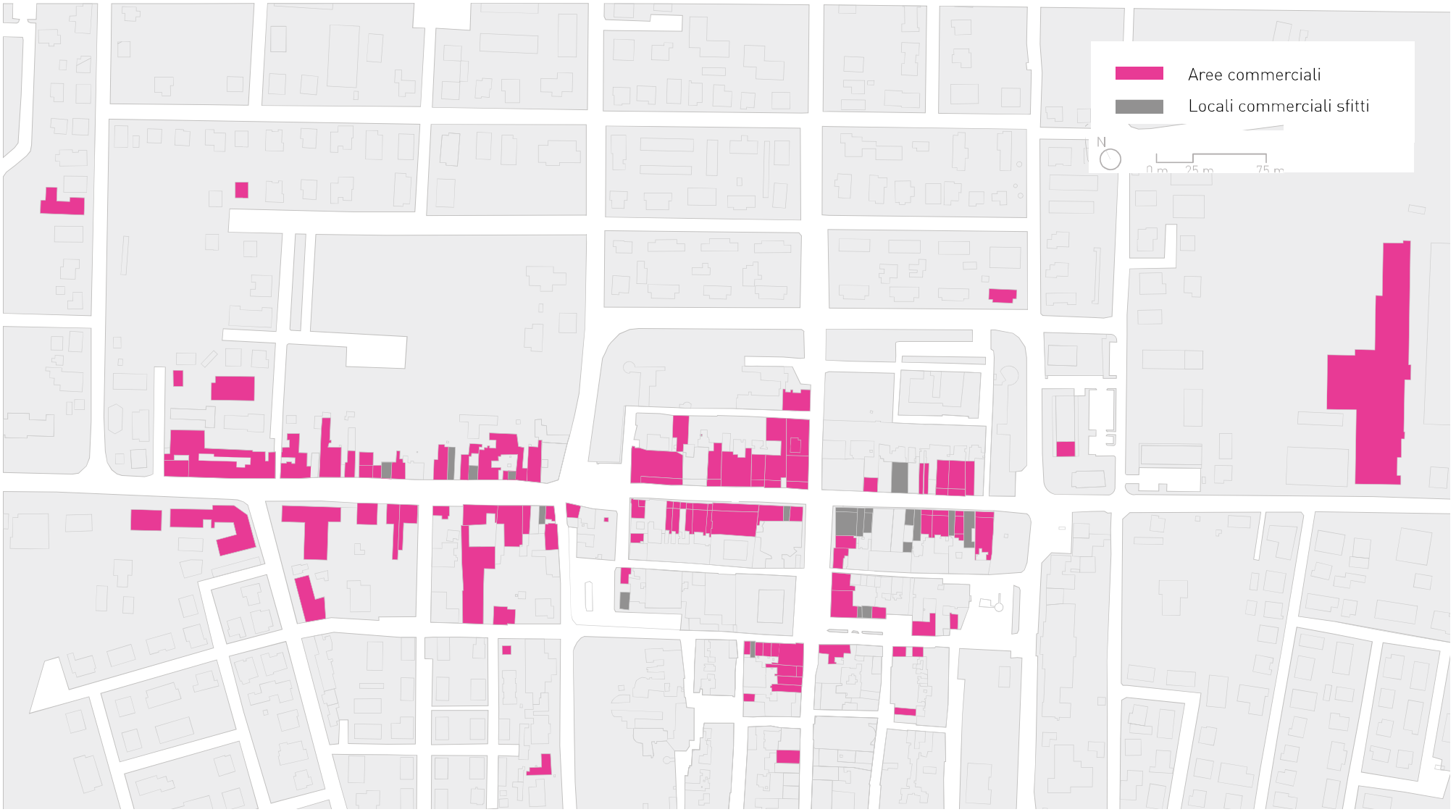
MD Next City Lab — progetto strategico e coordinamento, progetto di ciclovia urbana innovativa
GEA progetti — progetto tratto extraurbano

BANDO RIGENERAZIONE URBANA

FSC 2014-2020 Asse tematico E, Legge 23/12/2014 n. 190 art. 1 c. 703
delibera CIPE 10/08/2016 n. 25, delibera CIPE 1/12/2016 n. 54 Cassa Depositi e Prestiti

STRATEGIA PER LA RIGENERAZIONE URBANA

soggetto proponente: COMUNE DI CASTEL BOLOGNESE



analisi. distribuzione attività commerciali nel centro storico

stato di progetto. planimetria generale

CASTEL BOLOGNESE: IDENTITA' E INNOVAZIONE

indicatori

PROBLEMI	OBIETTIVI STRATEGICI	INTERVENTI E AZIONI	INDICATORI	VALORI EX ANTE	VALORI EX POST
identità sulla via Emilia	valorizzare ambito del centro storico	valorizzazione portici via emilia	mq riqualificati	0	1813
	recupero del patrimonio identitario	valorizzazione portici via garavini	mq riqualificati	0	418
		torre civica - tresoldi	pubblicazioni/articoli	0	30
			conferenze	0	2
		riqualificazione facciate	mq riqualificati	0	720
abbandono del centro storico	aumentare attrattività centro storico	centro comm. naturale	eventi, sagre	30 gg	50 gg
	migliorare la qualità degli spazi pubblici	torre civica - tresoldi	n. visitatori (extra CB)	0	5000
			n. visitatori (CB)	0	2000
		riqualificazione piazzale biblioteca	n. utenti servizi smart	0	40 famiglie
crisi delle attività commerciali	aumentare attrattività centro storico	centro comm. naturale	n. commerci centro storico	51	58
			negozi sfitti recuperati	13	10
riordino flussi urbani	valorizzare via emilia	viabilità centro storico	velocità media centro storico	<50 km/h	≤30 km/h
		attraversamenti safe&smart	n. utenti/gg	0	200
		centro comm. naturale	giorni chiusura via Emilia	5 gg./anno	30 gg./anno
sicurezza urbana	aumentare sicurezza stradale	riqualificazione biblioteca	n. servizi smart installati	0	8
		attraversamenti safe&smart	n. incidenti	5,42*	-15%
			quantità traffico	20000 auto/gg.	-5%
			superamento PM10	>35**	<35
			superamento NO2	>40**	< 40
			inquinamento rumoroso	68,8 dBA**	< 65 dBA

fonte: comune di Castel Bolognese

* tasso di incidentalità della provincia di Ravenna, ISTAT 2016

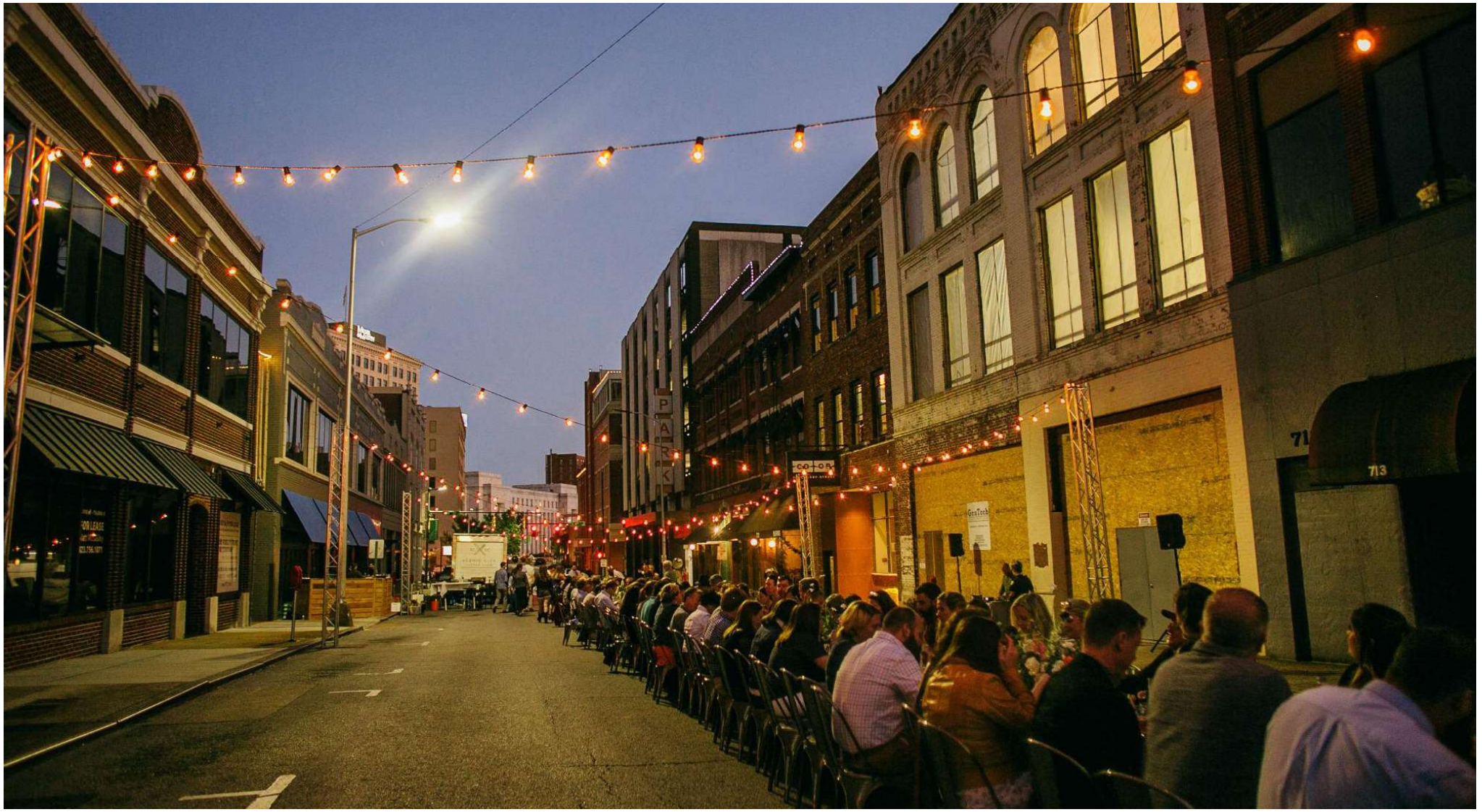
** monitoraggio qualità dell'aria Castel Bolognese, ARPAE 2013

tabella A. indicatori di progetto

La torre
vista da piazza Bernardi nel 1915 (a sinistra)
progetto di Edoardo Tresoldi (in alto)

bando rigenerazione urbana
soggetto proponente :
Comune di Castel bolognese

MD Next City Lab
elaborazione strategia urbana
progetto di rigenerazione urbana sperimentale



vie commerciali recuperate. community supper, chattanooga

nuova torre civica

CASTEL BOLOGNESE (RA)

SMART COMMUNITY AND MOBILITY

DEFINIZIONE DI UN MODELLO INNOVATIVO DI MOBILITÀ PER IL RILANCIO DEL CENTRO STORICO E DI COMUNITÀ PER GLI SPOSTAMENTI CASA-SCUOLA E CASA-SPORT A CASTEL BOLOGNESE

EI4SMART srl +MD Next City Lab DA - Dipartimento di Architettura, Università degli Studi di Ferrara

DESIGN TEAM

Smart Mobility and Communities
Research Team

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Enti coinvolti:

MINISTERO DELL'AMBIENTE
E DELLA TUTELA DEL TERRITORIO E DEL MARE

UNIONE della ROMAGNA FAENTINA

Comune di Castel Bolognese
Provincia di Ravenna

Programma sperimentale nazionale di mobilità sostenibile casa-scuola e casa-lavoro
(Legge n. 221 del 28/12/2015 - Art. 5: Disposizioni per incentivare la mobilità sostenibile)

Progetto l'Unione fa... bene: mobilità casa-scuola a piedi e in bici
Ente Capofila: Unione della Romagna Faentina
Partner pubblico: Unione dei Comuni della Bassa Romagna
Partner privati: Euromobility e Cras S.r.l.

Immagine di copertina tratta da internet:
https://bit.ly/2NfUhoj

Faenza, ottobre 2019

COLOPHON

CREDITI DELLE FONTI UTILIZZATE

Per la presente ricerca sono stati utilizzati dati provenienti da altre ricerche o realizzati in collaborazione con altre attività di progetto:

1. QUESTIONARIO "VIVERE A CASTEL BOLOGNESE"
Questionario realizzato all'interno della ricerca "Castello ++ Smart Town Planning" condotta da:
research team
Walter Nicolino - coordinatore
Gabriele Lelli - coordinatore
Marco Negri - project manager
Ilaria Fabbri
advisors
prof. Alfonso Acocella
prof. Theo Zaffagnini
prof. Giuseppe Mincolelli
prof. Andrea Rinaldi
All'interno del presente documento sono stati riportati e utilizzati i dati relativi alle domande inerenti la mobilità casa-scuola e casa-lavoro. Le rielaborazioni successive sono state svolte nell'ambito della presente ricerca.

2. ATTIVITÀ DI RICERCA PERCORSI CASA-SCUOLA E CASA-SPORT
Le attività di ricerca e le sperimentazioni svolte sono state realizzate nell'ambito del progetto "L'unione fa... bene: mobilità casa-scuola a piedi e in bici, finanziato dal programma nazionale e sperimentale di mobilità sostenibile casa-scuola e casa lavoro del Ministero dell'Ambiente" CIG: Z1E24E713A CUP: F59J17000520008

3. MATERIALE TECNOLOGICO UTILIZZATO
Per la sperimentazione sono state utilizzate le soluzioni tecnologiche "pedibus 2.0" e "kids go green" realizzate dalla Fondazione Bruno Kessler - FBK, concesse gratuitamente nell'ambito della ricerca accademica.
Il team FBK ha contribuito alla formazione dei volontari e all'elaborazione delle statistiche di fine sperimentazione.

4. ANALISI ECONOMICHE
Per le valutazioni economiche sono state utilizzati dati di cui al punto 1 del presente capitolo oltre a dati provenienti da fonti specializzate.

ALTRE ATTIVITÀ DI RICERCA
Gli altri contributi del documento sono stati realizzati nell'ambito della presente ricerca. Le fonti delle immagini non originali sono riportate nella pagina.

##

INDICE

Smart Community and Mobility

INDICE

2.0

MOBILITÀ SOSTENIBILE

Smart Community and Mobility

2.1 SPERIMENTAZIONE PEDIBUS 2.0

METODO, OBIETTIVI E RISULTATI RAGGIUNTI

Durante l'attività di ricerca è stata effettuata la sperimentazione di soluzioni tecnologiche innovative per migliorare l'attrattività e il livello di sicurezza del servizio pedibus attuale. La scelta di effettuare questa sperimentazione deriva dall'analisi delle esigenze dell'amministrazione svolta dal team di ricerca, che ha individuato come questo tipo di indagine – sperimentazione in loco di soluzioni già testate in contesti simili – possa essere la soluzione più idonea per rilevare i possibili benefici in termini di aumento della mobilità sostenibile attraverso l'uso di tecnologie innovative.

Le soluzioni testate consistono in due prodotti tecnologici forniti dalla Fondazione Bruno Kessler/FBK, ente di ricerca nel campo scientifico-tecnologico della provincia di Trento. Il primo è PedibusSmart, sistema tecnologico composto da un'applicazione mobile per la gestione dei volontari e delle presenze e da un sensore di piccole dimensioni che permette di automatizzare la registrazione della presenza dei bambini. Il secondo è Kids Go Green, una piattaforma-gioco accessibile da computer e mobile che rappresenta i chilometri percorsi dai bambini su mappe personalizzabili con contenuti interattivi. Attraverso l'utilizzo dei due sistemi tecnologici è stato possibile verificare il grado di integrazione dell'app con il servizio esistente, la capacità di stimolare attraverso il gioco comportamenti di mobilità virtuosi, eventuali miglioramenti al sistema tecnologico.

La sperimentazione ha avuto una durata limitata (due settimane dal 29 maggio al 7 giugno 2019) e ha coinvolto tutti i soggetti direttamente interessati: l'Associazione Genitori, che attualmente gestisce il servizio, l'assessorato all'istruzione del Comune come interlocutore istituzionale e il team di ricerca. Date queste condizioni si è scelto di testare i prodotti tecnologici su una parte dei bambini iscritti in ciascuna linea e di adeguare la piattaforma di gioco standard alle caratteristiche degli utenti interessati. Per quanto riguarda i partecipanti hanno aderito 27 bambini e 19 volontari di tutte le linee esistenti: 3 per la linea 1B, 3 per la linea 2B, 9 per la linea 3B, 7 per la linea 1C, 5 per la linea 2C. Per la piattaforma di gioco Kids Go Green è stata individuata una soluzione che tenesse conto del numero limitato dei km da percorrere, circa 200, e del fatto che i contenuti erano visualizzati da bambini e genitori e non dalla scuola. Richiamando la "100 km del Passatore", importante manifestazione storica romagnola, è stato proposto un percorso di andata e ritorno da Castel Bolognese a Firenze arricchita da contenuti multimediali lungo le tappe del percorso.

Il progetto così definito si è svolto nelle seguenti

2.1 SPERIMENTAZIONE PEDIBUS 2.0

fasi: una fase preliminare da marzo a maggio 2019, durante la quale si è proceduto ad effettuare diversi incontri organizzativi con le parti e svolgere alcune procedure amministrative; una fase di formazione dal 15 al 25 maggio 2019, dove sono stati fatti due incontri per illustrare il progetto a tutti i partecipanti e il funzionamento dei dispositivi tecnologici; una fase di sperimentazione, con volontari e bambini impegnati a testare le soluzioni adottate in contatto con il team di ricerca; una fase di chiusura del progetto, che si è concluso con un incontro di fine sperimentazione e la trasmissione di feedback al team di ricerca.

I dati raccolti durante la sperimentazione hanno permesso di rilevare un buon grado di partecipazione delle comunità coinvolte: quasi tutti bambini (26 su 27) sono stati registrati per almeno un giorno con una media giornaliera di utilizzo del 79% (69% valore minimo – 90% valore massimo). La piattaforma Kids Go Green è stata apprezzata sia da bambini che dai volontari e il percorso è stato completato entro i tempi previsti. In generale volontari e bambini hanno accolto positivamente la sperimentazione dimostrando un ottimo grado di integrazione con il servizio esistente: tutti i volontari hanno saputo utilizzare l'applicazione, l'applicazione è stata vista sia da volontari che da bambini, i sensori di presenza sono stati usati correttamente. In fase di chiusura della ricerca l'Associazione Genitori ha fornito un documento con alcuni suggerimenti su come migliorare il funzionamento della piattaforma esistente e come apportare possibili migliorie. La sperimentazione ha dimostrato quindi come le tecnologie utilizzate siano compatibili con il servizio esistente e possano migliorarne l'attrattività attraverso sistemi di gaming. Durante gli incontri svolti è emerso che quest'ultima parte, se integrata con l'offerta didattica, possa essere una valida leva per incentivare all'utilizzo del pedibus e in generale a comportamenti di mobilità sostenibile. La realizzazione di un sistema integrato comune-scuola-associazioni-famiglie potrebbe avere una migliore efficacia nel coinvolgimento di famiglie ad oggi non interessate e valorizzare comportamenti virtuosi attraverso una progettazione didattica orientata.

2.1 SPERIMENTAZIONE PEDIBUS 2.0

PRINCIPALI TAPPE DELLA RICERCA

Di seguito un elenco delle tappe principali legate alla sperimentazione "Pedibus 2.0":

dicembre-gennaio 2018
incontri preliminari per la definizione del progetto
presenti: EI4SMART+NCL+CB

15 marzo 2019
workshop internazionale small smart town
presenti: EI4SMART+NCL+AG+CB+FBK+URF

15 maggio 2019
incontro pre-sperimentazione, sala consiliare
presenti: EI4SMART+NCL+AG+CB+FBK+URF

25 maggio 2019
incontro formazione volontari pedibus presso centro sociale Castel Bolognese
presenti: NCL+AG

29 maggio-7 giugno 2019
PERIODO SPERIMENTAZIONE PEDIBUS 2.0

12 giugno 2019
incontro preliminare di fine sperimentazione
presenti: EI4SMART+NCL+AG

18 giugno 2019
incontro collettivo di fine sperimentazione
presenti: EI4SMART+NCL+AG+CB

10 luglio 2019
incontro di avanzamento
presenti: EI4SMART+NCL+AG+CB

10 luglio 2019
raccolta interviste parte 1 - NCL

10 luglio 2019
raccolta interviste parte 2 - NCL

5 settembre 2019
partecipazione alla manifestazione "sport in festa" per informare sui risultati della sperimentazione
presenti: NCL + AG

11 settembre 2019
incontro di aggiornamento nell'ambito del progetto "l'unione fa...bene"
presenti: NCL+FBK+URF

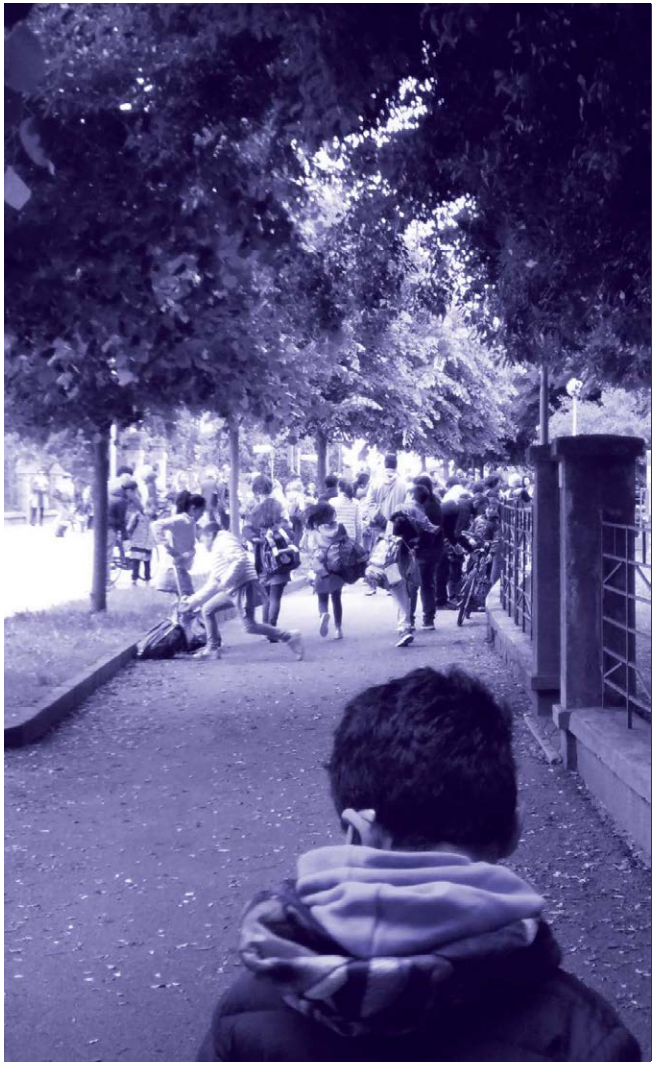
legenda:
EI4SMART: personale EI4SMART srl
NCL: personale gruppo di ricerca MD Next City Lab
AG: Associazione Genitori Castel Bolognese
CB: Amministrazione Comunale Castel Bolognese
URF: personale Unione Romagna Faentina

2.1 SPERIMENTAZIONE PEDIBUS 2.0

REPORT FOTOGRAFICO

Fermata linea Pedibus

Pedibus in marcia



Arrivo a scuola

2.1 SPERIMENTAZIONE PEDIBUS 2.0

ANALISI RISULTATI SPERIMENTAZIONE

La tabella riporta le presenze giornaliere rilevate dall'applicazione. I risultati sono buoni, anche alla luce del fatto che la sperimentazione è durata due settimane. La linea più presente è risultata la 2G, con una media di 4,50 bambini su 5, mentre quella meno frequentata è stata la linea 1G con una media di 1,20 bambini su 3 iscritti. Per quanto riguarda i dati dei volontari si deve tenere conto che il pedibus necessita di non più di 1 o 2 persone a seconda della linea.

		presenze giornaliere											media	iscritti
		27/5	28/5	29/5	30/5	31/5	1/6	3/6	4/6	5/6	6/6	7/6		
LINEA 1B	bambini			3	3	3	2	2	3	1	2	1	2,22	3
	volontari			1	1	1	2	2	1	1	2	1	1,33	4
LINEA 2B	bambini			3	0	3	3	2	3	3	0	2	2,71	3
	volontari			2	0	2	1	2	5	2	0	2	2,29	4
LINEA 3B	bambini			8	0	5	7	8	7	3	0	7	6,43	9
	volontari			1	0	1	3	2	1	1	0	1	1,43	4
LINEA 1G	bambini	2	7	4	0	6	0	0	5				4,80	7
	volontari	1	1	1	0	1	0	0	2				1,20	3
LINEA 2G	bambini	4	5	4	5	4	0	3	5	5	5	5	4,50	5
	volontari	1	1	2	1	1	0	1	1	1	1	1	1,10	4

2.1 SPERIMENTAZIONE PEDIBUS 2.0

ANALISI RISULTATI SPERIMENTAZIONE

La tabella sintetizza i dati rilevati nella pagina precedente. Incrociando i dati sulla percentuale di bambini che hanno utilizzato l'applicazione e la percentuale di frequenza dei bambini registrati si nota come l'applicazione abbia raggiunto in poco tempo un buon livello di utilizzabilità da parte della comunità. Questo risultato è frutto sia della partecipazione dimostrata dai bambini che della capacità di utilizzo dell'applicazione da parte dei volontari.

	Line	# kids registered	# kids using	% kids using	# days active	Avg # kids per day	% registered kids on average
CastelBolognese	1B	3	2	67%	10	2.2	73%
	2B	3	3	100%	7	2.7	90%
	3B	9	9	100%	7	6.4	71%
	1G	7	7	100%	5	4.8	69%
	2G	5	5	100%	10	4.5	90%

2.2 INTERVISTE A CAMPIONE

PRIMA SESSIONE - 10 LUGLIO

La tabella sintetizza le risposte date nella prima sessione di interviste. Le caselle non riempite corrispondono a risposte non date dagli intervistati.

	INTERVISTE 10/7									
DOMANDE	intervista 1	intervista 2	intervista 3	intervista 4	intervista 5	intervista 6	intervista 7	intervista 8	intervista 9	intervista 10
che scuola frequenti?	bassi	medie	ginnasi	nido	bassi	bassi	bassi	bassi	medie	ginnasi
con che mezzo ti rechi attualmente a scuola?	pedibus	bici	auto pedibus	auto	piedi, bici, auto	auto	pedibus	auto	bici	auto
ci sono cambiamenti tra estate e inverno?	no	no	d'estate a piedi	d'estate a piedi	d'estate meno auto	no	no	no	no	d'estate meno auto
se non usi il pedibus, perché?			comodità (mancanza di fermate)	figlio troppo piccolo	tempo	comodità	-	esigenze familiari, comodità (tempi lavorativi)		comodità, tempo
se usi il pedibus, avresti delle proposte di miglioramento?	posto per zaini				posto per zaini		no			
saresti favorevole al servizio di rientro del pedibus?	si		dipende dagli orari	dipende dagli orari	si	si	uscita	no		si
saresti favorevole a percorsi di mobilità condivisa scuola-sport?	si		no vado al sabato in piscina a faenza		insomma poco tempo per bimbi piccoli	no	danza piscina asciugare capelli	sì (nuoto)		si

2.2 INTERVISTE A CAMPIONE

SECONDA SESSIONE - 24 LUGLIO

La tabella sintetizza le risposte date nella seconda sessione di interviste. Si segnala che il tema della sicurezza stradale non riguarda, a parere degli intervistati, solo i bambini: l'attraversamento della via Emilia viene visto dai genitori come punto pericoloso anche per ragazzi di 14-18 anni.

	INTERVISTE 24/7										
DOMANDE	**intervista 11**	**intervista 12**	**intervista 13**	**intervista 14**	**intervista 15**	**intervista 16**	**intervista 17**	**intervista 18**	**intervista 19**	**intervista 20**	**intervista 21**
che scuola frequenti?	**materna**	materna	bassi	bassi	**bassi**	ginnasi	**ginnasi**	bassi	medie	bassi	**ginnasi**
con che mezzo ti rechi attualmente a scuola?	**auto**	a piedi	auto fino alla fermata + pedibus	pedibus, auto	**auto**	auto, bici	**auto**	bici, piedi	bici	piedi	**auto**
ci sono cambiamenti tra estate e inverno?	**no**	no	no	quando piove in auto	**no**	estate in bici	**no**	d'estate a piedi	no	no	**estate in bici**
se non usi il pedibus, perché?	**comodità (l'auto viene già usata)**	non ho l'auto		-	**comodità (3 figli), sicurezza**	esigenze familiari	**esigenze familiari, comodità (tempo)**	esigenze familiari, comodità (scuola vicina)	tempo	esigenze familiari, comodità (scuola vicina)	**esigenze familiari, comodità (tempo)**
se usi il pedibus, avresti delle proposte di miglioramento?	**-**	-	lo uso perché piace al bambimo	-	**-**	-	**-**	-	-	-	**-**
saresti favorevole al servizio di rientro del pedibus?	**si**	si	si	no, orari	**si**	sì	**sì**	sì	sì	no	**sì**
saresti favorevole a percorsi di mobilità condivisa scuola-sport?	**si**	si	si	sì, orari da gestire	**si**	sì danza	**sì pallanuoto faenza**	sì, orari da verificare faenza nuoto	sì, orari da verificare	no	**sì basket cb**

2.3 RISULTATI PRINCIPALI

INDICAZIONI PER POTENZIARE LA MOBILITÀ SOSTENIBILE

Una delle finalità della sperimentazione pedibus 2.0 e la raccolta di interviste a campione era la raccolta di informazioni utili a tratteggiare un quadro di massima dei comportamenti adottati dalle comunità di Castel Bolognese nel campo della mobilità sostenibile.

In entrambe le attività di ricerca è stata registrata un buon livello di partecipazione da parte delle persone coinvolte, che hanno contribuito attivamente alla riuscita del progetto. Questo tipo di risposta è sintomo di un buon grado di attività delle comunità sul piano sociale e una diffusa sensibilità al tema della mobilità sostenibile.

La sperimentazione pedibus 2.0 ha fatto rilevare buoni risultati in termini di partecipazione e corretto utilizzo dell'applicazione, dimostrando la compatibilità tra la soluzione tecnologica proposta e il servizio esistente. Inoltre ha accresciuto l'interesse verso questa soluzione di mobilità, considerato dalla comunità di Castel Bolognese come esempio virtuoso sia dal punto di vista ambientale che sociale. Si può quindi facilmente dedurre come la continuazione di questa sperimentazione possa essere accolta con favore dalla comunità locale, soprattutto se accompagnata da un maggior coinvolgimento delle istituzioni scolastiche.

Le interviste a campione, anche se effettuate in due sedute, hanno apportato ulteriori spunti di riflessione. Il servizio pedibus gode di una buona considerazione da parte della cittadinanza, probabilmente perché nato da un'iniziativa "dal basso". Le migliorie richieste riguardano aspetti organizzativi, la sicurezza e soprattutto la comodità d'uso. Quest'ultima è forse l'aspetto più importante rispetto a quanto rilevato nell'attività di ricerca: per rispondere a questa richiesta è necessaria una nuova organizzazione del sistema della mobilità, orientata a rendere più convenienti i comportamenti di mobilità sostenibile favorendo una minor durata o una minor spesa del tragitto considerato più virtuoso. Una scelta che potrebbe invertire i comportamenti di mobilità attuali, sostanzialmente invariati rispetto a quelli rilevati nel 2017 dove il 77% degli intervistati si spostava con auto propria.

In conclusione i risultati delle attività di ricerca evidenziano come per orientare i comportamenti di mobilità della comunità di Castel Bolognese sia importante far dialogare servizi di mobilità nati "dal basso" con le istituzioni che ne potrebbero favorire lo sviluppo (ad esempio il pedibus integrato) e modificare la rete viaria esistente in modo da favorire la mobilità dolce. Di questi interventi, raccolti nel capitolo successivo, viene analizzata la fattibilità di massima sia dal punto di vista tecnico che economico.

3.1 PROPOSTE A SCALA URBANA

DALLE CRITICITÀ AGLI OBIETTIVI DI PROGETTO

Obiettivi < Criticità

coordinazione tra i servizi di mobilità da migliorare	mobilità dolce più scomoda dell'auto	attraversamenti da rendere più sicuri	sviluppare una cultura della mobilità sostenibile
smart community creazione di una piattaforma tecnologica per attivare iniziative di mobilità sostenibile nella comunità	**kids mobility network** rete integrata della mobilità dolce che unisce scuola, commercio, associazioni	**incroci sicuri** attraversamenti intelligenti pensati per ridurre la probabilità di incidenti lungo le strade più trafficate	**CB mobility lab** iniziative volte a sviluppare comportamenti di mobilità sostenibile

Obiettivo principale: migliorare la qualità di vita dei cittadini rendendo gli spostamenti più sicuri, inclusivi e a minor impatto ambientale

3.1 PROPOSTE A SCALA URBANA

CB MOBILITY LAB

3.3 TECNOLOGIE E BEST PRACTICES

TECNOLOGIE UTILIZZATE

PEDIBUS SMART

PEDIBUS SMART è un progetto delle Politiche Giovanili del Comune di Trento in collaborazione con la Fondazione Bruno Kessler, che ha l'obiettivo di **sensibilizzare** ad una mobilità sostenibile nei tragitti casa-scuola; **ridurre il traffico in prossimità delle scuole** e migliorare la qualità della vita nell'ambiente urbano; **incoraggiare l'indipendenza dei bambini**, favorendo la conoscenza del quartiere e delle regole per muoversi in sicurezza.

Nell'anno scolastico 2018-2019, nella Provincia di Trento partecipano al **Pedibus Smart** le scuole elementari di Meano, Vela, Cognola e Cadine, per un totale di circa 120 bambini e più di 50 volontari. Inoltre dal 2019 anche Ferrara sperimenta il **Pedibus Smart** in 5 scuole della città.

FAENZA (RA)

SMART MOBILITY NETWORK

STRATEGIE DI INNOVAZIONE NELLA MOBILITÀ SOSTENIBILE

MD Next City Lab

DA - Dipartimento di Architettura
Università degli Studi di Ferrara

DESIGN TEAM

MD Next City Lab per CFR - Consorzio Futuro in Ricerca
Gabriele Lelli (responsabile scientifico)
Gianluca Cristoforetti
Marco Negri
Ilaria Fabbri

DA - Dipartimento di Architettura
Università degli studi di Ferrara

Smart Mobility Network
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Gabriele Lelli
Marco Negri
Ilaria Fabbri
Tommaso Larosa
Lorenzo Monaldini

Faenza, marzo 2020

##

INDICE

Smart Mobility Network

INDICE

0.0

INTRODUZIONE

Smart Mobility Network

MOBILITÀ 4.0

NUOVI STRUMENTI PER MUOVERSI IN SALUTE

Nei prossimi anni il modo di muoversi delle persone dentro e fuori le città è destinato a cambiare radicalmente: mobilità elettrica, auto a guida autonoma, micromobilità, car pooling, car sharing sono solo alcuni dei nuovi trend già acquisiti dalle comunità o che potrebbero esserlo nei prossimi anni.

Confrontarsi con questo tipo di innovazioni diventa fondamentale per non perdere opportunità di sviluppo e rendere gli spostamenti sempre più sicuri, efficienti e a basso impatto ambientale.

Il documento qui presentato offre un contributo su queste questioni, integrando i contenuti del PUMS - Piano Urbano della Mobilità Sostenibile - con strategie e strumenti innovativi utili a raggiungere gli obiettivi di lungo periodo definiti dal Piano, ovvero il miglioramento delle condizioni di circolazione e della sicurezza stradale, la riduzione degli inquinamenti acustico ed atmosferico ed il risparmio energetico nel rispetto dei valori ambientali.

Le soluzioni presentate sono state studiate con una visione 'sartoriale', modellando gli interventi sulla base delle esigenze e delle opportunità offerte dal territorio e dalle comunità che lo abitano.

1.

MIGLIORARE

migliorare la qualità di vita delle comunità rendendo il sistema dei trasporti più efficiente, sicuro, salubre, inclusivo.

2.

INTEGRARE

affiancare agli strumenti esistenti soluzioni innovative in linea con le più avanzate best practices in tema di mobilità sostenibile

3.

INNOVARE

sfruttare le possibilità di sviluppo date dalla cultura digitale e dai nuovi trend nel campo dei mezzi di trasporto, delle infrastrutture e dei comportamenti di mobilità

1.1

REPORT DATI PUMS

Smart Mobility Network

FAENZA

parte dell'Unione dei Comuni della Romagna Faentina con Brisighella, Casola Valsenio, Castel Bolognese, Riolo Terme, Solarolo

DATI PRINCIPALI

popolazione: 58.755 ab.

superficie: 215,8 kmq

strade comunali: 547 km

strade centro abitato: 145 km

n. linee di trasporto scolastico: 17

2006-2016 : Attività di ricucitura di tutti i percorsi ciclopedonali presenti sul territorio da parte dell'amministrazione, sia in ambito urbano che nel forese, per il completamento di percorsi ciclabili casa-scuola o casa-lavoro

piste ciclabili DM 557/1999: 50 km

piedibus: Don Milani, Carchidio, S. Rocco (7 percorsi, 270 bambini coinvolti)

reticolo viario inadeguato per volumi di traffico attuali

FAENZA

caratteristiche della struttura urbana - principali ambiti urbani

DATI PRINCIPALI

44% studenti delle scuole superiori usa TPL, 31% bici

17 linee scuolabus utilizzate da ca 300 alunni

50% scuole all'interno del centro storico, 50% tessuto urbano consolidato

morfologia compatta del centro storico e dell'agglomerato urbano

reticolo viario inadeguato per volumi di traffico attuali

il trasporto pubblico soddisfa solo il 2,5% degli spostamenti urbani (totale)

piste ciclabili mal collegate / poco sicure

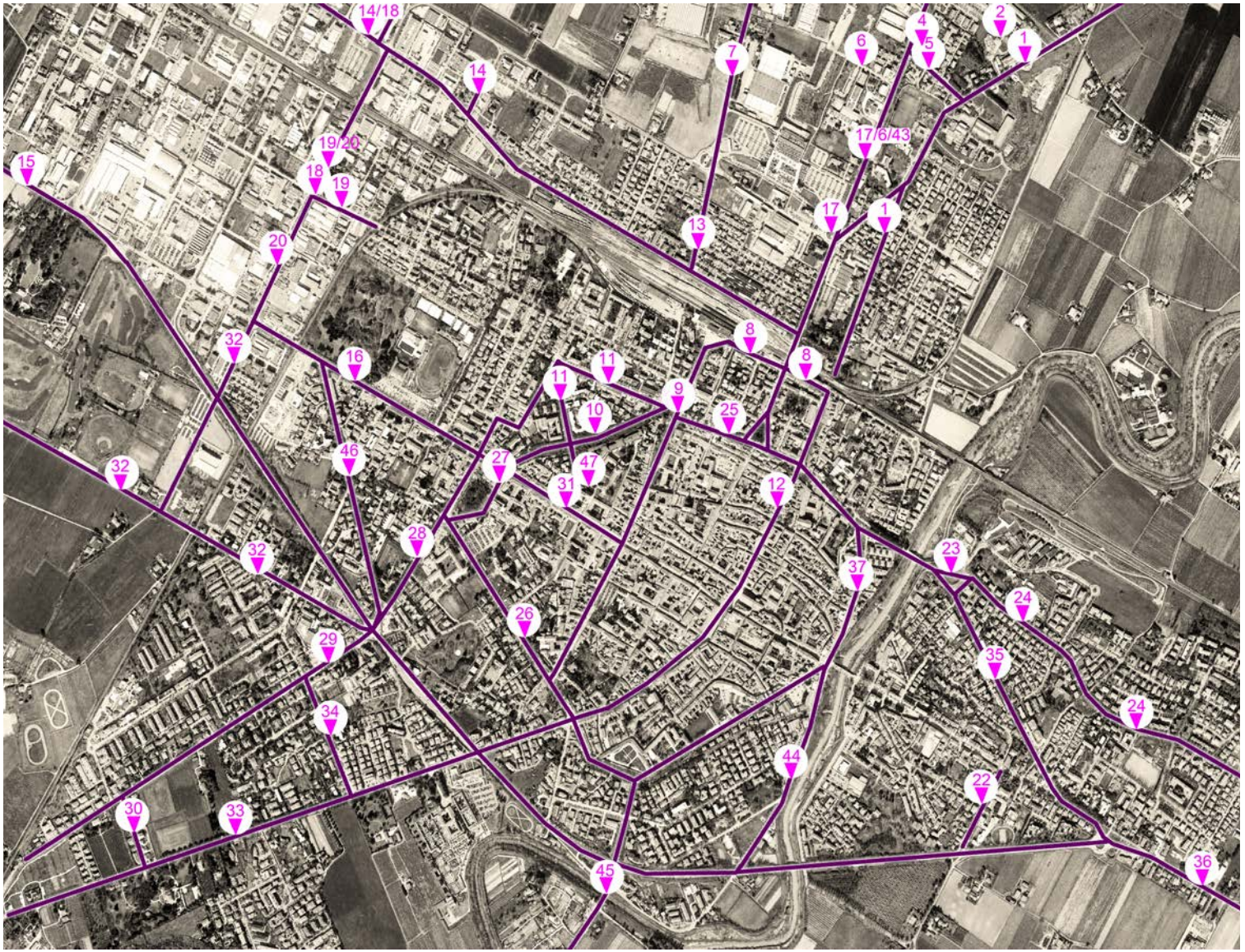
1.100 spostamenti giornalieri da fuori comune

uso esasperato e improprio dell'automobile causa problemi (ingressi scolastici, giorni di mercato, orari di shopping, ecc.)

7.700 su 8.800 spostamenti casa-scuola avvengono all'interno del comune di Faenza

MAPPATURA FIAB - PROBLEMI

segnalazioni manutenzioni straordinarie ciclabili faentine FIAB Faenza | ottobre 2018 | rielaborazione grafica Next City Lab

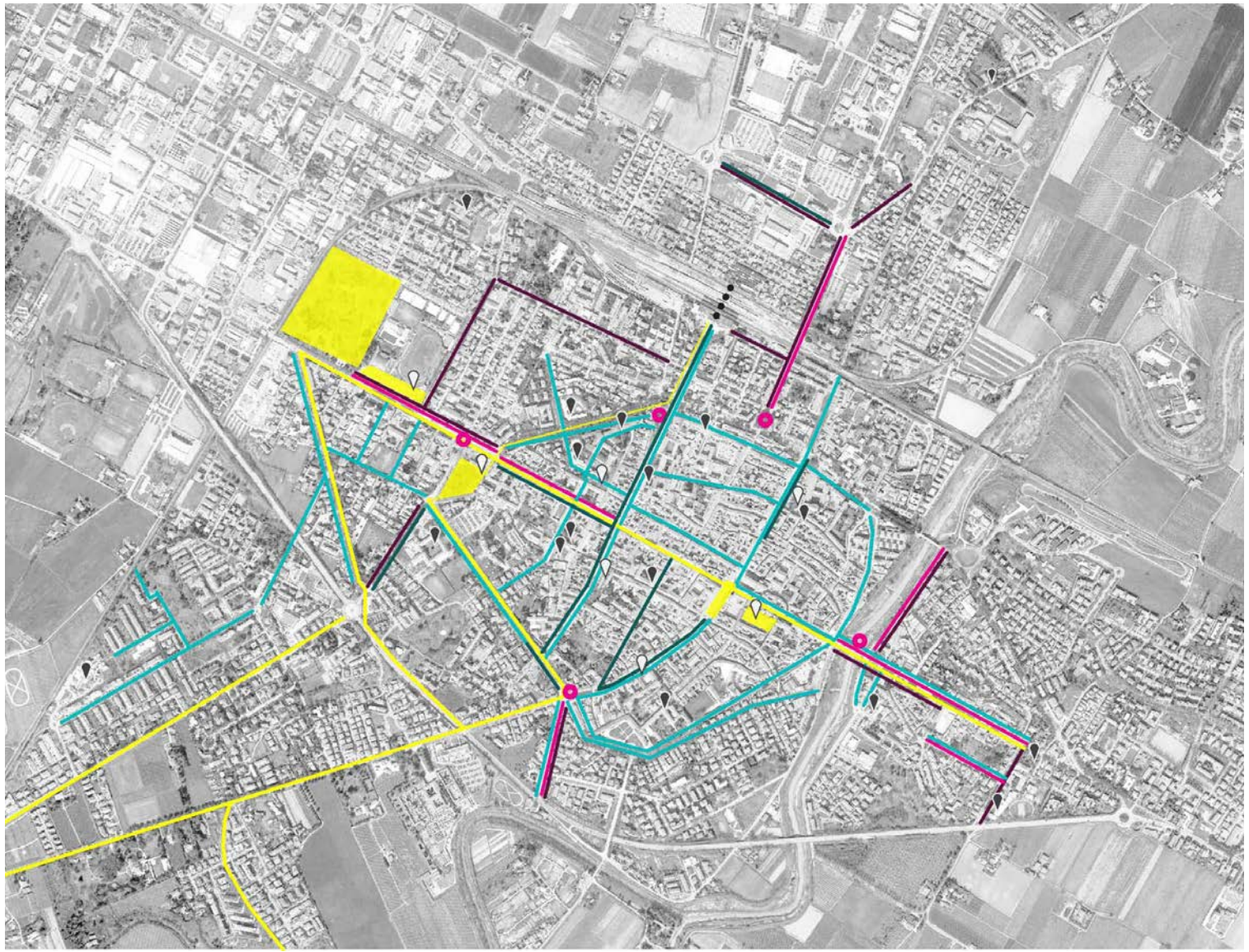


SEGNALAZIONI PRINCIPALI

13 - via Filanda Nuova
14- via Malpighi - via Mantegna e via Boaria
15- via Boaria - via Emilia Ponente
16 - via Oberdan
17- via Granarolo - rotonda balena
18 - via Malpighi - rotonda di via Risorgimento
19 - via Risorgimento - via Cittadini
20 - via Risorgimento - zona Fiera
21 - via Emilia Ponente
22 - via Carchidio
23 - rotonda Ponte della Memoria
24 - via Testi - via Fornarina
25 - viale IV Novembre
26 - viale Stradone
27 - via S. Giuliano
28 - via degli Insorti
29 - via Canal Grande
30 - via Melandri
31 - c.so Mazzini
32 - via Graziola - c.so S.Orsola - via Portisano
33 - via Firenze
34 - via Costa
35 - via F.lli Rosselli
36 - via Forlivese
37 - via Ponte Romano
38 - via Gubbio
39 - via Castelli
40 - via Edison
41 - via Proventa - via cà Bianca
42 - via della Punta
43 - ciclopedonale Granarolo - Faenza
44 - via Renaccio

MAPPATURA FIAB - AZIONI

proposte per il PUMS Faenza 2020 FIAB Faenza | giugno 2019 | rielaborazione grafica Next City Lab



LEGENDA

AZIONE 1
connessione delle ciclabili e manutenzione dell'esistente

AZIONE 2
senso unico eccetto bici

AZIONE 3
prevedere casa avanzata e temporizzazione semafori

AZIONE 4
sottopasso verso zona Filanda

AZIONE 5
parcheggi / centro storico da collegare con navette elettriche

AZIONE 6
zone antistanti istituti scolastici: school street, pedibus, trasporto pubblico gratuito

AZIONE 7
percorsi da ampliare, senza lo spazio sufficiente per le bici

AZIONE 8
percorsi da ampliare, senza lo spazio sufficiente per una ciclovia

SMART MOBILITY NETWORK

un sistema di mobilità più sicuro, inclusivo, smart

SICUREZZA

limitare la velocità per auto e moto
sezioni stradali adatte alla convivenza tra mezzi diversi

aumento comfort per mobilità dolce
miglioramento arredo urbano e servizi smart

segnaletica predittiva
per evitare le principali cause di incidenti

safety in numbers
più bici sulla strada, più sicurezza

BENESSERE

emissioni
limitare l'inquinamento atmosferico

sostenibilità
utilizzo materiali riciclati/permeabili

clima
riduzione effetto isola di calore

SMART MOBILITY NETWORK

un sistema di mobilità più sicuro, inclusivo, smart

Obiettivi < Criticità

ZONA 30

necessità di rivedere la zona 30, percepita come limitante rispetto alle esigenze della popolazione

COLLEGAMENTI

migliorare la qualità delle infrastrutture esistenti, collegandole tra loro seguendo le principali direttrici dI traffico

BENESSERE

migliorare il livello di benessere percepito per gli spostamenti a bici e a piedi, favorendo la mobilità dolce a tutte le età

SMART MOBILITY NETWORK

sicuro

le sezioni stradali dovranno migliorare il loro livello di sicurezza e inclusione, facilitando gli spostamenti di bambini, anziani, persone con disabilità

sostenibile

un ecosistema della mobilità incentrato sui livelli di benessere delle persone e dell'impronta ambientale

fattibile

l'articolazione in diverse azioni consente una realizzazione per stralci successivi

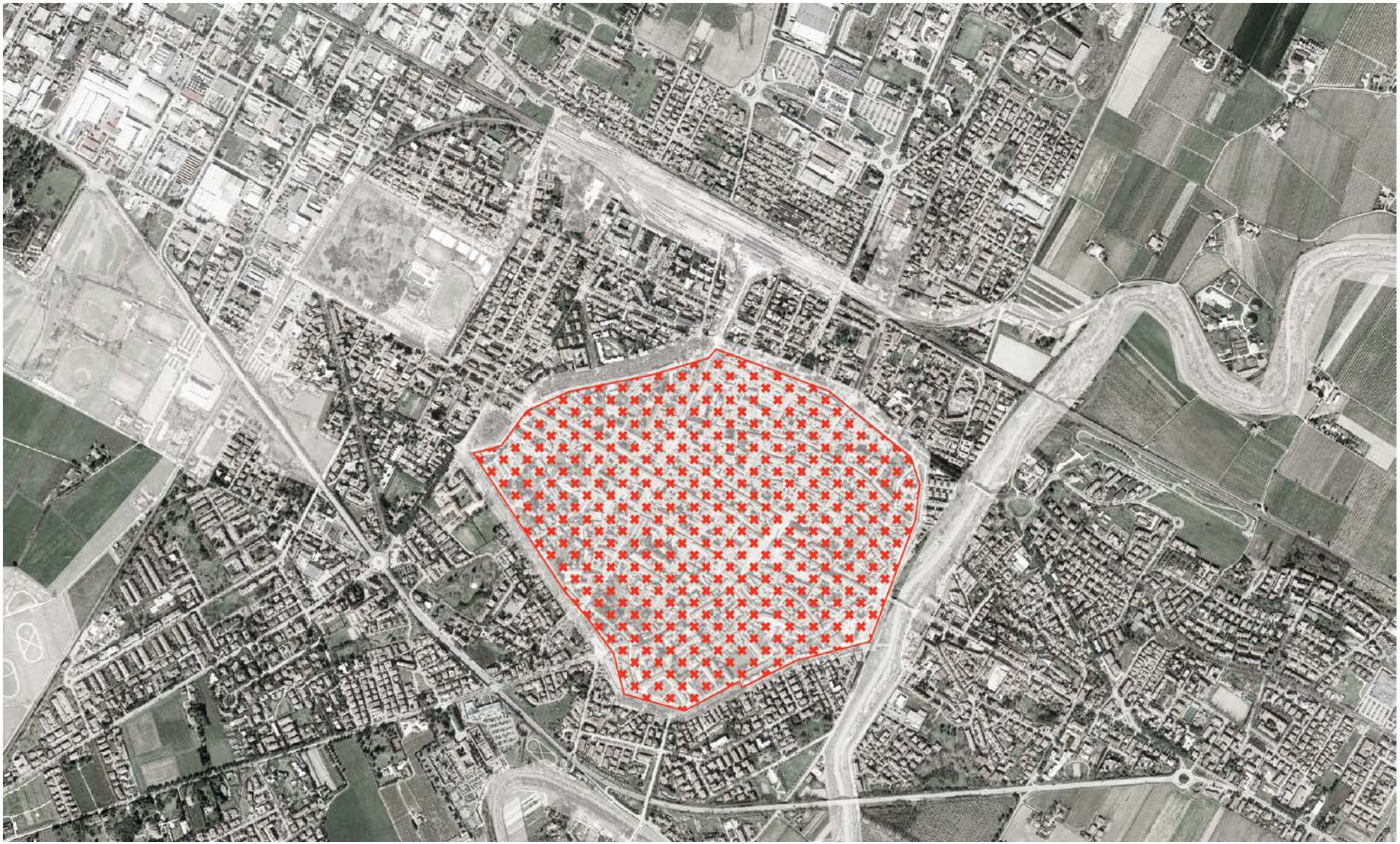
smart

possibilità di integrazione con sensori e device per favorire il gaming urbano e una risposta in tempo reale del sistema di viabilità

Obiettivo principale: migliorare la qualità di vita dei cittadini

SMART MOBILITY NETWORK

STATO DI FATTO - zona 30, cinta muraria, “anello verde” (cf. mozione C.C. 26 settembre 2019)

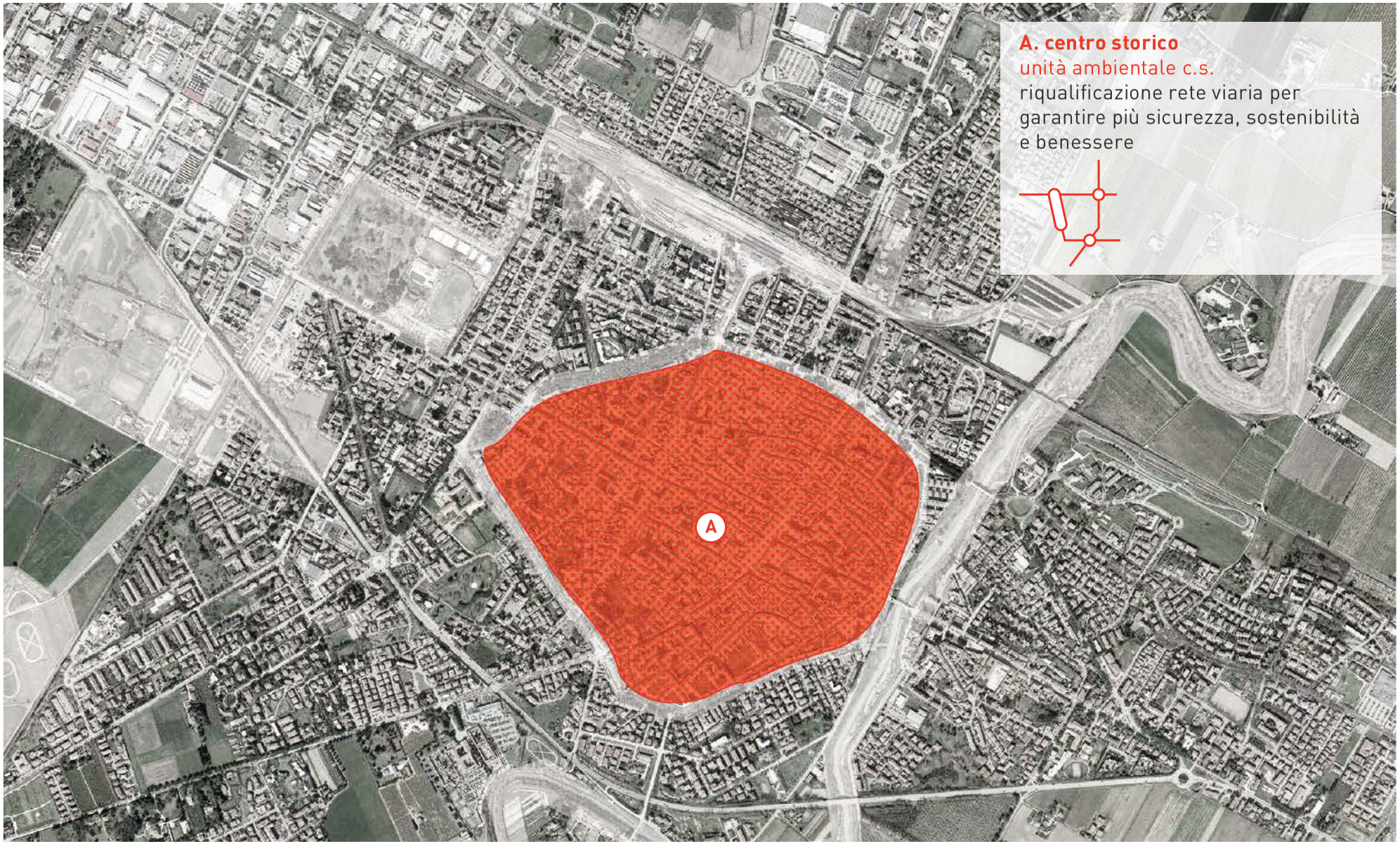


SMART MOBILITY NETWORK

STATO DI PROGETTO - smart mobility network

SMART MOBILITY NETWORK

PARTE A - unità ambientale centro storico



SMART MOBILITY NETWORK

PARTE B - unità ambientali residenziali

SMART MOBILITY NETWORK

PARTE C - bicipolitana 4.0

SMART MOBILITY NETWORK

PARTE D - autostrada delle scuole

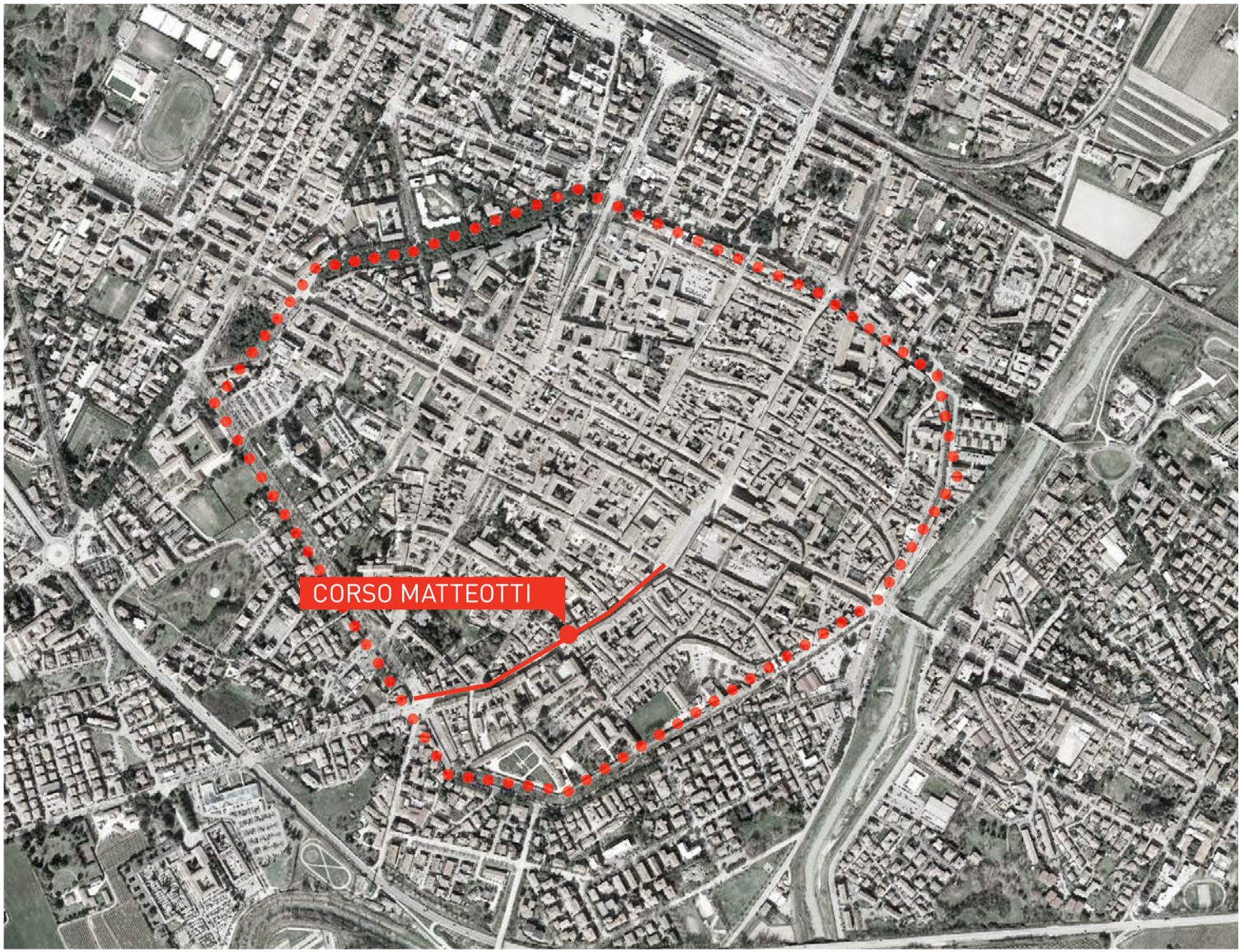
3.0

FOCUS

Smart Mobility Network

CORSO MATTEOTTI

simulazioni e viste di progetto



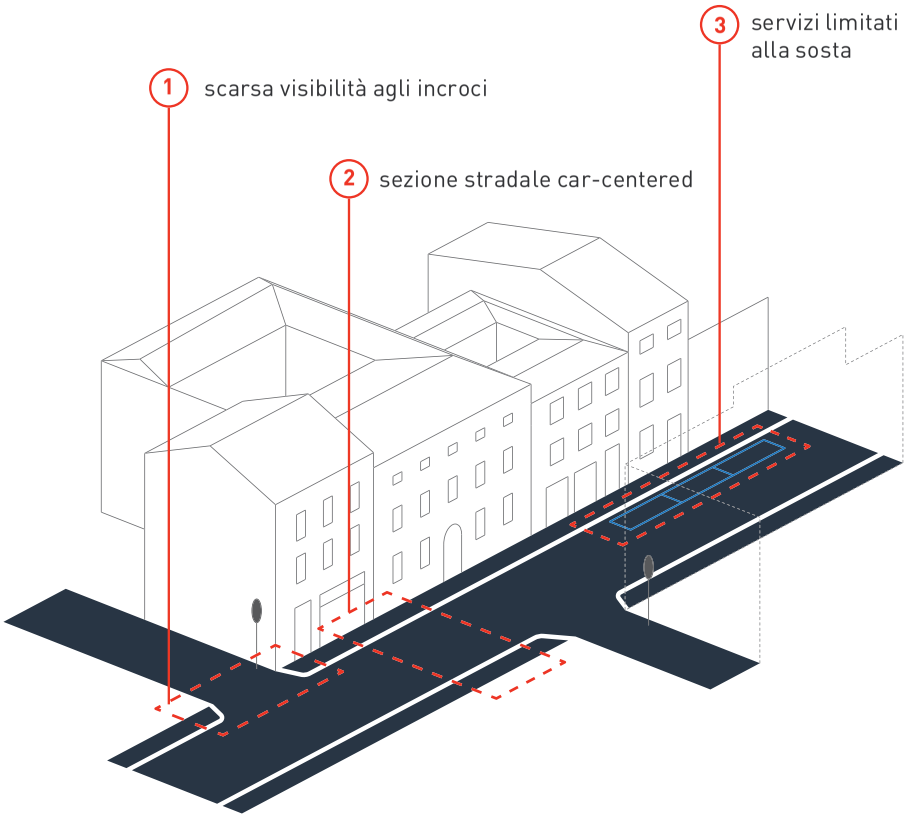
Corso Matteotti

una delle via principali del centro storico, collega il centro con la parte a sud di Faenza passando per Porta Montanara.
La parte iniziale, fino all'incrocio con via Cavina, è compresa nella ZTL comunale; dalla fine di questa verso Porta Monanara corso Matteotti rientra nella zona 30 del centro storico. Nonostante le prescrizioni indicate negli strumenti urbanistici è stato rilevato che questo limite non sempre viene rispettato dai mezzi in transito.
In quanto via di passaggio è frequente la compresenza di auto, pedoni e bici. Mentre i pedoni si attestano ai lati auto e bici occupano entrambi la corsia principale a senso unico.

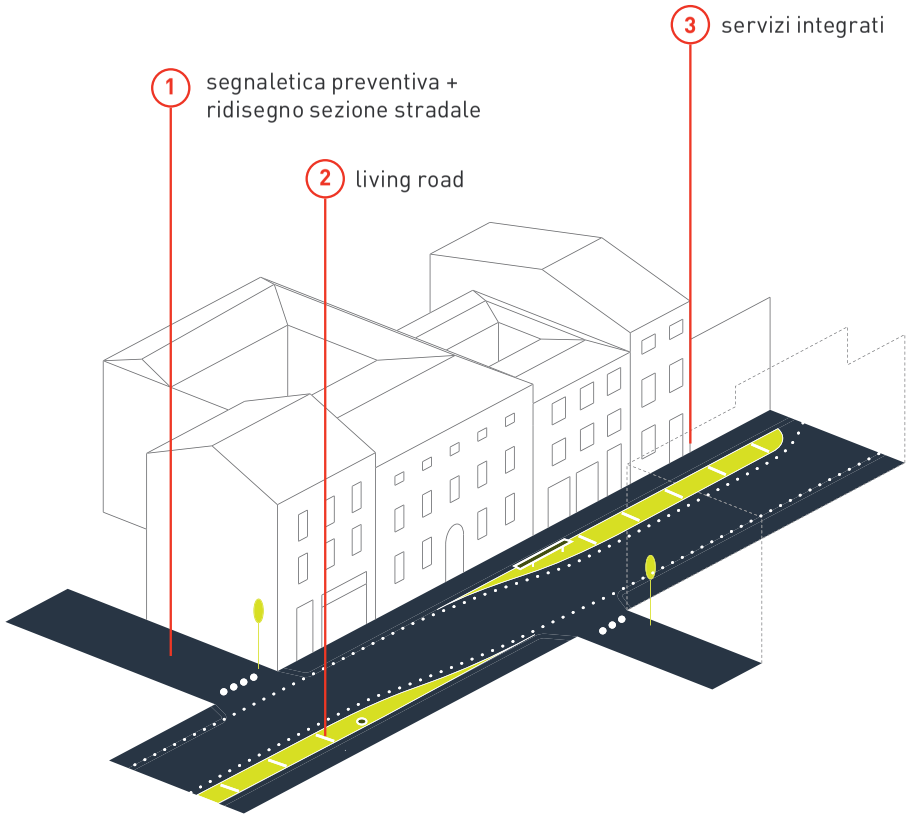
CORSO MATTEOTTI

simulazione A: living road

stato attuale



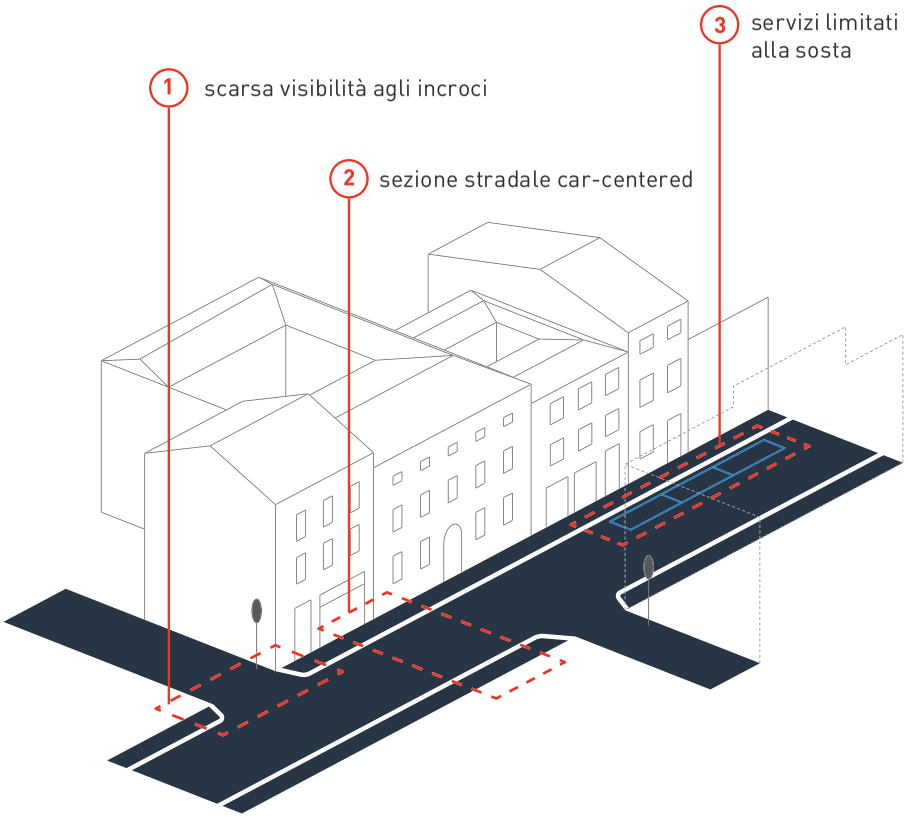
living road



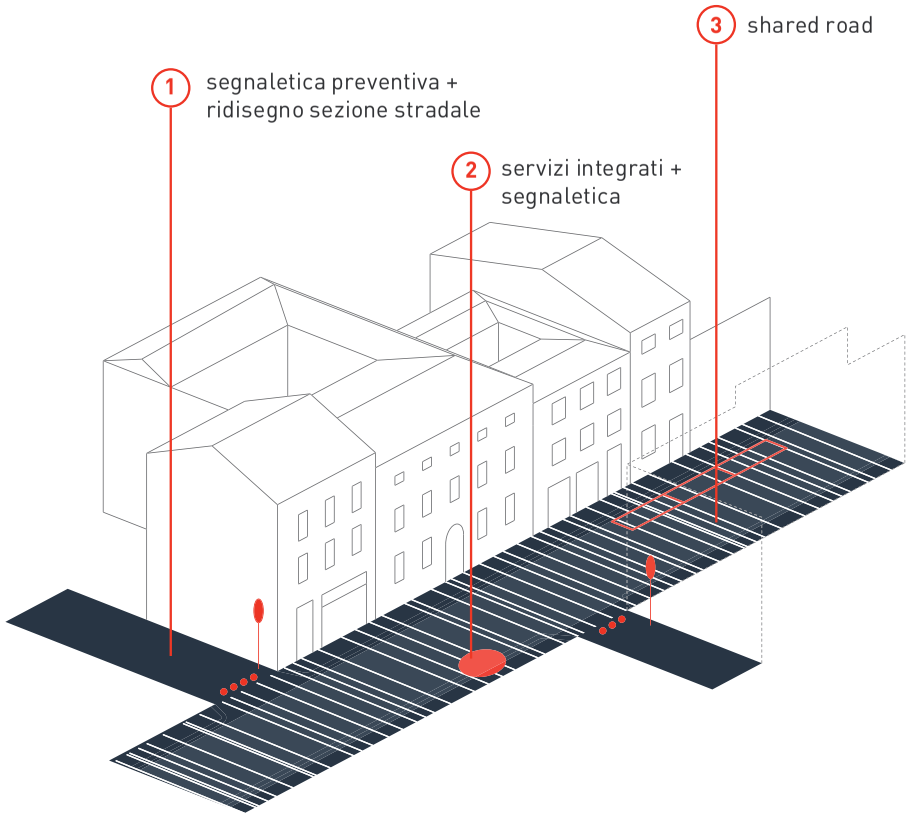
CORSO MATTEOTTI

simulazione B: shared road

stato attuale



shared road



CORSO MATTEOTTI / 2

stato di fatto

CORSO MATTEOTTI / 2

stato di fatto

CORSO MATTEOTTI / 2

stato di progetto - living road

CORSO MATTEOTTI / 2

stato di progetto - living road

CORSO MATTEOTTI / 2

stato di progetto - living road

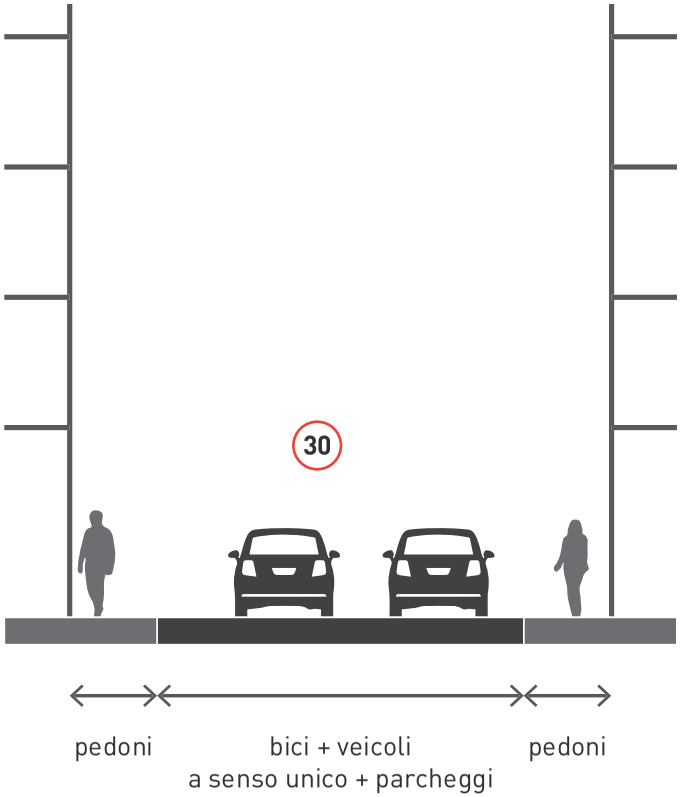
CORSO MATTEOTTI / 2

stato di progetto - living road

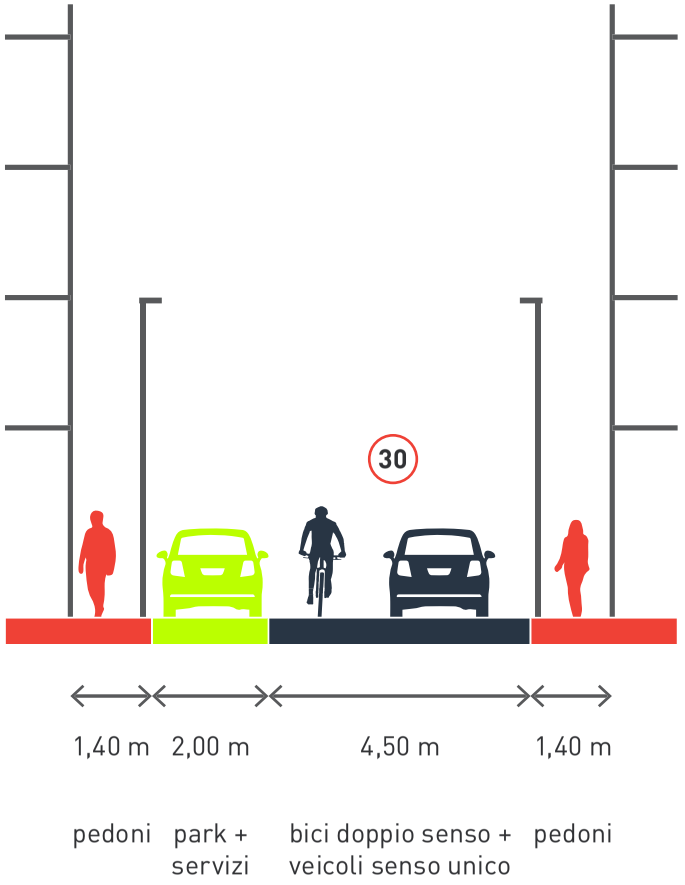
CORSO MATTEOTTI / 2

stato di progetto - living road

stato di fatto

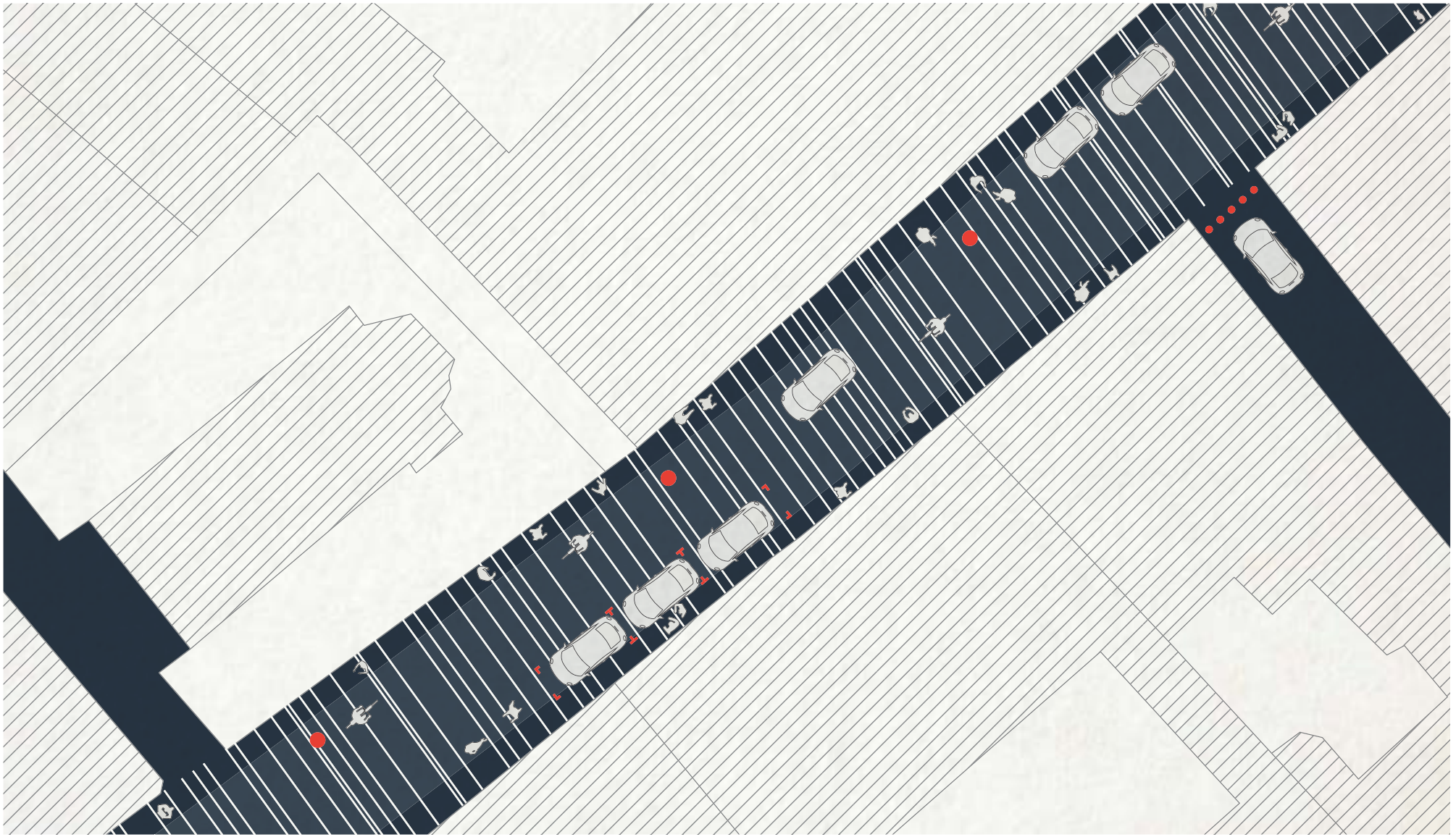


stato di progetto



CORSO MATTEOTTI / 2

stato di progetto - shared road



CORSO MATTEOTTI / 2

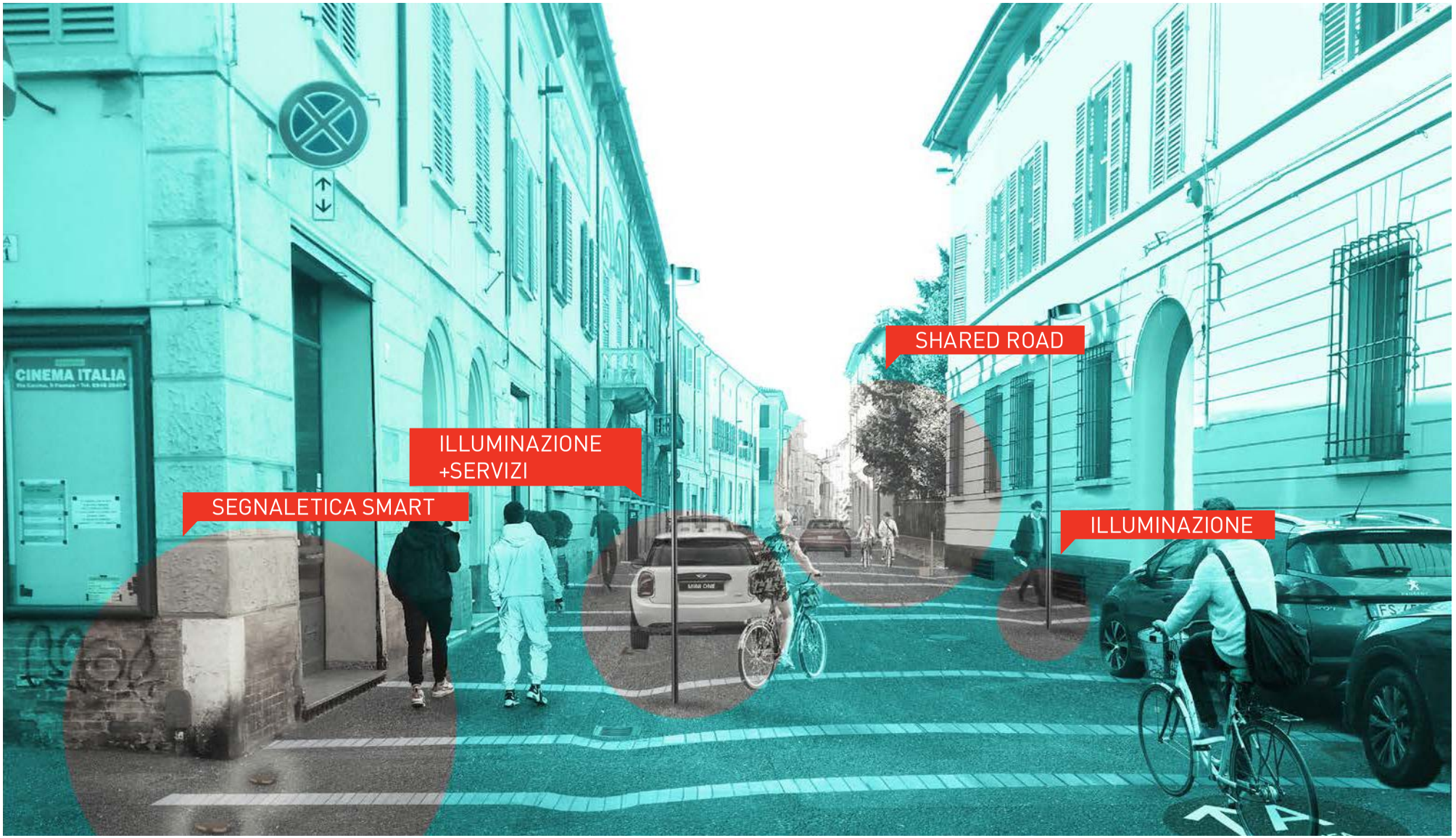
stato di progetto - shared road

CORSO MATTEOTTI / 2

stato di progetto - shared road

CORSO MATTEOTTI / 2

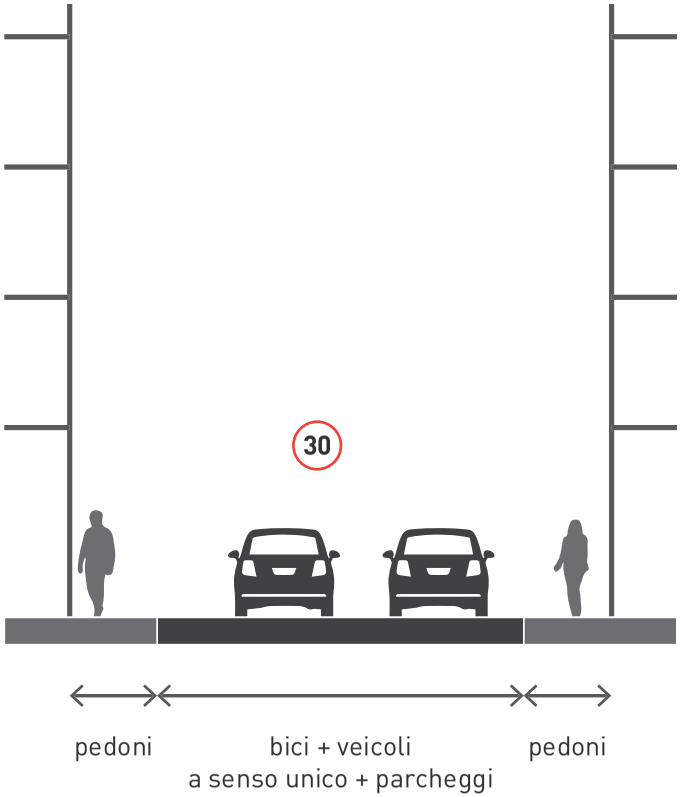
stato di progetto - shared road



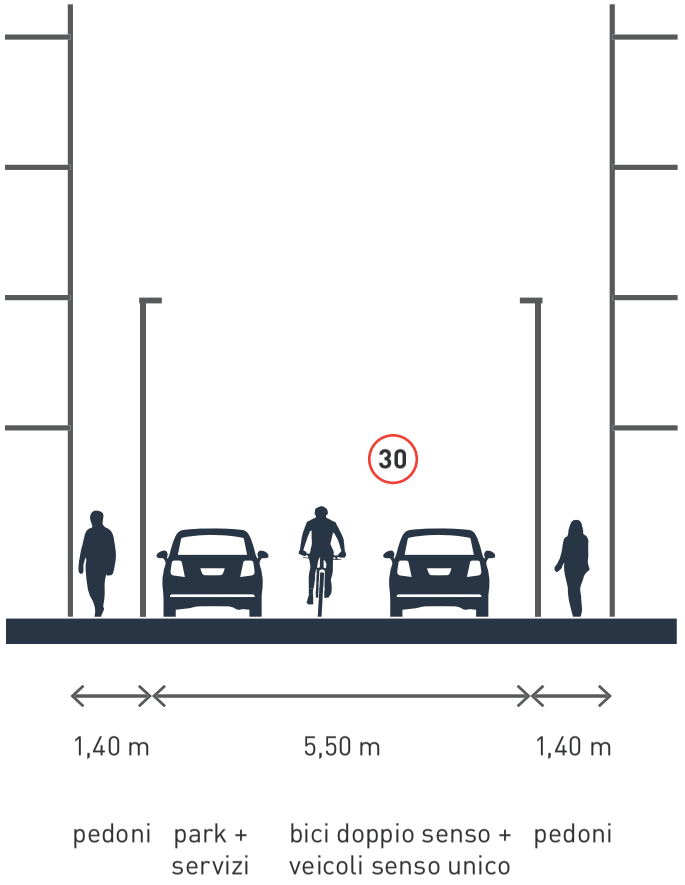
CORSO MATTEOTTI / 2

stato di progetto - shared road

stato di fatto



stato di progetto



SMART MOBILITY NETWORK

Studio di fattibilità per il potenziamento delle aree di sosta a servizio del centro storico

planimetria generale

0 100 250 500 1000

SMART MOBILITY NETWORK

Centro storico - Aree di sosta principali

parcheggi esistenti

piazza del Popolo

centro storico

percorsi principali

planimetria generale

0 100 250 500 1000

SMART MOBILITY NETWORK

Centro storico - Aree di sosta upgrade

SMART MOBILITY NETWORK

Centro storico - Aree di sosta upgrade

LEGENDA:

1 Stazione FFSS Faenza, via Filanda nuova

2 Stazione FFSS Faenza, piazza Cesare Battisti

3 Parcheggio piazza Ricci

4 Cortile ex VVFF e area delle Ceramiche

5 Parcheggio ASL via Morini

6 Parcheggio via Renaccio

400 m - 5 minuti a piedi

800 m - 10 minuti a piedi

planimetria generale

0 100 250 500 1000

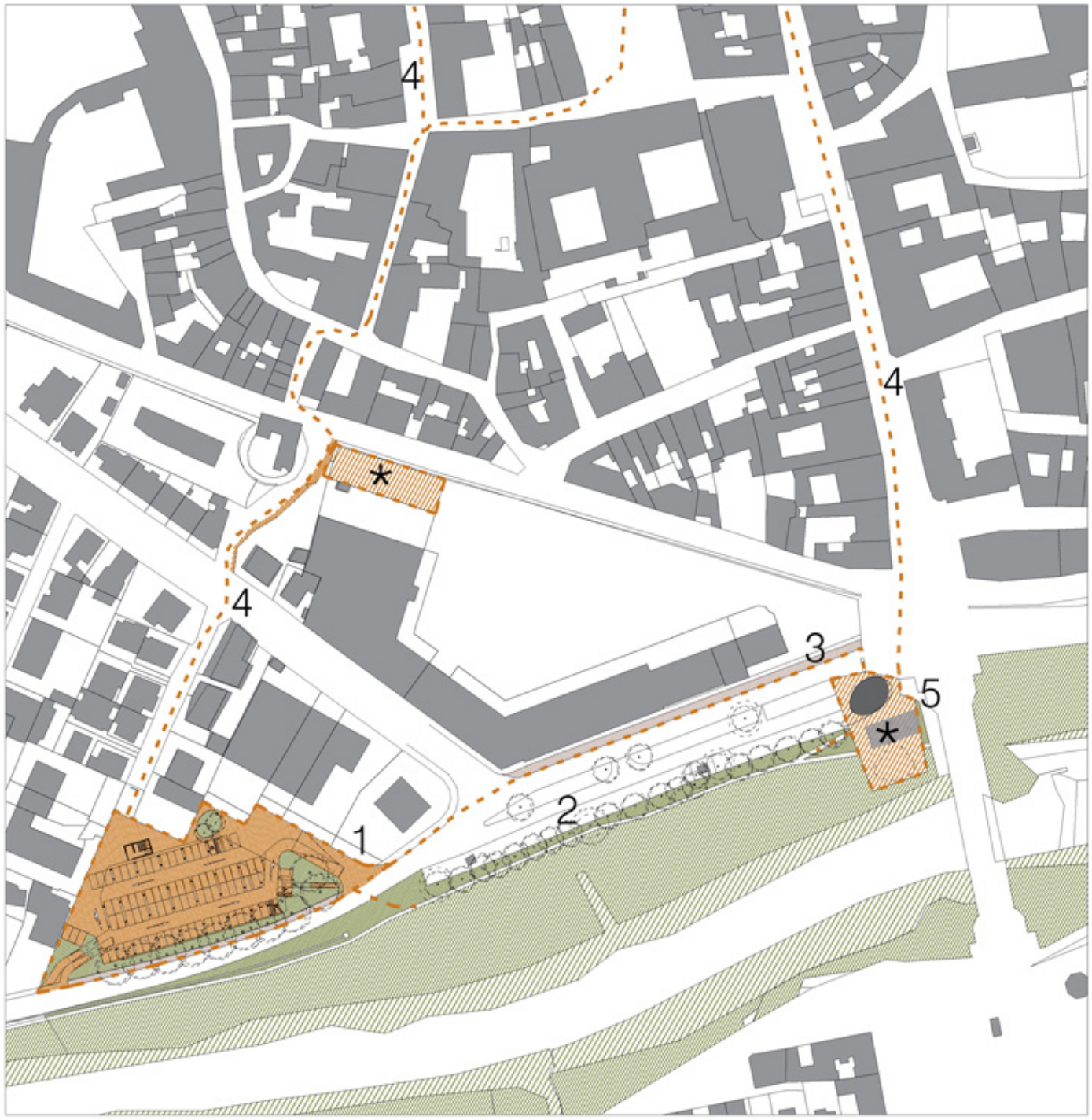
SMART MOBILITY NETWORK

Parcheggio via Renaccio

LEGENDA:

1. Parcheggio multipiano
2. rafforzamento percorso ciclo-pedonale lungo il fiume Lamone
3. percorso pedonale lungo via Renaccio
4. collegamenti con piazza del Popolo lungo via Orzolari, via Lapi, via Torricino
5. realizzazione di nuovi servizi (bar)

* aree oggetto di intervento specifico



planimetria generale

0 10 25 50 100

SMART MOBILITY NETWORK

Parcheggio via Renaccio - vista dell'intervento

SMART MOBILITY NETWORK

Velostazione Castel Bolognese

Superficie di intervento: 465 mq

Pensilina: 225 mq

n. posti bici/e-bike: 130

ortofoto

0 10 25 50 100

SMART MOBILITY NETWORK

Parcheggio Velostazione Castel Bolognese - vista dell'intervento

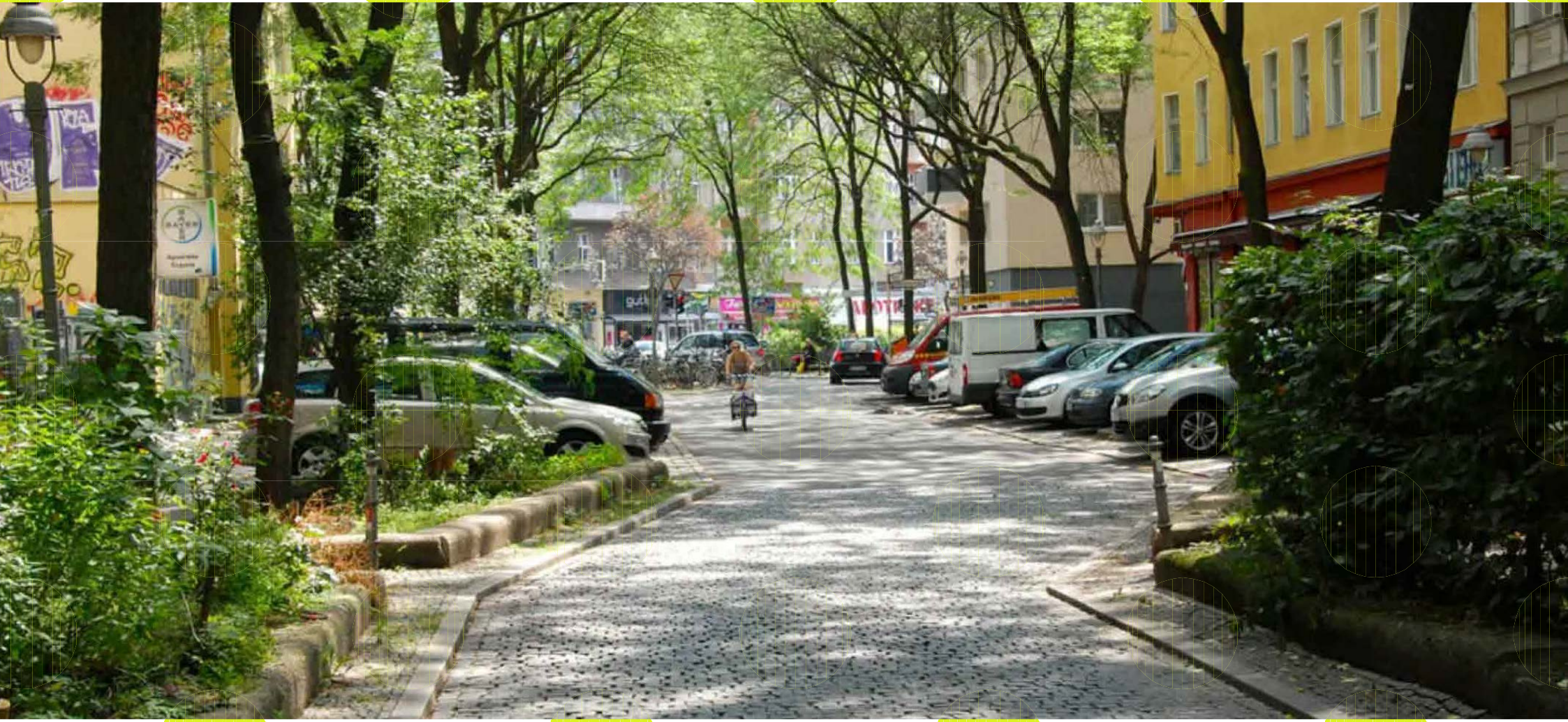
Comune di Faenza
Premio Europa 1968

UNIONE della ROMAGNA FAENTINA

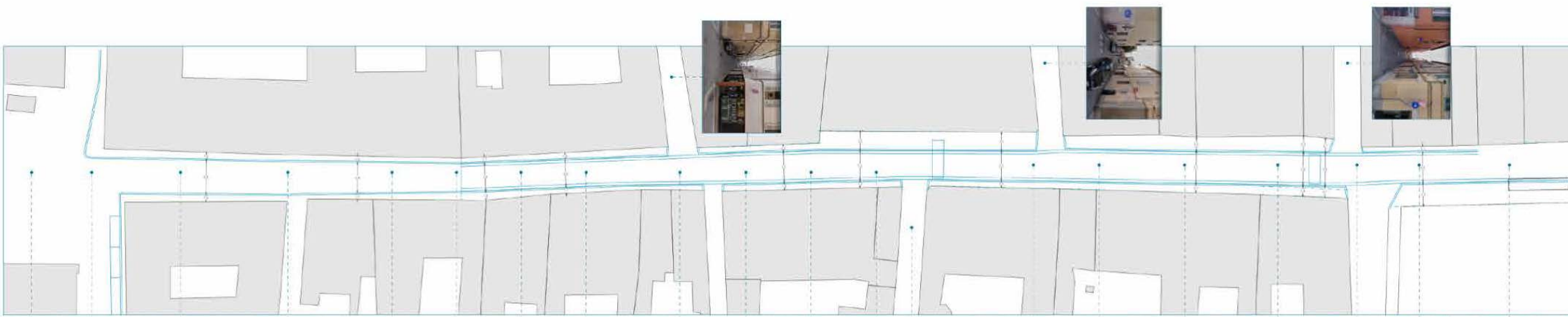
STRADA PER TE

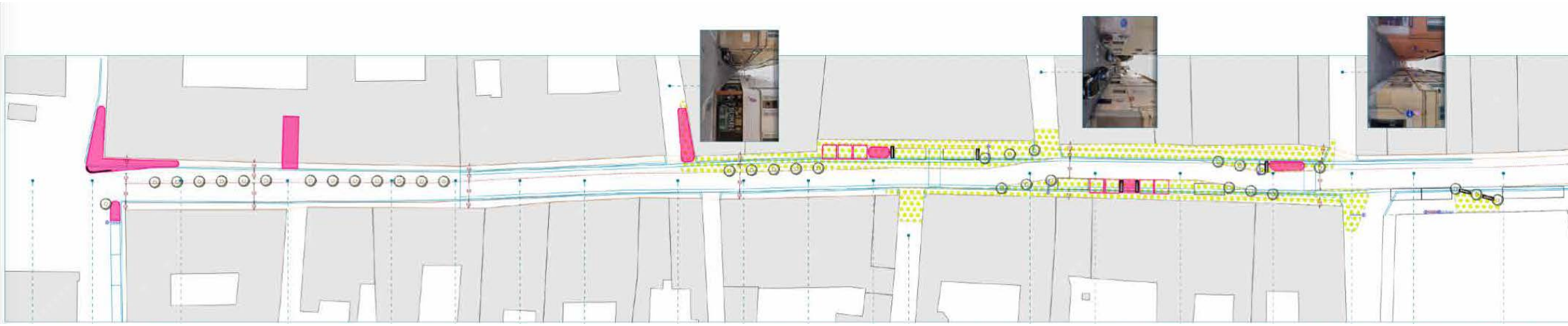
Sperimentazione temporanea per il rallentamento del traffico
Corso Giuseppe Garibaldi, Faenza - settembre 2022

CFR
CONSORZIO FUTURO IN RICERCA

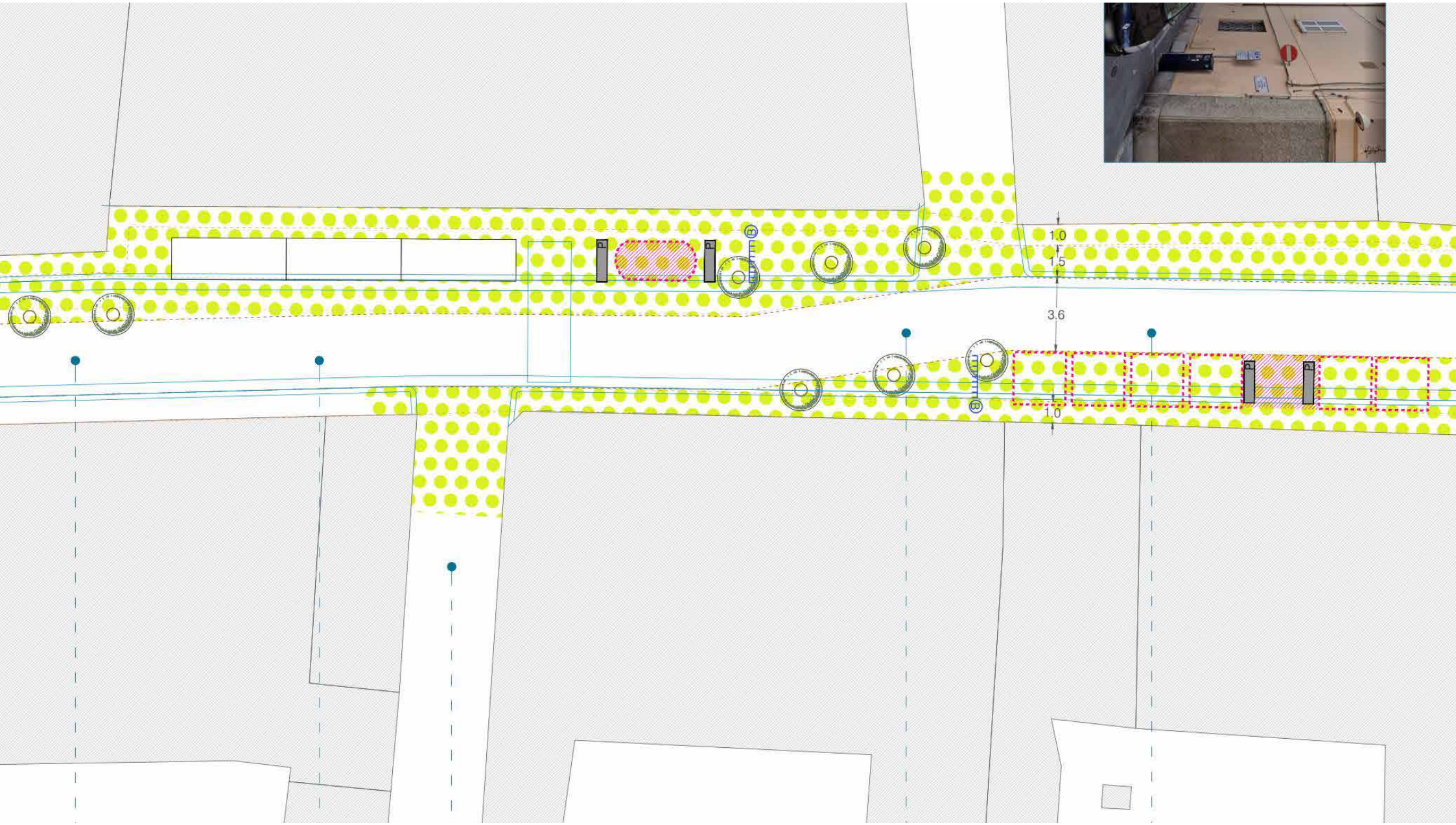


Woonerf, Netherlands





Corso Garibaldi, Faenza. Stato di fatto e progetto.

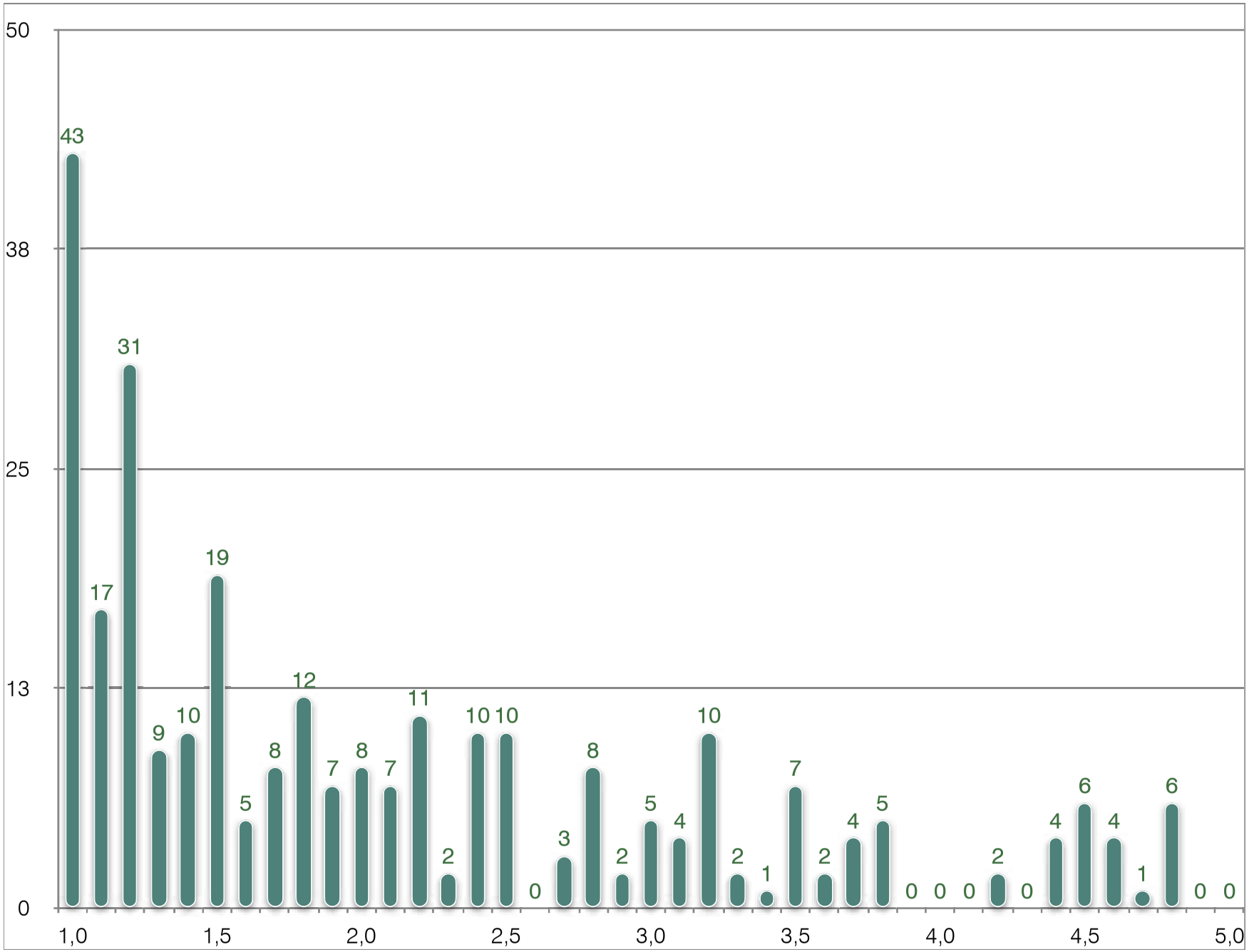


Corso Garibaldi, Faenza


MOND


Paolo Ciani


BANCOMAT
solo per
SALI TABACCHI
VALORI BOLLI
LOTTO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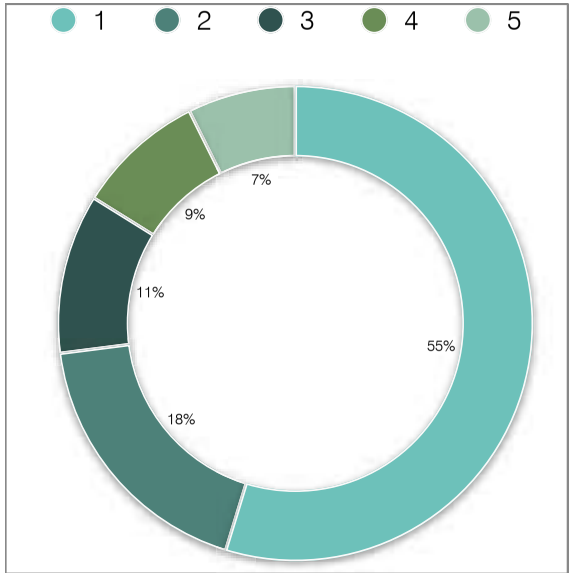
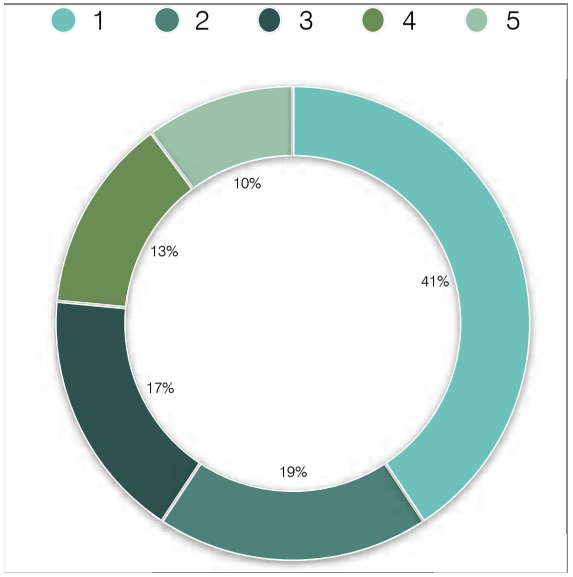
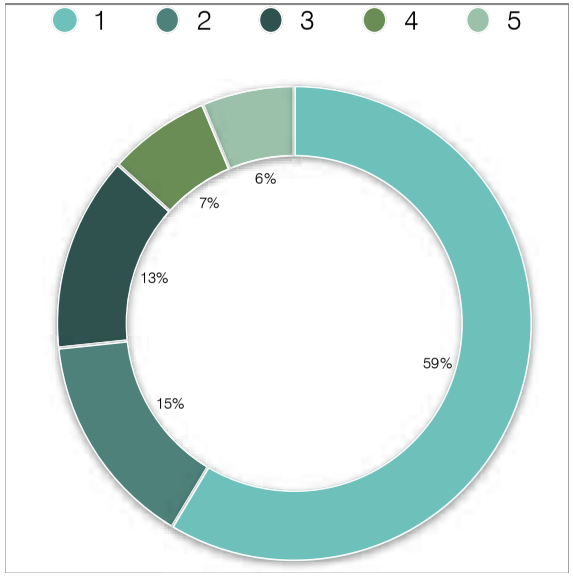


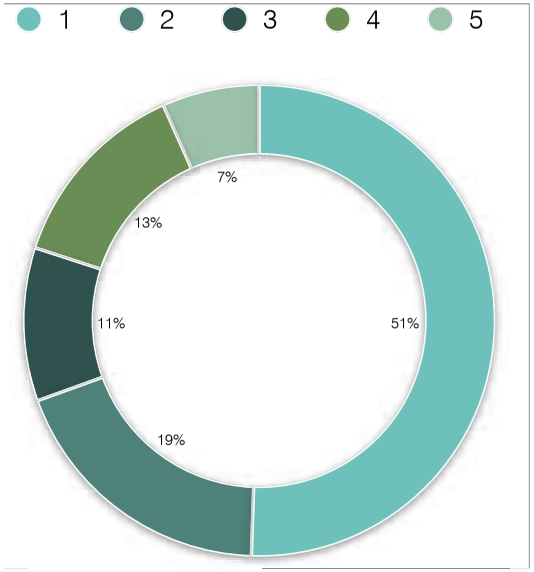
Come valuta (punteggio da 1 a 5) la situazione in merito ai seguenti aspetti dopo gli interventi del progetto StradA PER TE? [Condizioni generali di sicurezza del pedone (attraversamenti, marciapiedi, segnaletica, ecc)]



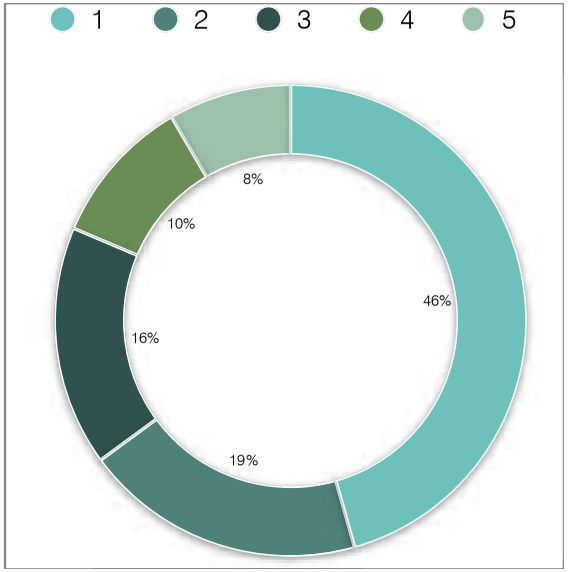
Come valuta (punteggio da 1 a 5) la situazione in merito ai seguenti aspetti dopo gli interventi del progetto StradA PER TE? [Condizioni generali di accessibilità alle attività e ai servizi]



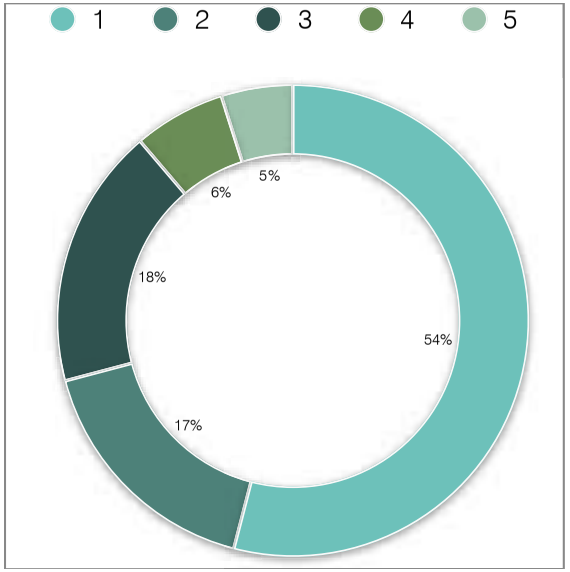
Come valuta (punteggio da 1 a 5) la situazione in merito ai seguenti aspetti dopo gli interventi del progetto StradA PER TE? [Condizioni di accessibilità per persone con disabilità (motoria, visiva, uditiva, ecc)]



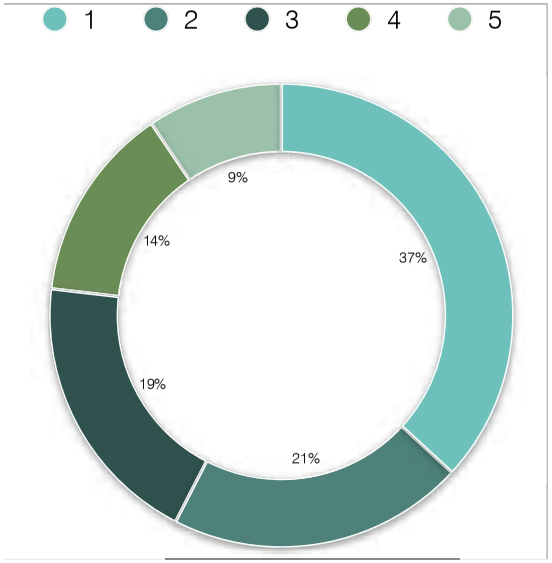
Come valuta (punteggio da 1 a 5) la situazione in merito ai seguenti aspetti dopo gli interventi del progetto StradA PER TE? [Qualità estetica e funzionalità dello spazio (arredo urbano, segnaletica, illuminazione, ecc)]



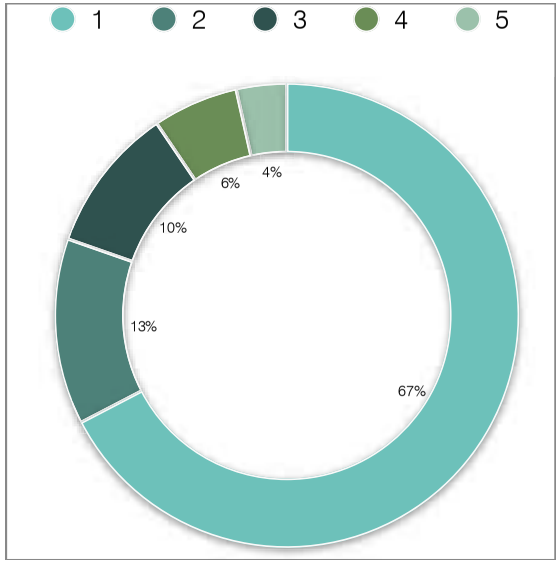
Come valuta (punteggio da 1 a 5) la situazione in merito ai seguenti aspetti dopo gli interventi del progetto StradA PER TE? [Condizioni di visibilità diurna e notturna]



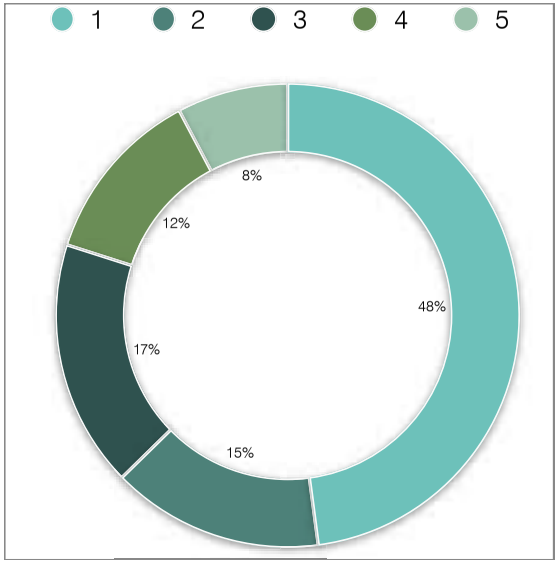
Come valuta (punteggio da 1 a 5) la situazione in merito ai seguenti aspetti dopo gli interventi del progetto StradA PER TE? [Flussi automobilistici: riduzione del numero di auto in circolazione]



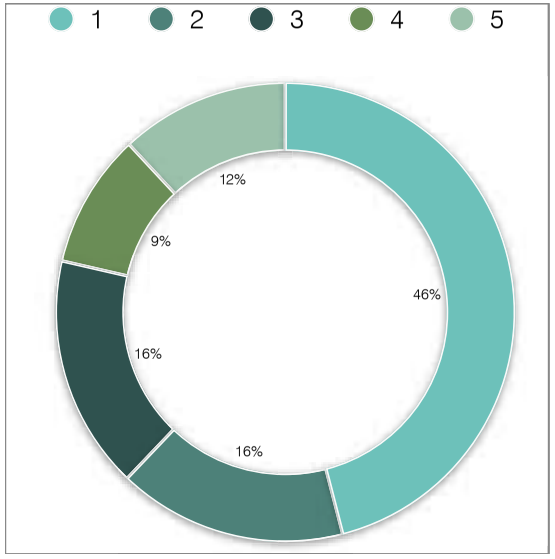
Come valuta (punteggio da 1 a 5) la situazione in merito ai seguenti aspetti dopo gli interventi del progetto StradA PER TE? [Flussi automobilistici: moderazione della velocità delle auto in circolazione]



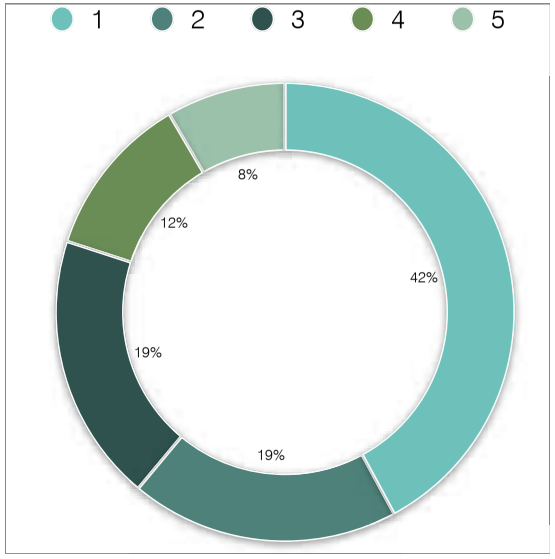
Come valuta (punteggio da 1 a 5) la situazione in merito ai seguenti aspetti dopo gli interventi del progetto StradA PER TE? [Sistema della sosta per automobili]



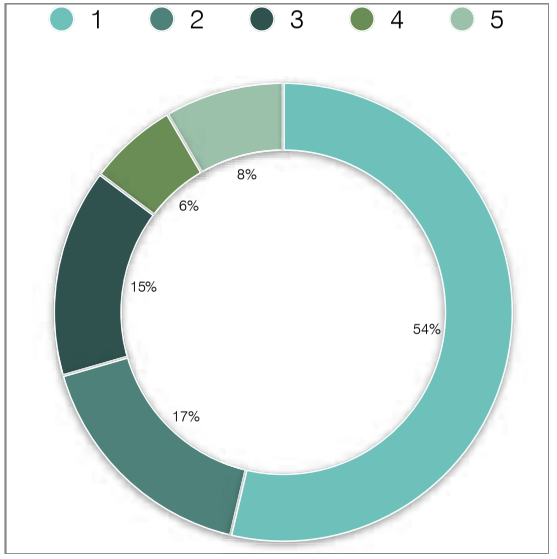
Come valuta (punteggio da 1 a 5) la situazione in merito ai seguenti aspetti dopo gli interventi del progetto StradA PER TE? [Sistema della sosta per biciclette]



Come valuta (punteggio da 1 a 5) la situazione in merito ai seguenti aspetti dopo gli interventi del progetto StradA PER TE? [Sistema della sosta per pedoni]



Come valuta (punteggio da 1 a 5) la situazione in merito ai seguenti aspetti dopo gli interventi del progetto StradA PER TE? [Possibilità di utilizzo degli spazi per i commercianti]

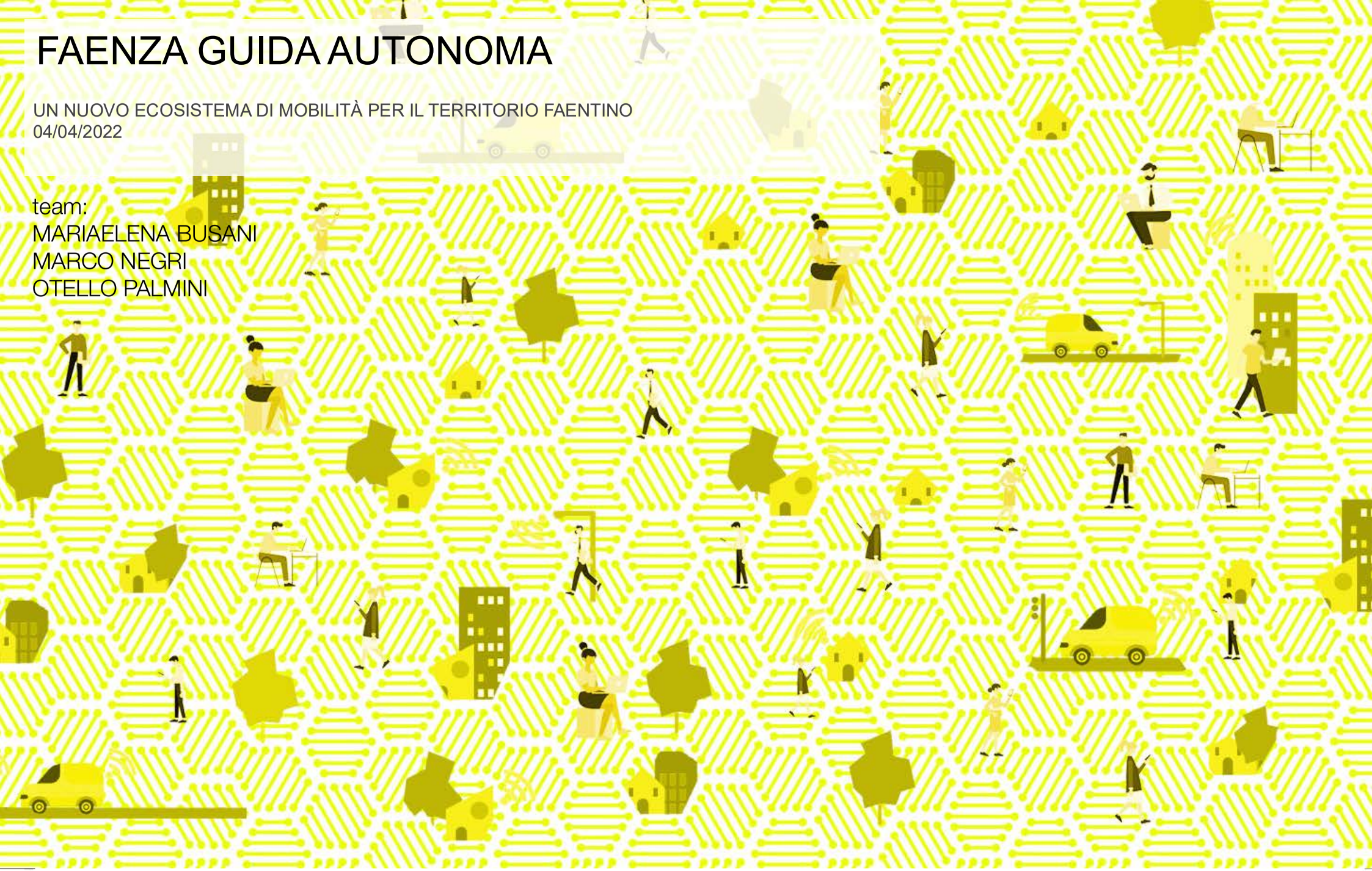


Come valuta (punteggio da 1 a 5) la situazione in merito ai seguenti aspetti dopo gli interventi del progetto StradA PER TE? [Sfruttamento dell'arredo urbano aggiunto]

FAENZA GUIDA AUTONOMA

UN NUOVO ECOSISTEMA DI MOBILITÀ PER IL TERRITORIO FAENTINO
04/04/2022

team:
MARIAELENA BUSANI
MARCO NEGRI
OTELLO PALMINI



MICmaster
matching real and digital cities
Master Universitario di II livello
Innovation Management and Communities
edizione 2021-2022

Università degli Studi di Ferrara
DA Dipartimento Architettura Ferrara
Next City Lab

FAENZA GUIDA AUTONOMA

INNOVAZIONE

Innovazione tecnologica
l'attività tesa a introdurre nuovi prodotti e nuovi servizi, nonché nuovi metodi per produrli, distribuirli e usarli.

Innovazione urbana
quando lo sviluppo tecnologico entra in dialogo, ridefinendo vincoli e possibilità, con le istanze di una comunità

Etica urbana
quantità e qualità delle relazioni tra gli attori urbani

CONTESTO

FAENZA:DATI MOBILITÀ

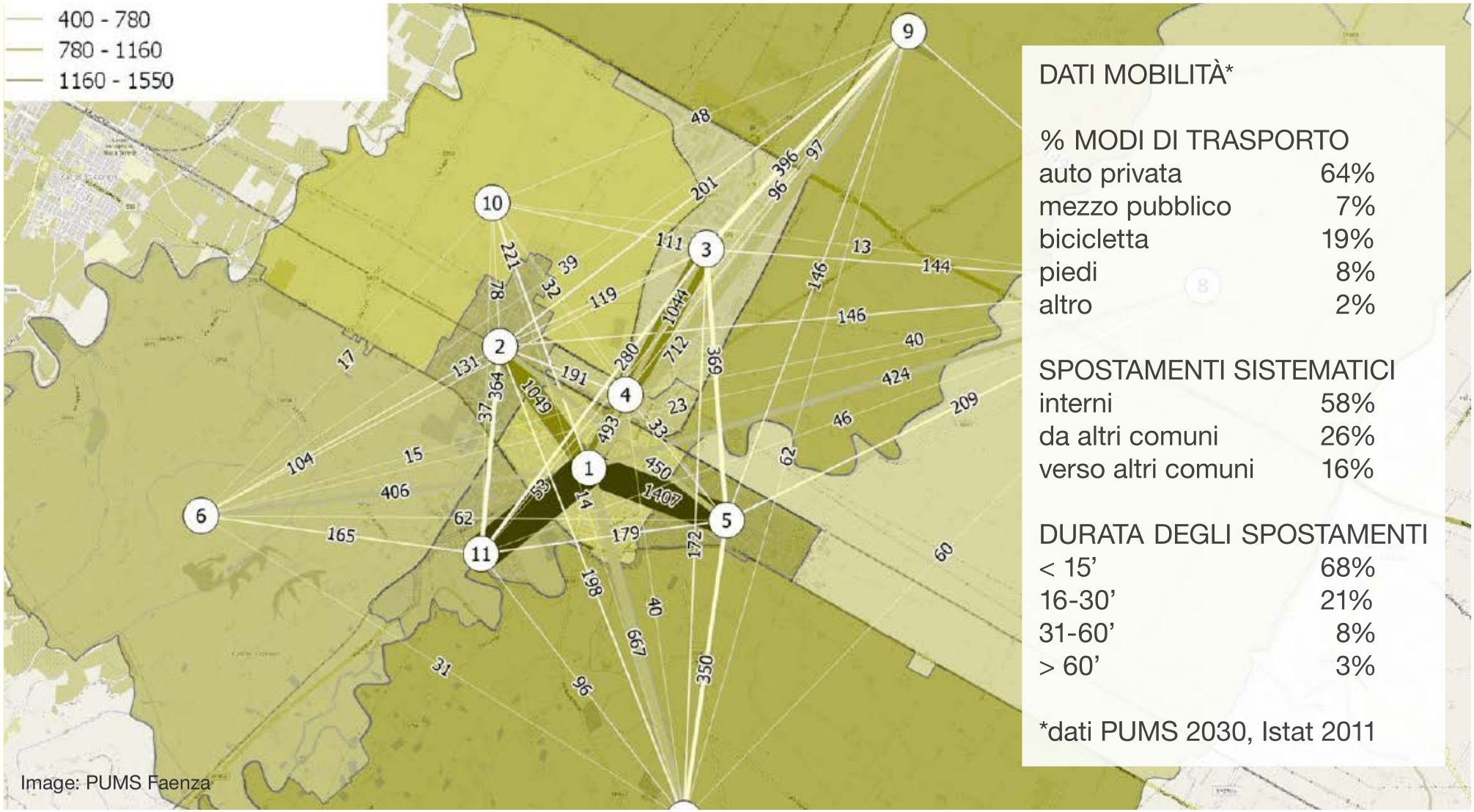


Image: PUMS Faenza

DATI MOBILITÀ*

% MODI DI TRASPORTO	
auto privata	64%
mezzo pubblico	7%
bicicletta	19%
piedi	8%
altro	2%

SPOSTAMENTI SISTEMATICI	
interni	58%
da altri comuni	26%
verso altri comuni	16%

DURATA DEGLI SPOSTAMENTI	
< 15’	68%
16-30’	21%
31-60’	8%
> 60’	3%

*dati PUMS 2030, Istat 2011

CONTESTO

FAENZA:DATI MOBILITÀ

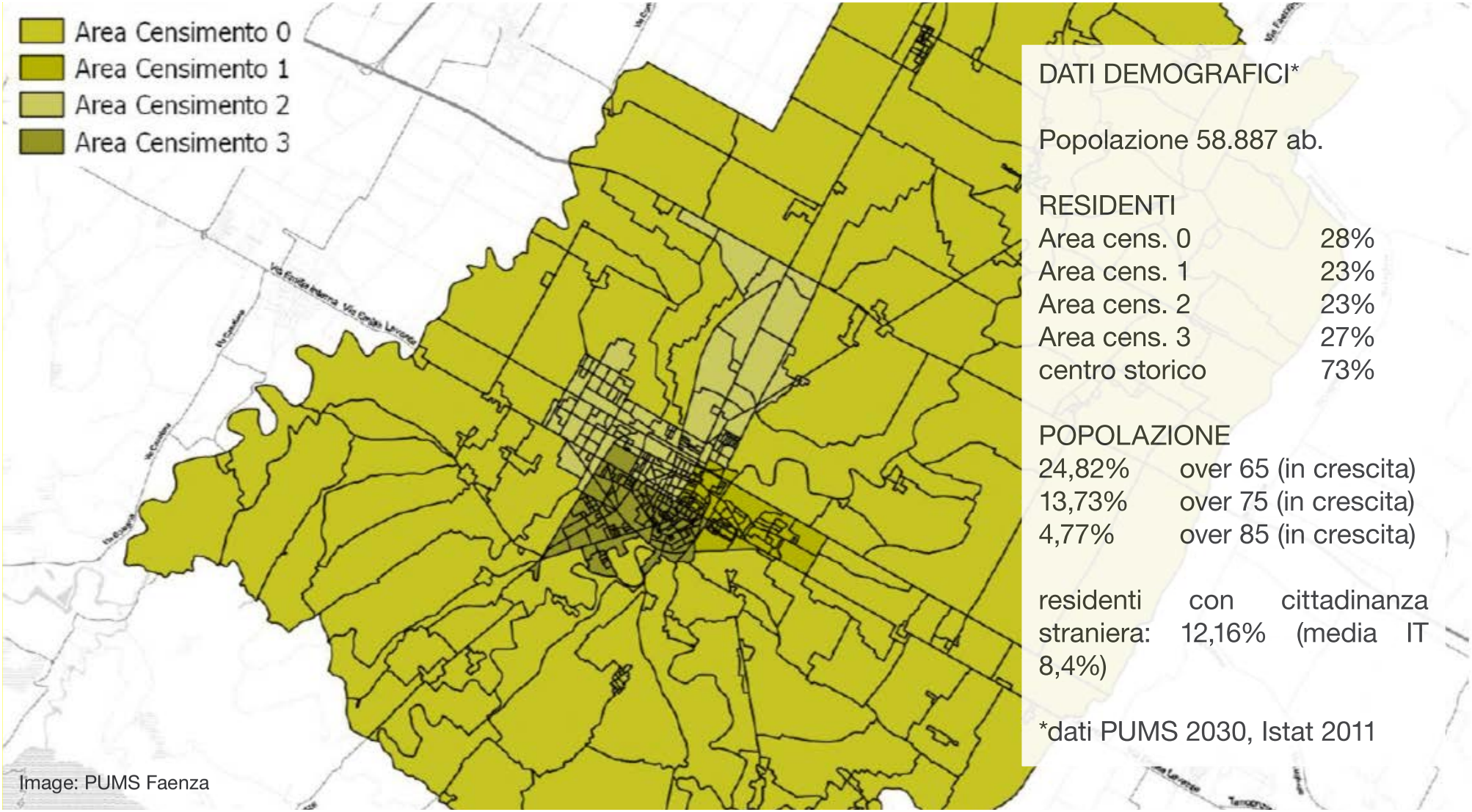


Image: PUMS Faenza

DATI DEMOGRAFICI*

Popolazione 58.887 ab.

RESIDENTI

Area cens. 0	28%
Area cens. 1	23%
Area cens. 2	23%
Area cens. 3	27%
centro storico	73%

POPOLAZIONE

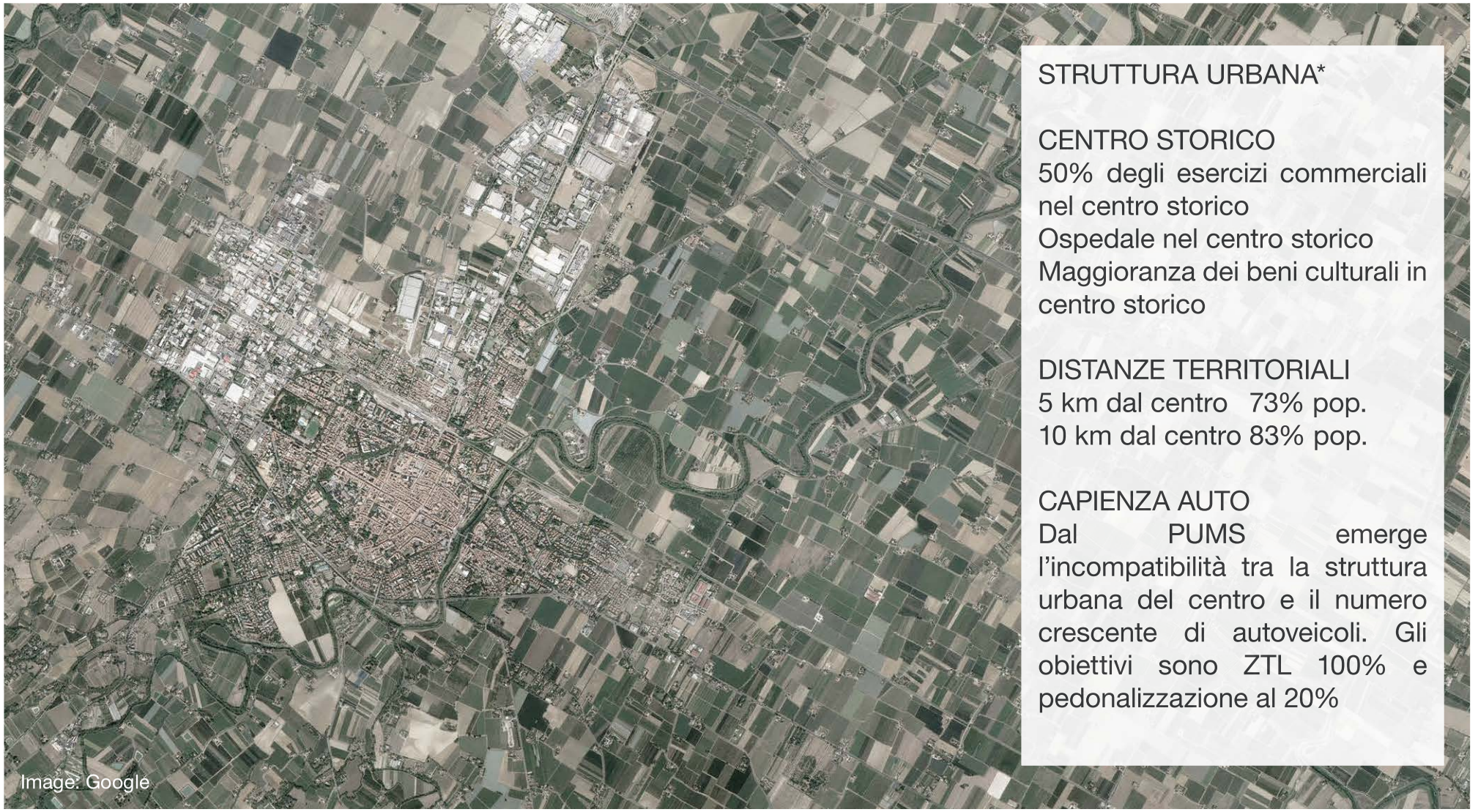
24,82%	over 65 (in crescita)
13,73%	over 75 (in crescita)
4,77%	over 85 (in crescita)

residenti con cittadinanza straniera: 12,16% (media IT 8,4%)

*dati PUMS 2030, Istat 2011

CONTESTO

FAENZA:DATI MOBILITÀ



STRUTTURA URBANA*

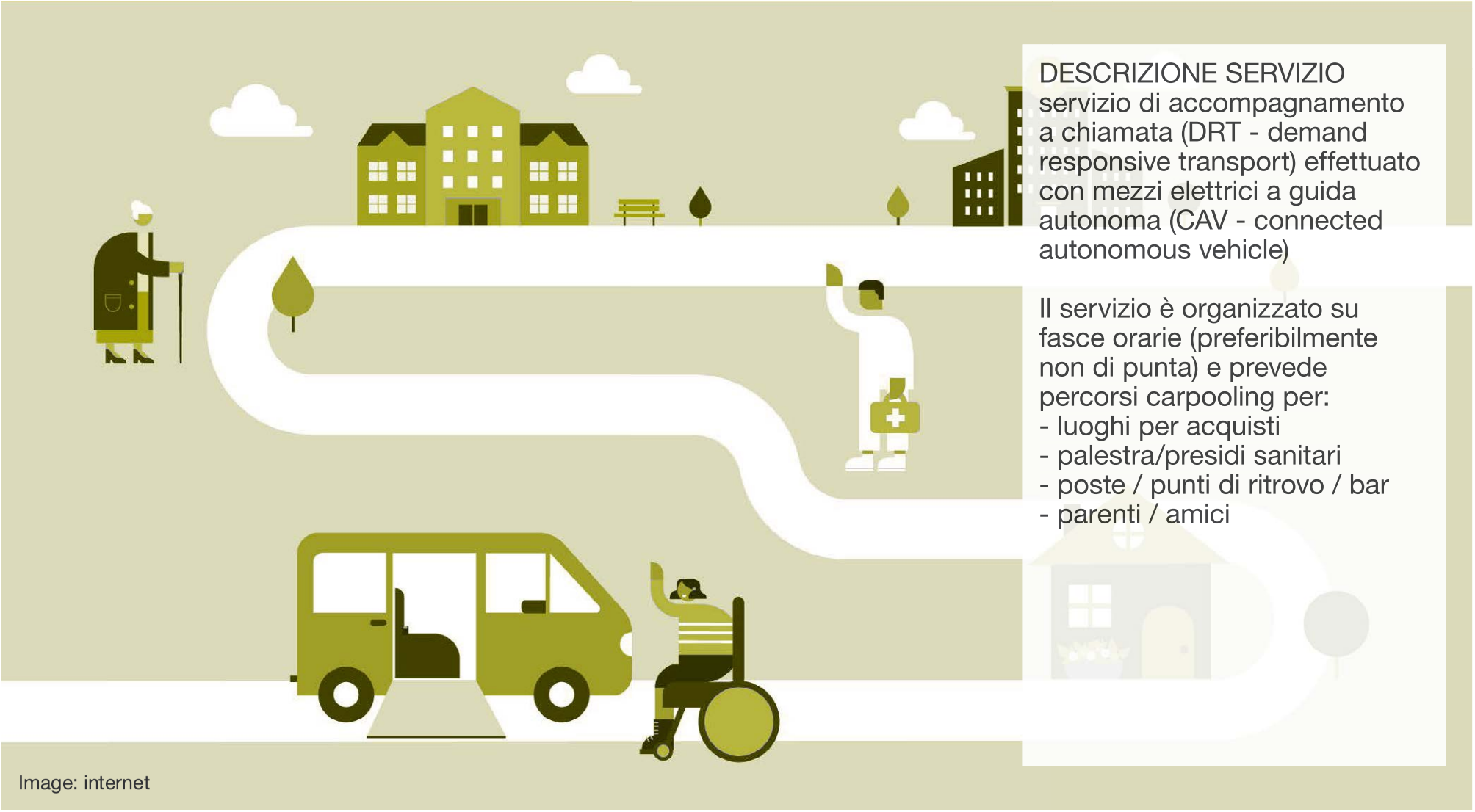
CENTRO STORICO
50% degli esercizi commerciali nel centro storico
Ospedale nel centro storico
Maggioranza dei beni culturali in centro storico

DISTANZE TERRITORIALI
5 km dal centro 73% pop.
10 km dal centro 83% pop.

CAPIENZA AUTO
Dal PUMS emerge l'incompatibilità tra la struttura urbana del centro e il numero crescente di autoveicoli. Gli obiettivi sono ZTL 100% e pedonalizzazione al 20%

STRUMENTI E RISORSE

SERVIZIO DI ACCOMPAGNAMENTO PER PERSONE A MOBILITÀ RIDOTTA



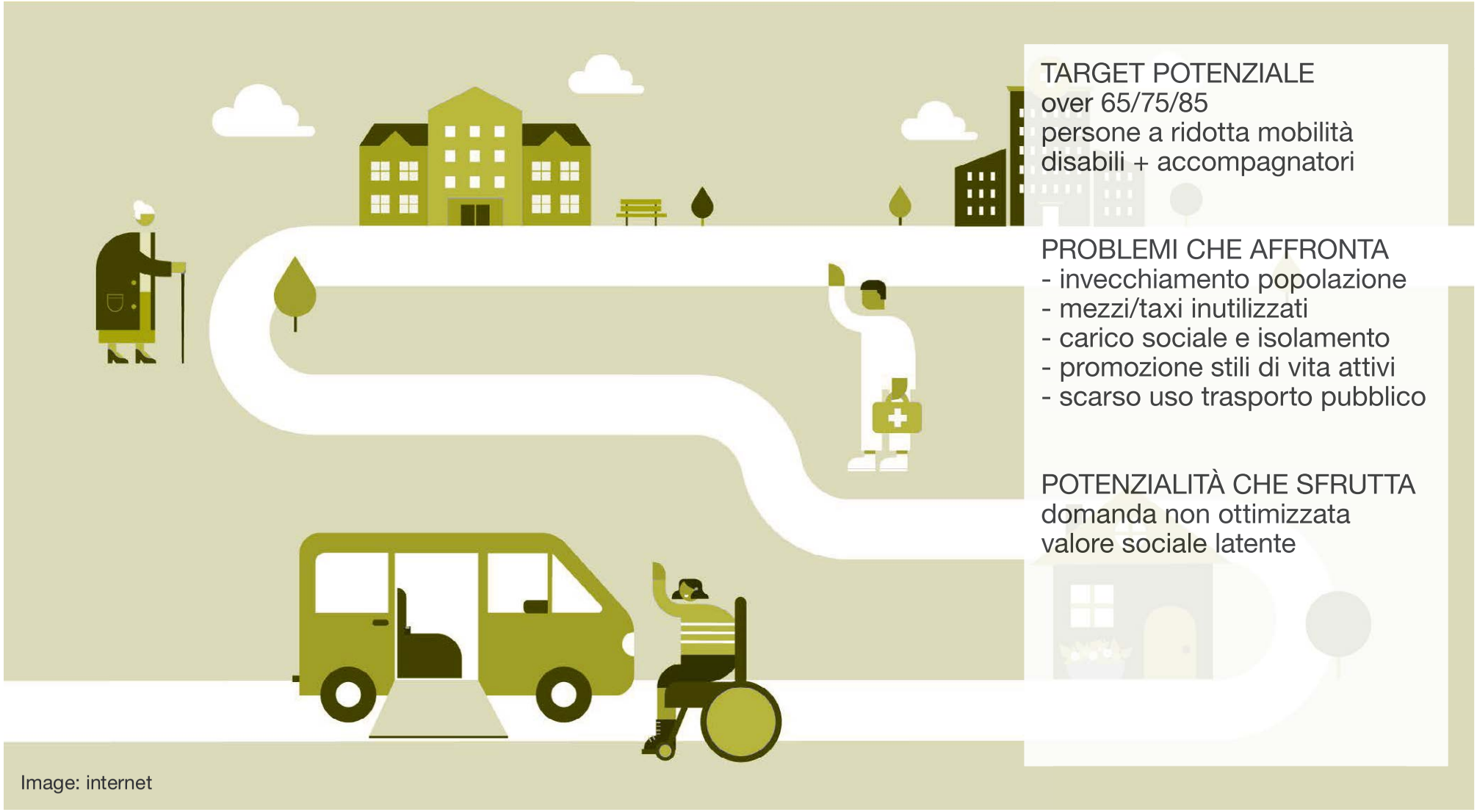
DESCRIZIONE SERVIZIO
servizio di accompagnamento a chiamata (DRT - demand responsive transport) effettuato con mezzi elettrici a guida autonoma (CAV - connected autonomous vehicle)

Il servizio è organizzato su fasce orarie (preferibilmente non di punta) e prevede percorsi carpooling per:
- luoghi per acquisti
- palestra/presidi sanitari
- poste / punti di ritrovo / bar
- parenti / amici

Image: internet

STRUMENTI E RISORSE

SERVIZIO DI ACCOMPAGNAMENTO PER PERSONE A MOBILITÀ RIDOTTA



TARGET POTENZIALE
over 65/75/85
persone a ridotta mobilità
disabili + accompagnatori

PROBLEMI CHE AFFRONTA
- invecchiamento popolazione
- mezzi/taxi inutilizzati
- carico sociale e isolamento
- promozione stili di vita attivi
- scarso uso trasporto pubblico

POTENZIALITÀ CHE SFRUTTA
domanda non ottimizzata
valore sociale latente

Image: internet

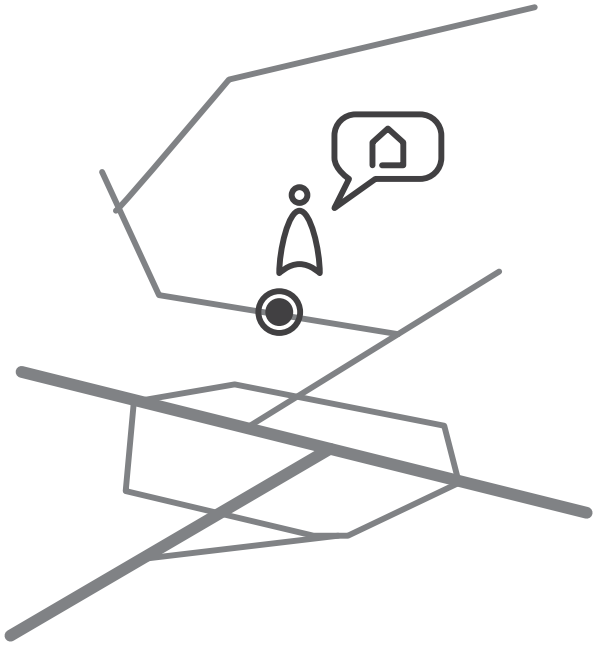
STRUMENTI E RISORSE

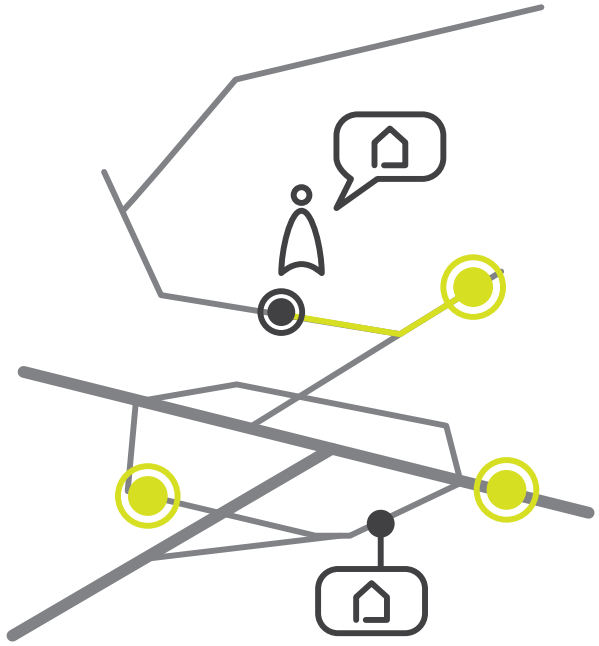
SERVIZIO DI ACCOMPAGNAMENTO PER PERSONE A MOBILITÀ RIDOTTA

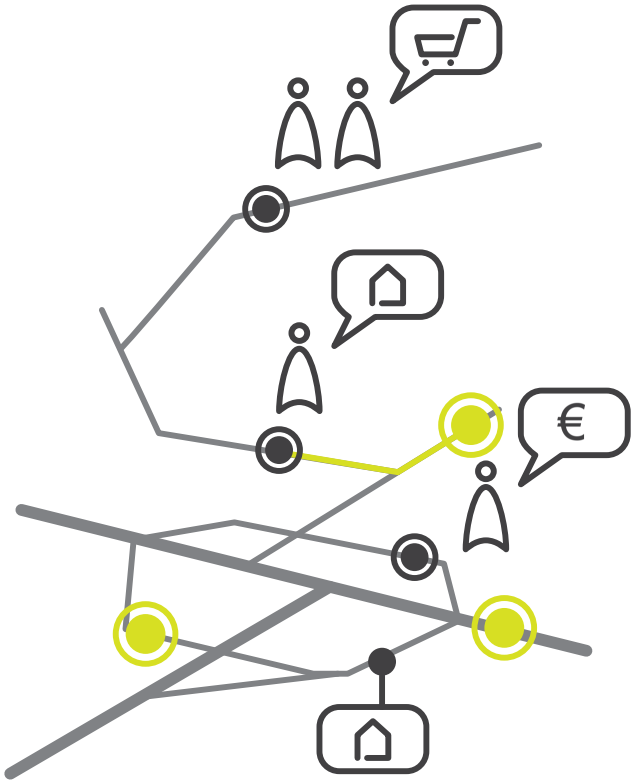
1. CHIAMATA
l'utente chiede di attivare il servizio di trasporto tramite APP o prenotazione telefonica

2. ATTIVAZIONE SERVIZIO
la piattaforma valuta i mezzi in servizio su strada o a riposo e fa arrivare il mezzo più vicino all'utente.
Tempo di attesa medio 10'-15'

3. INTEGRAZIONE DOMANDA
basandosi sulle richieste già prenotate o sulle chiamate fatte, la piattaforma organizza il tragitto del mezzo







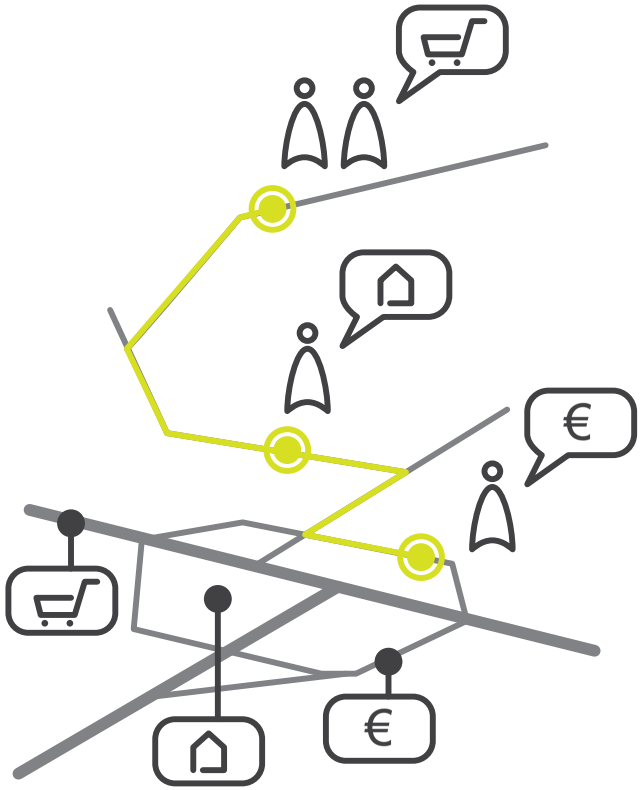
STRUMENTI E RISORSE

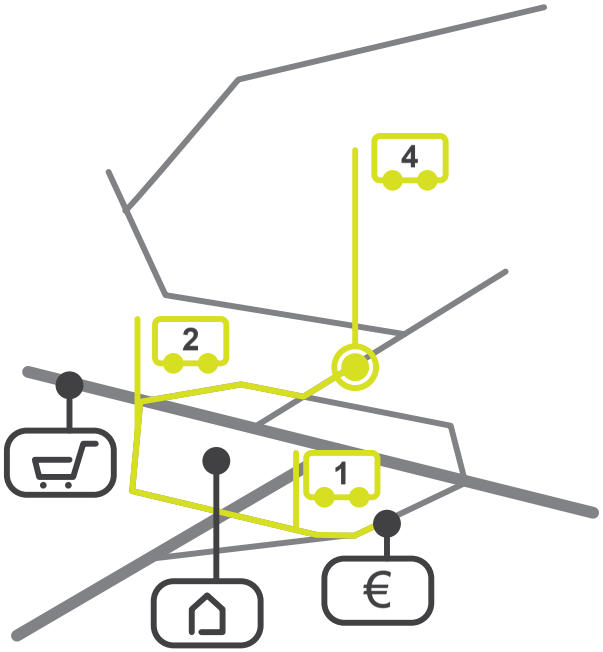
SERVIZIO DI ACCOMPAGNAMENTO PER PERSONE A MOBILITÀ RIDOTTA

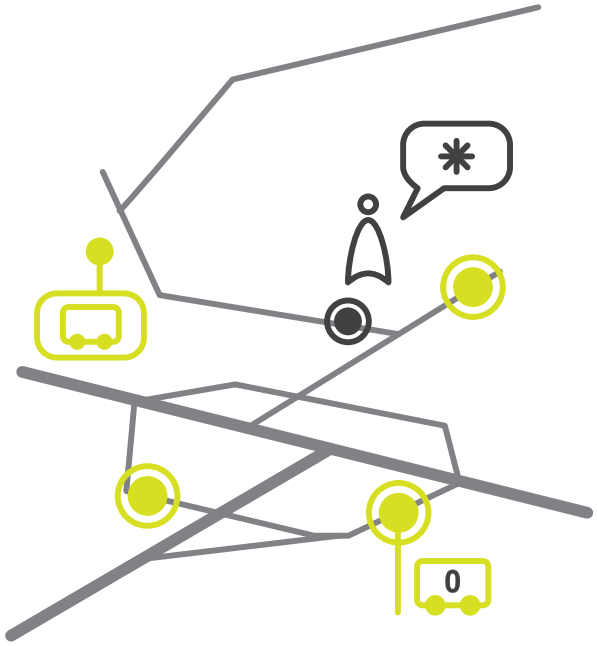
4. INTEGRAZIONE PERCORSI
il percorso è il risultato dell'integrazione della domanda, della disponibilità di mezzi prevista, delle destinazioni richieste dagli utenti

5. ARRIVO A DESTINAZIONE
il mezzo porta a destinazione i passeggeri portando la propria capienza da 4 a 0 utenti durante il percorso

6. NUOVO SERVIZIO
esauriti i viaggi assegnati, il mezzo può rientrare in un deposito / hub o riprendere servizio su strada per rispondere ad una nuova domanda

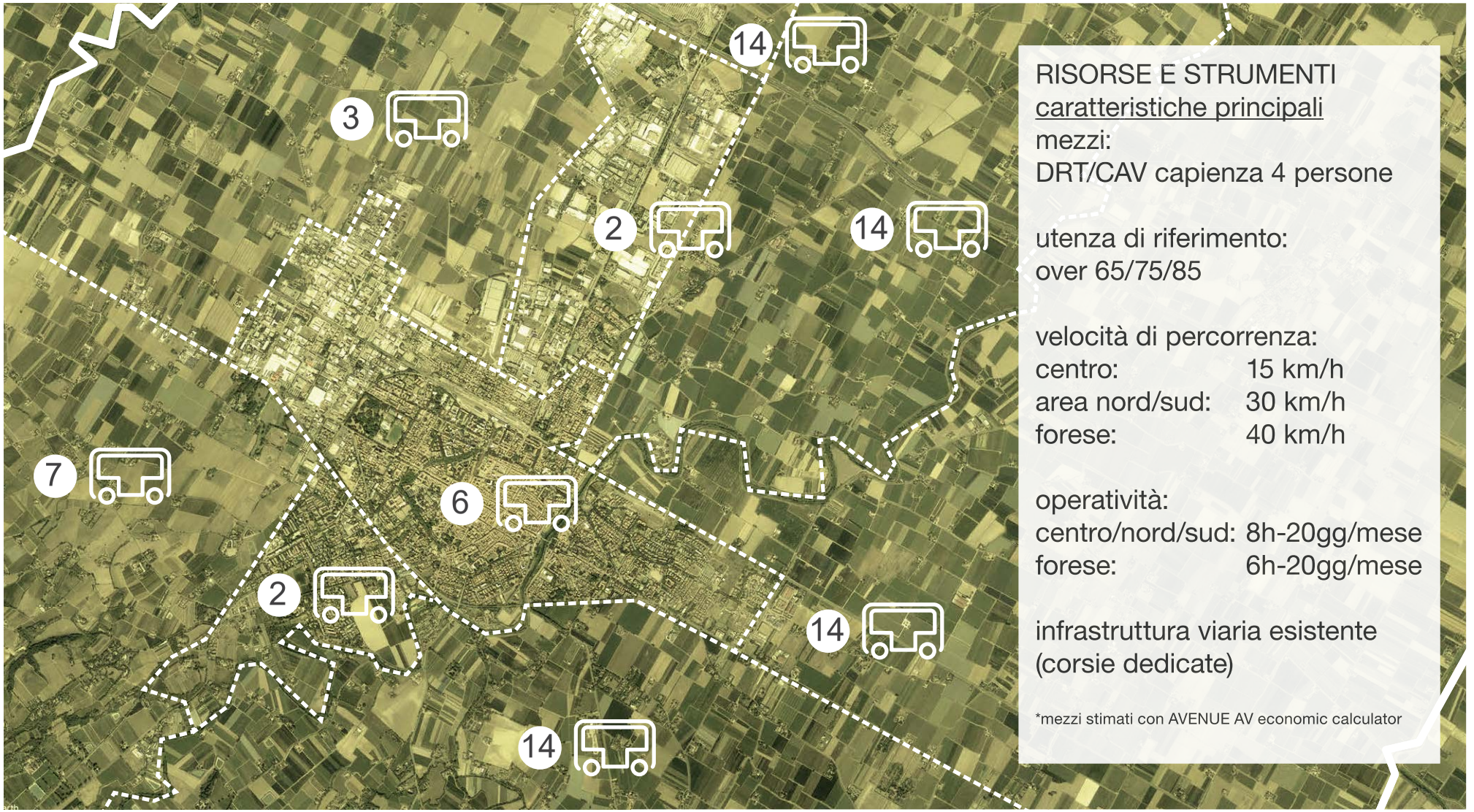






STRUMENTI E RISORSE

SERVIZIO DI ACCOMPAGNAMENTO PER PERSONE A MOBILITÀ RIDOTTA



RISORSE E STRUMENTI
caratteristiche principali
mezzi:
DRT/CAV capienza 4 persone

utenza di riferimento:
over 65/75/85

velocità di percorrenza:
centro: 15 km/h
area nord/sud: 30 km/h
forese: 40 km/h

operatività:
centro/nord/sud: 8h-20gg/mese
forese: 6h-20gg/mese

infrastruttura viaria esistente
(corsie dedicate)

*mezzi stimati con AVENUE AV economic calculator

STRUMENTI E RISORSE

SERVIZIO DI ACCOMPAGNAMENTO PER PERSONE A MOBILITÀ RIDOTTA

RISORSE E STRUMENTI

mezzi

taxi/auto esistenti

DRT / CAV

sistemi tecnologici

dati AULSS, comune, associazioni, privati

app MAAS

comportamenti

disponibilità al cambiamento da parte di alcune fasce di utenti

socialità

infrastruttura

infrastruttura viaria esistente (corsie dedicate / zone 20)

Annex 3

This annex provides a detailed illustration of the qualitative analysis of smart mobility solutions identified in Chapters 2 and 3, in relation to the accessibility patterns elaborated in Chapter 4. These analyses have been included to enhance understanding of the relationships between innovative design solutions and their impacts on accessibility and urban identity

assessment of smart mobility solutions and potential impacts and applications

	MOBILITY DOMAIN			IMPACT ON SERVICE ACCESSIBILITY					IMPACT ON STREET ACCESSIBILITY	IMPACT ON IDENTITY			APPLICATION IN ACCESSIBILITY GRID								
SMART MOBILITY SOLUTIONS	**vehicles**	**behaviour/services**	**infrastructures**	Education	Health and social services	Entertainment	Living	Commerce		heritage, pub space, built environment	place-based approach	local needs	**LL**	**LM**	**LH**	**ML**	**MM**	**MH**	**HL**	**HM**	**HH**
STREET INNOVATIONS [CHAP. 1]																					
complete streets			X	X			X		X	X	X	X			X		X			X	X
healthy streets			X	X	X		X		X	X	X		X	X	X	X	X	X		X	
smart urban services		X	X		X		X	X				X	X		X	X	X	X		X	X
X-minute streets		X	X		X	X	X	X	X	X	X	X					X	X			
SMART MOBILITY SOLUTIONS - CASE STUDIES [CHAP. 2]																					
Mobility app to support DRT, SM		X																			
Mobility needs mapping		X																			
Co working hub		X	X	X	X	X	X	X		X		X	X	X			X			X	X
New hiking and cycling trails									X	X	X		X	X		X					
Smart parking			X																		
App/hub to share things		X	X		X			X				X	X	X		X	X			X	X
Ride-sharing benches			X	X	X			X		X		X	X	X	X	X	X	X		X	X
App for shared tourists accommodation		X																			
ICT to increase accessibility			X																		
Creation of fibre optic network			X																		
SMART MOBILITY SOLUTIONS - APPLIED RESEARCHES [CHAP. 3]																					
soft trail			X						X	X	X		X	X		X					
cycling network upgrading			X						X	X		X	X	X	X		X			X	
smart cycling network		X	X		X				X	X		X					X			X	
leisure cycle network		X	X						X	X	X		X	X			X			X	X
cycling highways			X						X	X		X	X	X	X		X			X	
school streets		X	X	X						X	X	X	X	X			X			X	X
low emission zone - LEZ		X							X	X	X	X									X
shared road		X	X	X		X	X		X	X	X	X	X	X		X	X			X	X
zone 20		X							X	X		X		X		X	X	X		X	
parking network			X	X		X		X		X		X	X	X	X					X	
CAVs	X																				
smart pedibus		X	X	X						X	X	X	X	X	X	X	X	X	X	X	X
servizi urban services in the town centre		X			X			X				X	X	X			X			X	X
urban services and shops		X			X						X		X	X			X			X	X
smart urban services		X		X	X			X		X			X	X	X	X	X	X		X	X
smart community house-to-school commuting		X											depends on specific mobility needs								
smart community house-to-work commuting		X											depends on specific mobility needs								
PUMS		X																			
Maas		X												X		X	X	X	X	X	X

urban policies / urban planning
cycling network design
road network design
social innovation
urban services

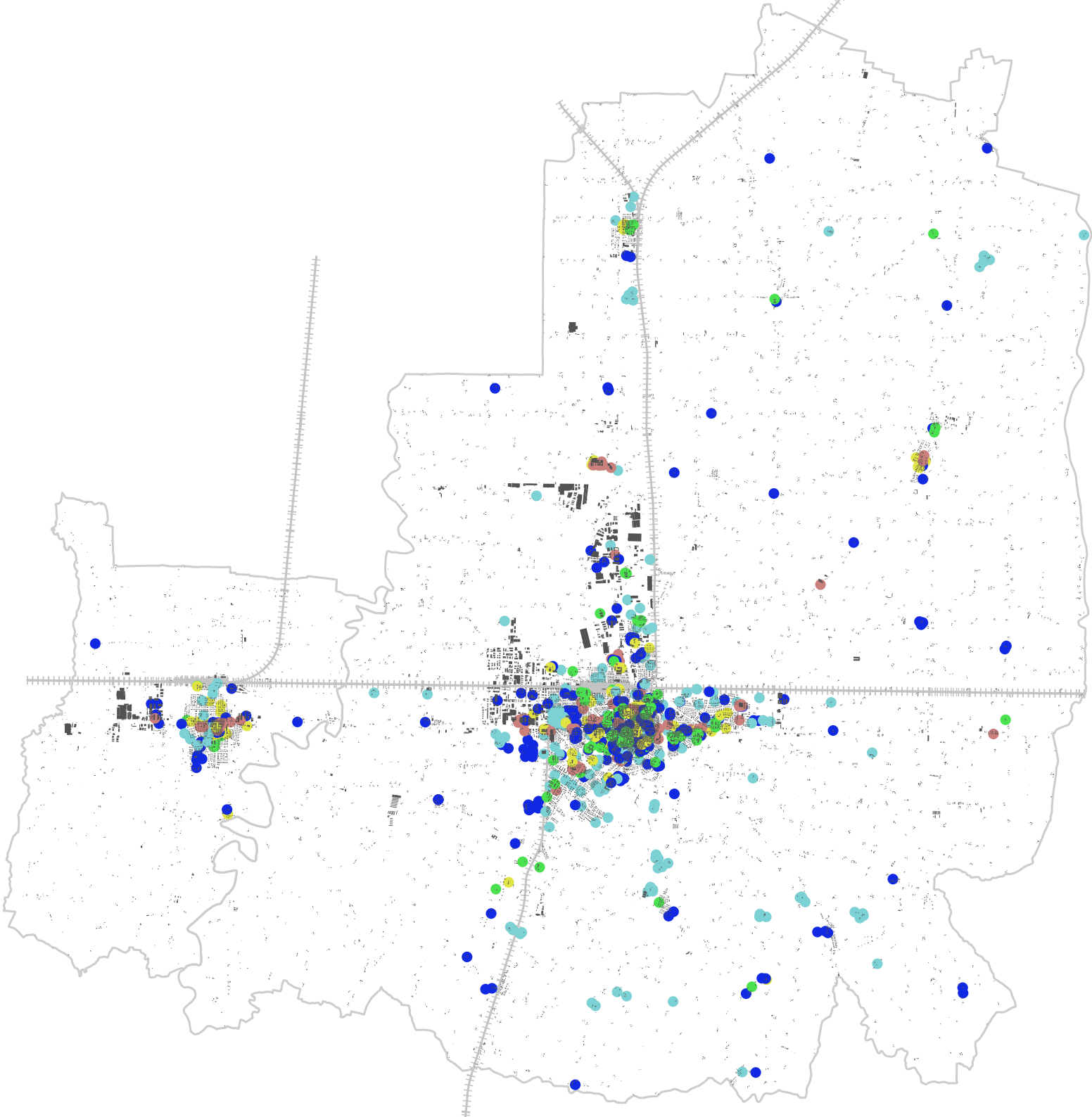
compared review of literature framework for accessibility analysis

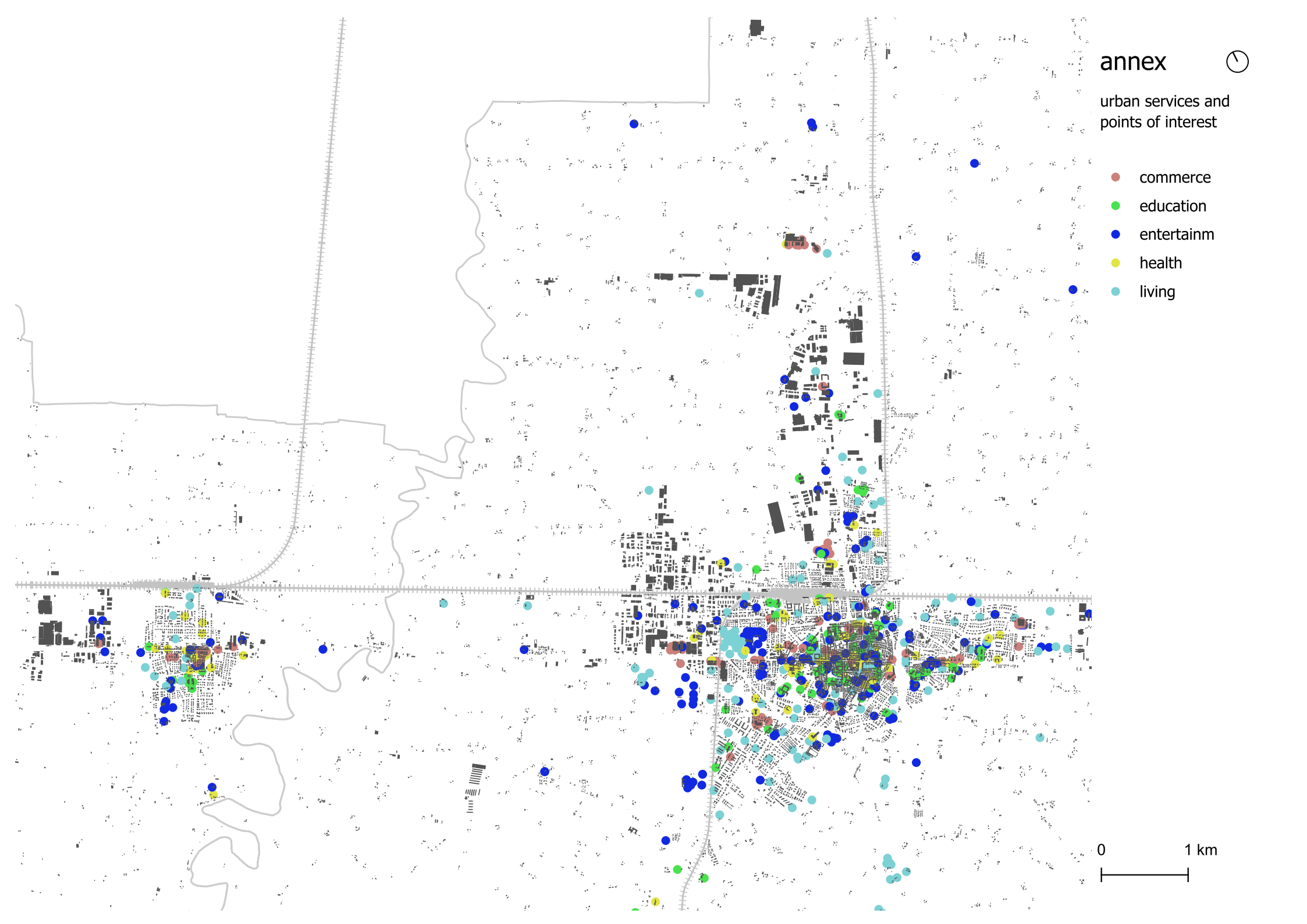
service domain / author ref.	ITF-OECD, 2019	STARICCO, 2022	EIT, 2022	proposed service framework
Education	schools (all levels)	Nurseries Kindergartens Elementary schools Middle schools Secondary schools	Nurseries Kindergartens Libraries Elementary schools Secondary schools University	Nurseries kindergarten library Elementary school Middle school Secondary school
Health and social services	hospitals	Neighbourhood health centres Counselling centres Social care services Registry offices Post offices Police stations Churches Open air markets	Pharmacies Doctor Hospital Retirement home	Pharmacies Doctor Hospital / Neighbourhood health centres Police stations Social care services Town hall / public offices
Entertainment		Green areas Playgrounds Playrooms Sports facilities Libraries Theatres Cinemas	Restaurant Bar Gym Theatres Cinemas Churches Swimming pool Sports ground	Sport associations Gym Theatres / Cinemas Churches Swimming pool Sports ground
Living	green spaces		Public meeting place Playground Park	Public meeting place Open air market place Playground Green area
Commerce	shops		Supermarket Bakery Butcher Bank/ATM Fruit and vegetable seller Clothing Shop Post office Hairdresser Consumer electronics retailer	Supermarket Store ATM bank Post office Shopping mall

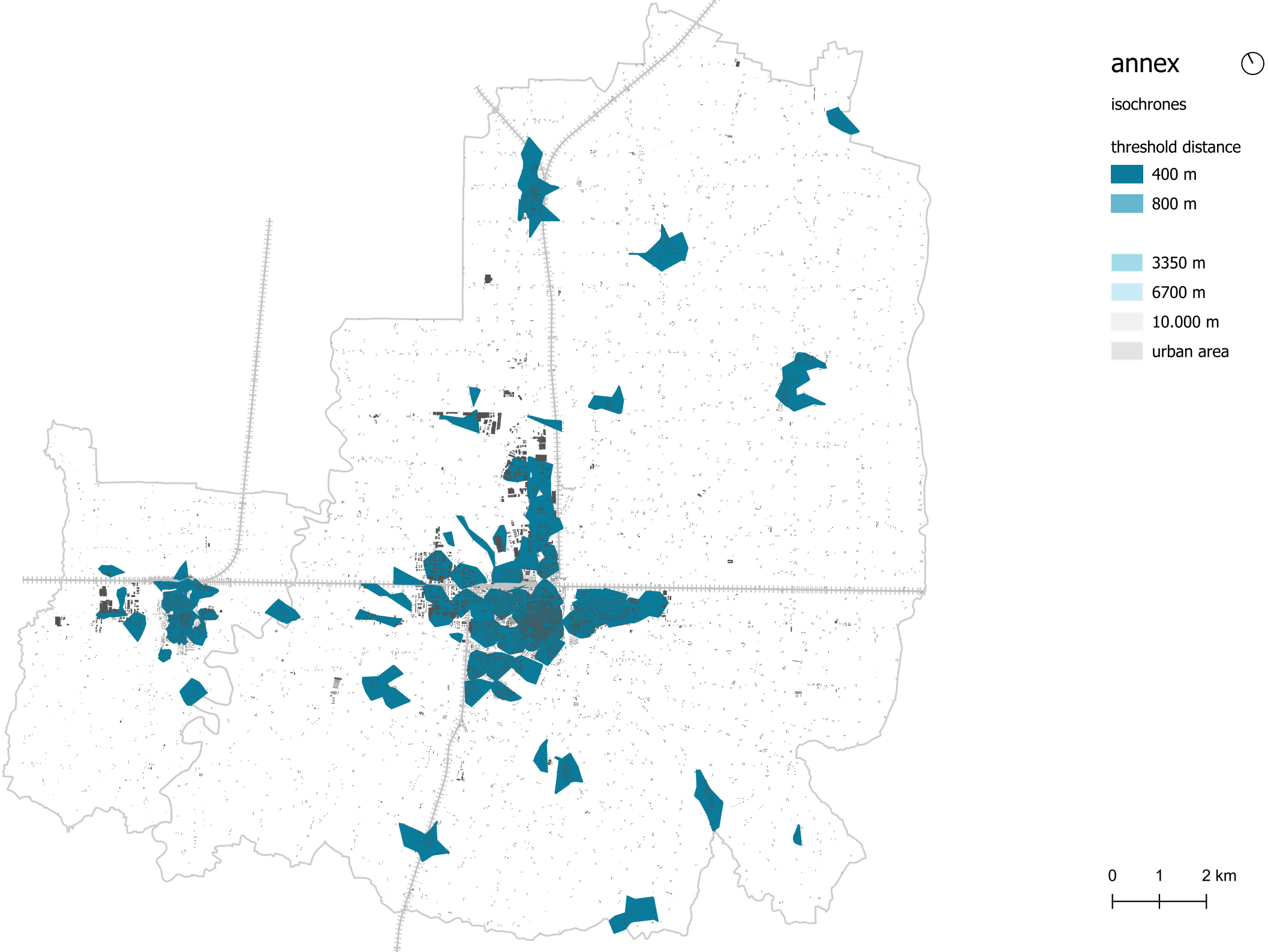
Annex 4

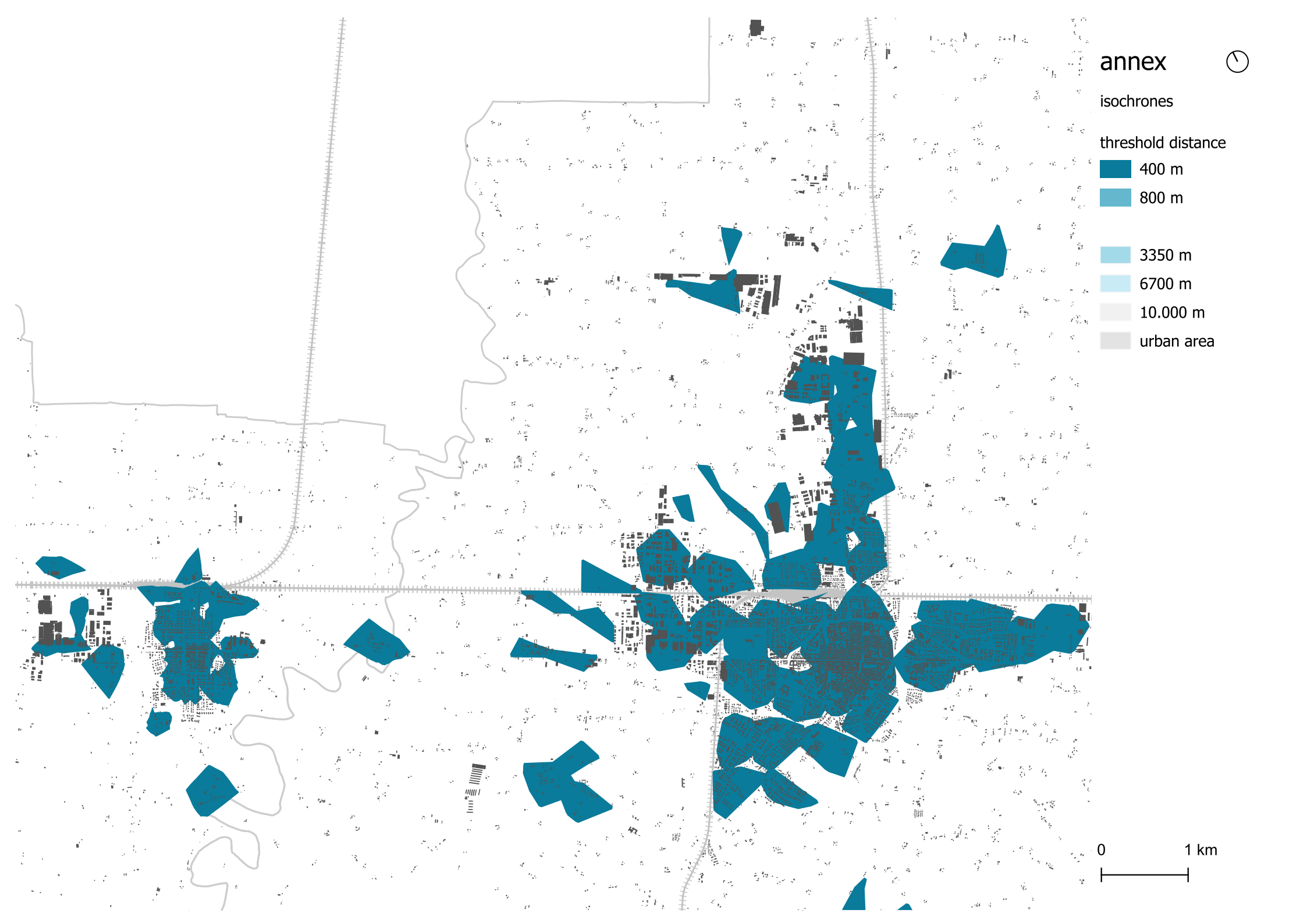
This annex details the accessibility analyses outlined in Chapter 4. In patricular, we included here the identification of POIs; the isochrone analysis for all the distances-thresholds (400 m, 800 m, 6,700 m, 10 km); the accessibility analyses by urban service categories; the road network accessibility analyses for all distances-thresholds; and the comprehensive accessibility map that includes figure ground, service and road network accessibility for all distances-thresholds.

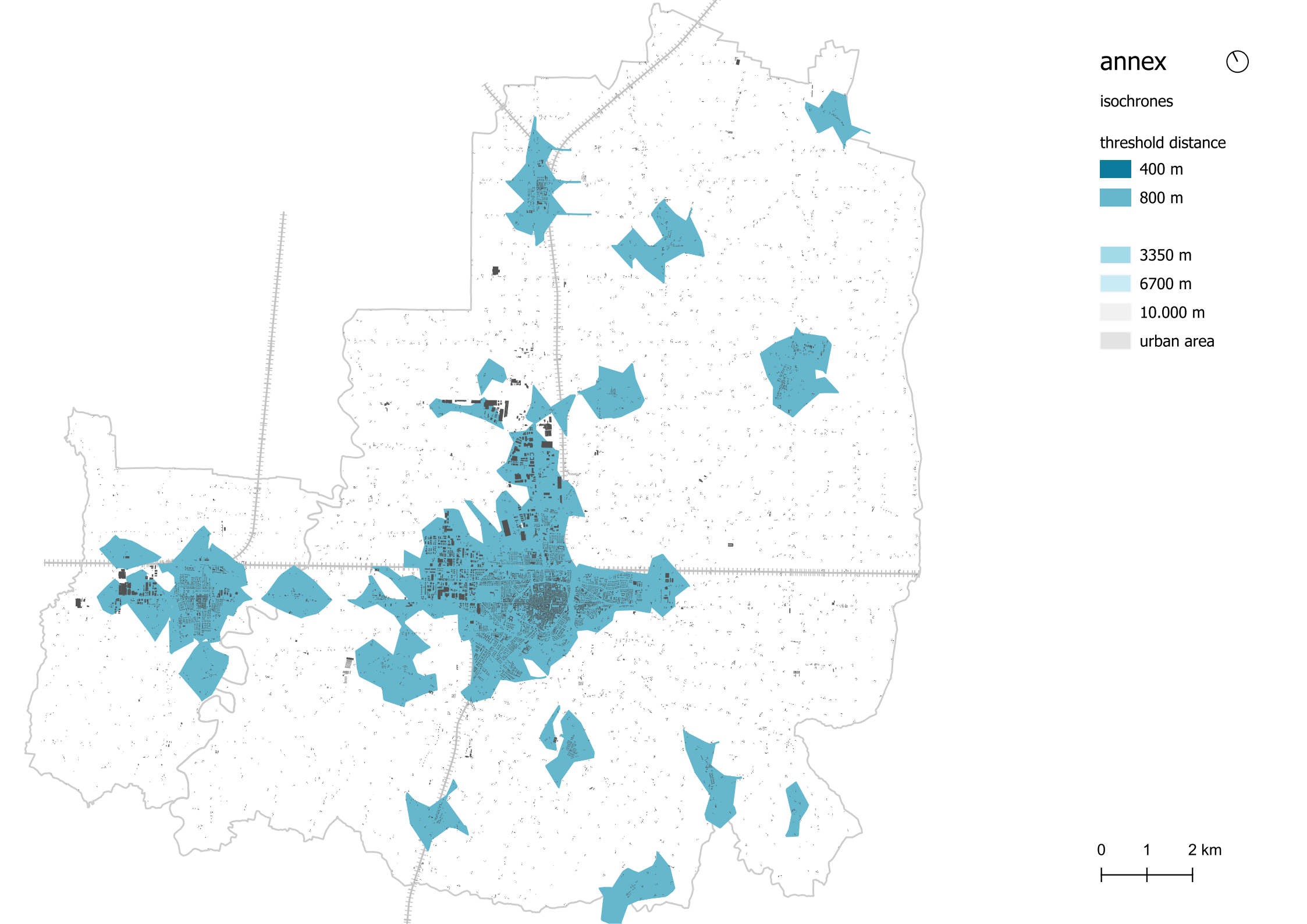

table §
0
1
2 km

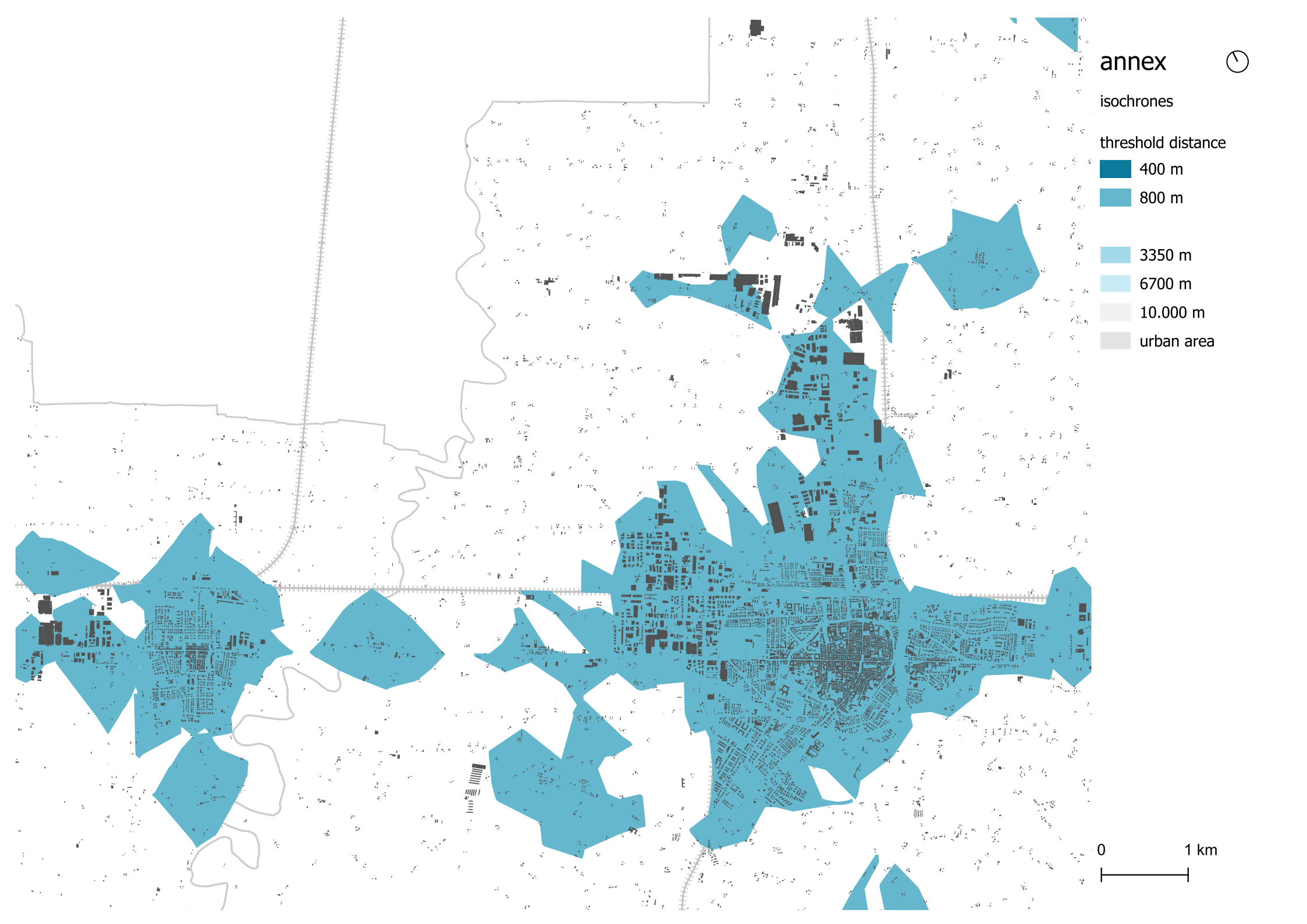

annex
urban services and
points of interest
commerce
education
entertainment
health
living
0
1
2 km


annex
urban services and points of interest
commerce
education
entertainm
health
living
0
1 km


annex
isochrones
threshold distance
400 m
800 m
3350 m
6700 m
10.000 m
urban area
0
1
2 km


annex
isochrones
threshold distance
400 m
800 m
3350 m
6700 m
10.000 m
urban area
0
1 km


annex
isochrones
threshold distance
400 m
800 m
3350 m
6700 m
10.000 m
urban area
0
1
2 km


annex
isochrones
threshold distance
400 m
800 m
3350 m
6700 m
10.000 m
urban area
0
1 km