This is the post-print author's version of the following book chapter: Garau, C., Desogus, G., Maltinti, F., Olivo, A., Peretti, L., Coni, M. (2021). Practices for an Integrated Planning Between Urban Planning and Green Infrastructures for the Development of the Municipal Urban Plan (MUP) of Cagliari (Italy). In: Gervasi, O., et al. Computational Science and Its Applications – ICCSA 2021. ICCSA 2021. Lecture Notes in Computer Science(), vol 12958. Springer, Cham. https://doi.org/10.1007/978-3-030-87016-4_1

Practices for an Integrated Planning between Urban Planning and Green Infrastructures for the Development of the Municipal Urban Plan (MUP) of Cagliari (Italy)

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Abstract. As underlined by the European Commission in Green Infrastructure (GI) - Enhancing Europe's Natural Capital (2013), in Europe, solutions based on green infrastructures are particularly used in urban areas to reduce pollution and health problems related to population growth, and to the settlement concentration of activities and residences. With this paper, the authors evaluate the link between the old sectoral model of infrastructure planning and a more functional one, based on the new green infrastructure paradigms used in different European cities. The main aim is to understand how these paradigms can improve the viability and the quality of life of the population in a coastal city with a particular frame on sustainability. To this end, starting from national and international examples, the authors outline typologies of integrated planning between urban planning and green infrastructures with particular reference to the relationship between historic city and waterfront in coastal cities. Subsequently, these typologies will be applied to the case study of Cagliari (Sardinia, Italy) as a tool to mitigate the fragmentation and unsustainable use of the soil with a particular frame in achieving the Sustainable Development Goals (SDGs). This allowed not only to study a model for the city of Cagliari for the regeneration of waterfront urban areas, but also for developing a system of green infrastructures capable of minimizing travel times within the city and of increasing the accessibility of slow mobility. This paper shows a first phase of research as part of the ongoing elaboration of the Municipal Urban Plan (MUP) of Cagliari.

Keywords: Green Infrastructure, Accessibility, Slow Mobility, MUP, Waterfront, Coastal Cities

1 Introduction

Today cities represent less than 2% of the total world territory, but have about 55% of the world population with a level of urbanization that is expected to reach almost 70% by 2050 [2]. Cities also develop through an organized physical layout and a road

interconnection system in which roads particularly play a fundamental role, as they interconnect places, people and goods, thus facilitating trade, social interaction and mobility. All of this requires effective management by national and local authorities to make cities and human settlements inclusive, safe, long-lasting and sustainable [3]. In fact, in accordance with the Sustainable Development Goals (SDGs) (particularly with Goal 11), by 2030 cities will have to increase inclusive and sustainable urbanization by providing access not only to safe, sustainable and affordable for all but also to safe and inclusive public green spaces through integrated policies and plans towards inclusion and efficiency [3].

Mobility must therefore become a primary factor also considering social inclusion as a tool for improving the environmental, social and economic well-being of communities and not focusing exclusively on transferring people [4]. From this point of view, in a city the spaces intended for transport infrastructures should be designed on a human scale to perform a collective function through integrated mobility between multiple transport systems to offer people different, efficient and pleasant options. In fact, urban planning strategies, correlated to the smart city model [5, 6], are leading local institutions to use social capital to improve city services [7, 8]. These services are especially related to mobility including urban accessibility, infrastructure of traditional transport communication, the availability of ICT infrastructures, sustainable, innovative and safe transport systems [9, 10]. The infrastructures should therefore be interpreted as socially active connection networks in which the functions of streets and squares must have the aim of improving the needs and perceptions of citizens [4]. They should be thought of as relational spaces in which the interactions of pedestrians become one of the primary objectives of their design. In the United Nations report "Streets as Public Spaces and Drivers of Urban Prosperity", this concept has been highlighted since 2013. It is stated that "streets, as public spaces, have lost importance in terms of shared surface and in their primary role in formation of the culture and history of the city" [11].

These premises lead to think about green infrastructures. Starting from 2011, the European Union recognizes them as a network of natural or semi-natural areas, which, if strategically planned with other environmental elements, can become an effective tool for obtaining ecological, economic and social benefits. Furthermore, they constitute a strategy aimed at reconnecting natural areas with urban centers and at restoring and improving their functional role [12]. The “Green Infrastructure Handbook” [13] argues that green infrastructures vary in the scales at which they can be identified and planned. At the urban level it is possible to design artificial connectivity elements: they are "elements made by man with the aim of facilitating the passage of species in a territory, including green bridges and eco-pipelines to bypass transport infrastructures and stairs for ichthyofauna, where natural movement is prevented by human activities and settlements” [14, p.9]. The inclusion of these elements in cities would reduce pollution and health problems related to the growth of the population, and would also promote sociability and pedestrian use of the street.

Furthermore, as numerous examples in the world demonstrate (Barcelona, Marseille, etc.), in the case of a coastal city, these elements make possible to connect the built city with water through a sustainable design of the waterfront. In fact, through green infrastructures (eco-pipelines or green bridges) these areas take on a strategic dimension

especially in terms of environmental and social sustainability that has increasingly made possible to involve the entire area in the urban system behind it, even on a metropolitan scale. In other words, the seafront with the inclusion of sustainable connection infrastructures can be understood as an integral part of the large urban system and as a hinge and junction of mediation with the static nature of the urban territory.

Starting from these assumptions, the goal of this study is to highlight how it is possible to improve urban mobility, through an integrated design between urban planning and green infrastructure. The intent of this article is to answer the following question: is it possible to read, design, interpret the streets as places of relationship and not exclusively as places of transition or separation?

Therefore, this paper focuses on how, in a coastal city, the design of infrastructures can radically change the relationship between the built city and the waterfront, by favouring the union and interpenetration of the two ones. To do this, this study initially focuses on the description of the Cagliari case study, highlighting the current conformation of the area facing the waterfront (paragraph 2). Subsequently, the authors analyse some national and international projects by comparing the positive and negative aspects of the overpass and underpass to unite city and waterfront (paragraph 3). In light of this, section 4 proposes a functional redevelopment of the viability of the Cagliari waterfront as the first starting point for the development of the Municipal Urban Plan (MUP). The document concludes by emphasizing the need for a functional interplay between port infrastructure, waterfront and urban fabric through a massive change in traffic, projected towards sustainable development.

2 Description of the case study of Cagliari (Italy)

The Cagliari case study is a significant example because, as a reference city for the whole of Sardinia, starting from the 1960s the population moved from rural areas to the city, and now 1/4 of the Sardinian population lives in its Metropolitan area [15, 16]. This has had a negative impact of rapid urbanization and high traffic in a city characterized by an urban structure typical of a coastal city [17].

With art. 17 of the Regional Law 4 February 2016, n. 2 "Reorganization of the local autonomy system of Sardinia" the city of Cagliari has become the capital of the metropolitan city of Cagliari (constituted by seventeen municipalities with approximately 432,000 inhabitants). This has caused a further increase in the problems linked to commuting with a high prevalence of private vehicles and with a public transport not adequate to meet the demands [18]. This is also the result of the wrong transport policies of the 1980s when cars were allowed to enter the city by occupying pedestrian areas and squares. “The result of these policies was that until 2010 Cagliari was characterized by the absence of pedestrian areas, restricted traffic areas and cycle infrastructures. At the same time, an important urban tram network was abolished. Consequently, the Cagliari recorded a loss of social relations, culture and peculiarities of the community” [19, p.557]. Furthermore, Cagliari is the largest city in Sardinia with an area of 85.01 km² and a population of approximately 151,000 inhabitants. Cagliari has a strong link

with nature not only because it is coastal but above all because within it several Special Protection Areas (SPAs) and Sites of Community Importance (SIC) are present.

This environmental heritage is projected on the Gulf of Cagliari through the port system which becomes (i) the neuralgic center between the built city and its projection on the sea; (ii) an integral part of the vast area; (iii) a hinge and junction of economic mediation with the hinterland of southern Sardinia. These characteristics form a city characterized by a strong link between city and nature which should also be enhanced by considering the relationship that the city has with its metropolitan area.

An emblematic example of the relationship between city and nature is the large area that goes from *piazza Matteotti* to the *Sant'Elia* Stadium (streets, squares and places are deliberately left in Italian throughout the paper, so as not to lose the identity of the places) passing through the Port of Cagliari and *via Roma* which represents a nodal point not only for the city of Cagliari and its metropolitan area, but for the whole of Sardinia (Fig. 1). In fact, it hosts the most important port center in the south of the island where the highest concentration of inhabitants converges, with the most relevant indices of industrialization, of the commercial service sector and production in the agricultural sector [20]. Furthermore, the port front on the *via Roma* is the area of greatest interest both from a historical point of view and for its strong interrelation with the whole city. This area, in recent decades, has undergone various transformations [21] which have significantly improved urban use.

Fig. 1. The waterfront of Cagliari. Relation between historic city and sea. Source: elaboration by the authors

These can be summarized in [22]:

1. The demolition of the separation wall between *via Roma* and the port area subject to customs control has allowed the opening of the seafront to the city. This opening made the water in front of it usable after the construction of the mooring piers for pleasure boats.

2. East side of *via Roma*:
2.a The arrangement of the Ichnusa Pier with the building of the maritime station, currently used for cultural and recreational activities, and the construction of a long pedestrian walkway over the sea in front of the fence of the naval base to connect the Ichnusa Pier to the Bonaria zone;
2.b The requalification of the *Su Siccu* pinewood and of the park on the sea in front of the Basilica of Bonaria;
2.c. The ongoing design of the *Su Siccu* strip where the sports clubs are located, the Sant'Elmo Basin and the *Padiglione Nervi*;
2.d. The waterfront equipped with cycle paths to the Sant'Elia district and cultural promotion in the old *Lazzaretto* complex.
3. West side of *via Roma*:
3.a The *Rinascita* Pier, equipped for the reception of large cruise ships.
3.b The *Porto Canale* area, with quays equipped for unloading and loading of containers and for secondary handling of goods in transit through transhipment. In it are located, with dedicated basins, the maritime structures of finance and the operational structures of the Harbor Master's Office.
3.c The start of the ministerial and regional procedure for the establishment of a Customs Free Zone. It should give, through the competitiveness of the *Porto Canale*, new opportunities for international movement and substantial economic implications in the hinterland of the island.

From the list of public works realised in the port complex, the positivity of the system and the connective articulated between land and water can be assessed. But after the realization of these works, it becomes even more important to guarantee in the area a precise policy based on infrastructures that allow, at the same time, a fast traffic flow (to dispose of the traffic linked to the station and the port area with the cruise terminal) and a design for the area with a soft mobility.

These reflections lead the authors to evaluate sustainable solutions for this area that make possible to implement the relationship between water and city. With this in mind, an extensive national and international experience in the transport sector exists [23] on the implementation of green infrastructures linked to the design of underpasses and overpasses. In the waterfront area of Cagliari, these infrastructures can improve the general viability of the area under study, and also can create interdependence with the surrounding environment. This would ensure added value to the city and its relationship between the historic city and the waterfront. For this reason, the authors studied several case studies for the design of the Cagliari waterfront. They are illustrated in the next section and highlighted the positive and negative aspects of the overpasses and underpasses in the cities with similar problems of Cagliari.

3 Overpass or Underpass? National and International Practices on Green Infrastructure Connecting City and Waterfront

At the national and international level, there are several examples of cities that have significantly changed their structure through infrastructures (underpasses and overpasses). These allowed the development of settlements and urbanization to be controlled [24]. With the aim of understanding how these infrastructures can become a tool

for sustainable development in a maritime city, the authors focus on the positive and negative aspects of underpasses and overpasses from a perspective of sustainability and connection between city and nature. To do this, five national and international case studies are analysed (Genoa, Naples in Italy, Barcelona and Madrid in Spain and New York in the United States). These case studies allow not only to have a broader framework of how these cities have chosen their infrastructure, but also to understand the opportunities of connecting the historic city with its waterfront. For the overpasses, the Genoa project allows to understand how the infrastructure, through a single hub, can connect the city and the port. The Naples project, on the other hand, allows to reflect on how the relationship above/below the flyover can work as an opportunity for car/pedestrian connection. The underpasses are studied through the projects of Madrid (emblematic example of green connection infrastructure between two well-established city sections), of New York, by considering Central Park (example of connection between urban viability and internal viability of the park) and of Barcelona (example of connection between sliding and local roads through an underpass). This projects and their analysis of the strengths and weaknesses of underpasses and overpasses, therefore, allows to have a more precise framework of the connection methods that identify best practices in relation to two fundamental elements for the objective of this work: [1] the function and intended use of the transport infrastructure [2] and the potential repercussions that a new appearance of the road infrastructure can bring to the relationship between built cities and natural and maritime environment.

Genoa: the relationship between the port and the historic city through the connection of the flyover called "Sopraelevata". The "Sopraelevata" inaugurated in 1965, was designed with the aim of disposing the traffic crossing of Genoa which was increasing immeasurably between the end of the fifties and the beginning of the sixties, with the spread of mass motorization. Its construction was already foreseen by the general master plan adopted in 1956 and was definitively approved by the Ministry of Public Works in 1959 [25]. In 2004, for "Genoa European Capital of Culture", a total transformation of the city's waterfront took place, by modifying the previous sense that the Sopraelevata used to have as a dividing element between the city and the port.

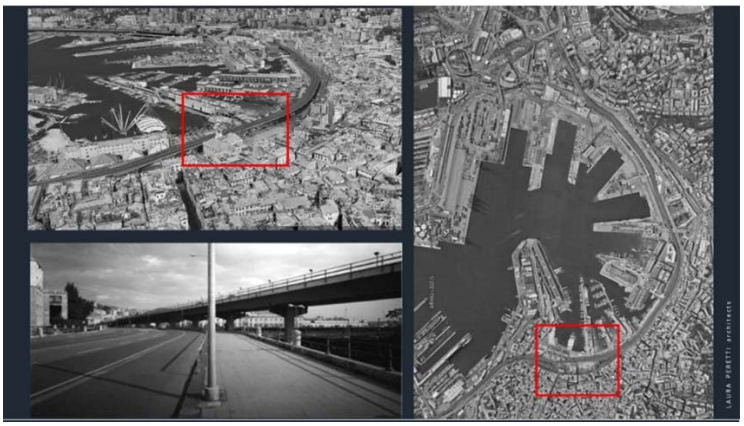

Fig. 2. Case study 1 _ Genoa. Relation between the port and the historic city through the flyover called "Sopraelevata". Source: elaboration by "LAURA PERETTI_architects"

In fact, Renzo Piano's project that connects the historic center to the sea has transformed the historic port from a port area to an urban area (Fig. 2) through the design of an urban port park [26, 27, 28]. This urban port park moved "the center of gravity of the city towards the sea, with positive repercussions both on the recovery process of the neighbouring historic center and, above all, on the relationship between the city and the sea. In essence, the city was able to begin to interface with its sea and to create a direct iteration with it" [28, p. 3]. Currently, the "Sopraelevata", which has 3 other levels of roads below the aquarium, is the only pedestrian point of contact between the historic city and the sea.

Naples: the relationship and use of the above and below the flyover. The project analyses the function of the infrastructure and in particular the use and intended use of the above and below the elevation. The flyover of Naples highlights the complex pedestrian/car relationship which over the years has transformed into a long strip of decay that entered into the city (Fig. 3) and which has given rise to a sort of no man's land difficult to manage below the infrastructure.

Fig. 3. Case study 2 _ Naples. Relationship and use of the above and below the infrastructure. Source: elaboration by "LAURA PERETTI_architects"

These two projects illustrated some negative and positive aspects of the overpasses.

Table 1 clearly shows that the negatives outweigh the positives ones. The flyover allows a better connection between different parts of the city and between distant points, the possibility of avoiding demolition during construction and the possibility of using the above and below the infrastructure, However, the negative aspects are many, over the high percentage of urban decay that can occur under the flyover (such as in Naples). From the greater acoustic and environmental impact and the difficulties of maintaining the supporting structure, from a landscape point of view the overpass is a linear building that could significantly change the skyline of the city. In addition, in most cases this involves a doubling of the infrastructure on two or more levels.

In coastal cities, this becomes an even bigger problem. In fact, connecting the city and the waterfront, the linear road parallel to the sea creates an element of disconnection and not a union that must be resolved through the connecting hubs (such as Genoa).

Furthermore, the structure creates a landscape different from the initial one, not making the city perceive by those arriving from the sea, or the sea by those who live in the city.

Table 1. Positive and negative aspects of the overpasses. Source: elaboration by the authors

Overpass	
Positive aspects	**Negative aspects**
1. Connection between different parts of the city	1. Significative maintenance of the supporting structure
2. Connection between distant points of the city	2. Acoustic impact amplification
3. Possibility of avoiding demolitions	3. Environmental impact amplification
4. Possibility of connections below	4. Greater dispersion of fine dust
	5. Intrusion in the skyline of a linear artifact
	6. Formation of ramps
	7. Formation of a "world below": urban decay
	8. Usual doubling of the linear infrastructure on two or more levels

Madrid: the underpass as a connection between parts of the city. The large urban arteries are treated as open rivers and the crossings are hubs that are always equal to the altitude of the city. This system is likewise adopted for pedestrians, creating urban continuity between the parts (Fig. 4). The strategic location of the market on the bridges favours the social and economic exchange between two adjacent districts of the city otherwise separated by the infrastructure.

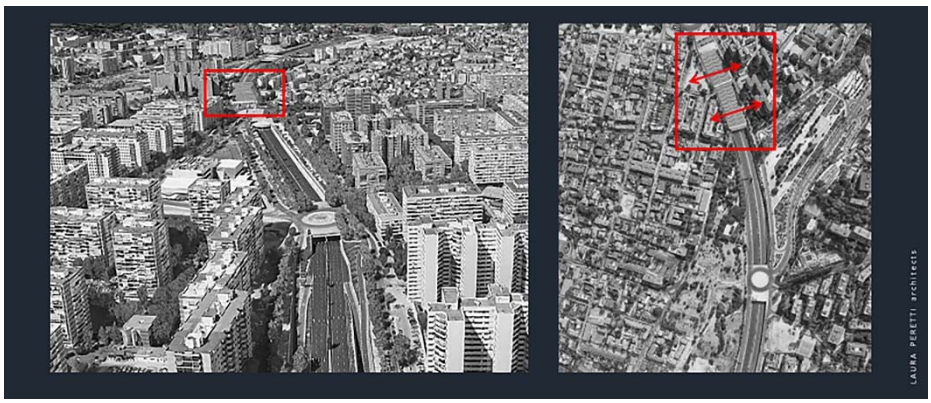

Fig. 4. Case study 3 _ Madrid. The underpass as a connection between parts of the city. Source: elaboration by "LAURA PERETTI_architects"

New York. Connection between environment and city. The park, opened in 1856 with a project by Frederick Law Olmsted, is now characterized by a longitudinal and transversal road system with different functions (fig. 5). The longitudinal direction is

crossed by park ways used for internal uses, for the only passage of pedestrians and cycles. The great urban arteries cross it in a transverse direction. From south to north, they are located on 65th Street, 79th Street, 86th Street and 97th Street. Each street contains two lanes, one in each direction placed below the level of the rest of the park. In the four transversal streets the passage of cars takes place through a slight change in altitude, with the park becoming a sort of "anti-litteram ecoduct". Each of them represents a communication route between one side of the city and the other.

Fig. 5. Case study 4 _ New York, Central Park. connection between environment and city. Source: elaboration by "LAURA PERETTI_architects"

Barcelona. Relationship and use of the above and below infrastructure near the sea. The case of Barcelona (Fig. 6) is completely different from the case studies previously described. In 1992, the Vila Olímpica, one of the many projects for the major urban restructuring for the Olympic Games, emerged as a hinge between the port and the historic city. Through the complete infrastructural reorganization “the site was enhanced by creating a pedestrian connection space where citizens practice outdoor sports and today it has become an attractive tourist center animated by numerous restaurants and clubs” [29, p.83]. The project includes large green public areas that connect the city to the sea and it is interesting for the choice of mobility. In fact, the great sliding roadway passes underneath allowing to use the coast with a soft mobility. It is a worthy example of the relationship between two different types of mobility that still leave space for pedestrian use of the coast.

Table 2 shows several positive and negative aspects of the underpasses, highlighted by the analysed projects. Unlike the overpasses, these examples have more positive aspects. In fact, apart from the separation of joint areas and the formation of residual spaces, the underpasses offer better maintenance and better control of the environmental impact. From a landscape point of view, the underpasses maintain the indispensable view for maritime cities, preserving the urban horizon in a waterfront that wants to

connect (even visibly) the historic city and water. Moreover, the negative aspects can be easily mitigated thanks to the construction of eco-pipelines that restore continuity between the neighbourhoods and limit the interluded spaces usually destined for urban decay.

Fig. 6. Case study 5 _ Barcelona. Relationship and use of the above and below infrastructure near the sea. Source: elaboration by "LAURA PERETTI_architects"

Table 2. Positive and negative aspects of the underpasses. Source: elaboration by the authors

Underpass	
Positive aspects	**Negative aspects**
1. Ease of maintenance	1. Separation between contiguous areas
2. Possibility of connections to the city elevation line	2. Formation of debris spaces for ramps
3. Reduction of acoustic impact	
4. Containment of fine dust	
5. Reduction of environmental impact	
6. Maintenance of the urban horizon	

All case studies analysed allowed to think about the connection between the historic city and the waterfront. In light of the analysis of the case studies and the subsequent study on the strengths and weaknesses of the overpasses and underpasses for designing an infrastructure capable of connecting the historic city to the sea, the authors in the next section propose different proposals of an infrastructure redevelopment of the Cagliari waterfront showing a first phase of a research as part of the ongoing elaboration of the Municipal Urban Plan (MUP) of Cagliari.

4 Proposals for the infrastructural redevelopment of the Cagliari waterfront for the Municipal Urban Plan (MUP)

Figure 7 shows the proposals of the authors, which include the coastal area from *piazza Matteotti* to *via Ferrara*. Seven proposals are foreseen for the functional requalification of the road infrastructure system, coherent and linked each other which will then be further explored in a subsequent phase. Each proposal consists of a critical area and deals with the critical points of the current road network, even disconnected from the sea (Fig. 7, proposals 6-7) but which, for design continuity, deserve no less attention in the relationship between the historic city and the sea.

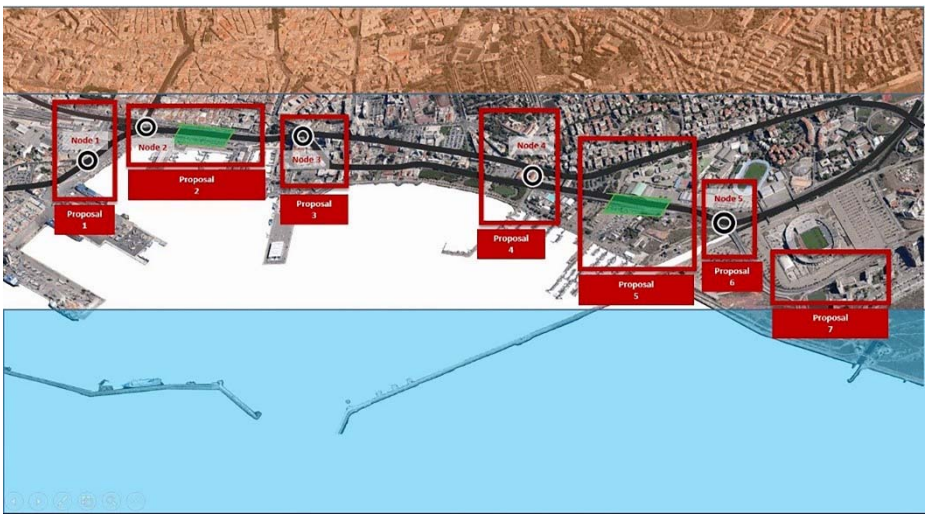

Fig. 7. The infrastructure redevelopment in seven proposals for the Cagliari waterfront. Source: elaboration by the authors

Proposal 1 "*Piazza Matteotti*". The piazza is an emblematic center of the city which, due to its presence from the station and the proximity of the cruise terminal, becomes an intermediate center characterised not only by the flow of people arriving from other parts of Sardinia but also by the flow of tourists from Italy and beyond. The proposal provides for pedestrian and vehicular flows between the station, the square (intermodal center) and an underground structure that allows cars to pass over and under pedestrians. The cars, in fact, remain on the surface and are sorted by a roundabout between the station, *piazza Matteotti* and the head of the intermodal center, thus building an underground pedestrian area.

Proposal 2 "*Via Roma*". This street is characterised by arcaded buildings built between the end of the 19th century and the second half of the 20th century, interspersed with various alleys that rise towards the upper part of the historic city (the Marina district). The current road structure creates a strong separation between the historic city and the port, so as to make an urban redevelopment necessary. It should review the organization of the entire road network to promote the continuity of the space between

the historic city and the arcades of the buildings and between the latter and the port docks. The proposal foresees pedestrian and vehicular flows, transverse crossings and functional continuity of longitudinal flows. To do this, a solution is proposed: the idea is to do a lowering of the *via Roma* for a very limited stretch (250 m), by restoring completely the transversal continuity to the sea through the eco-pipelines.

In addition, restricted access roads for shops and the port may be envisaged in the area. In this way the street could become a unitary square with parking spaces under the street in a simple way, contextually to the excavation. An example of this modality can be found in Barcelona where the connection between the historic city and the port, in a wide band of 130 x 656 (Cagliari 110x474), is solved with only 2 crossings and the maintenance of many longitudinal flows both at an altitude of the city than at a slightly lower-level difference.

Proposal 3 "Darsena" (the Dock). It is characterised by a historic urban form which is currently surrounded by modern buildings of uneven quality and size. This context is crossed by the main flows of vehicular traffic coming and going from the city. The rear part of the Darsena has buildings of limited value and consistency. For design continuity, which sees the infrastructure of the area from *piazza Matteotti* to *via Ferrara*, the redevelopment could include the connection of *viale Diaz* and *viale Colombo* through v*ia Pirastu*. This would give the possibility of diverting vehicle flows, thus giving continuity on the transversal promenade on via Roma, increasing the freedom through a roundabout in *piazza Defenu*. Furthermore, this would give the possibility to pedestrianize the area of the Darsena.

Proposal 4 Basilica of the "*Madonna di Bonaria*". This proposal aims to re-join the path from the Basilica of Bonaria to the sea, currently separated from the vehicular flows of *viale Diaz* and *viale Colombo*. This is conceived with a redevelopment of the parking area as an urban place of transition and the organization of the sea urchin market that today takes place in the Bonaria pine forest. The passage that connects the basilica directly to the sea starts next to the monumental staircase. The parking area could be covered and could be used in a multifunctional way: the roof could remain viable as a public space.

Proposal 5 "Fiera and Porto". The proposal sees the connection between parts that today are completely disconnected from each other (the "fiera" complex, the sea and the port) as a continuation of proposal 4 (Madonna di Bonaria) which is part of the transversal crossings that reunite the city with the sea. The goal is to bring the perception of the sea into the city and to the Cagliari "fiera" and vice versa, to project this onto the seafront. This could be done through two eco-pipelines that allow to cross *viale Colombo*, resizing the road network that is now oversized compared to real needs. Along *viale Colombo* the eco-pipelines reconnect the "fiera" and the port according to the new network, with pedestrian and vehicular routes that directly connect the urban fabric to the sea.

The proposed interventions are in total coherence with the initiatives and planning that the port authority is doing around the Nervi pavilion. In this hub a roundabout (Fig. 7, proposal 6) would effectively reconnect the reorganized road axes, increasing the accessibility of the context and the parking facilities. The same hub could accommodate a pedestrian crossing at high altitude by completely integrating the two sectors now

divided. It would be extremely useful to envisage a redevelopment of *via Ferrara* (Fig. 7, proposal 7) to connect two important but still separate parts of the area: the stadium and *Sant'Elia* district.

5 Discussion and Conclusions

With this study, the authors have assessed how the functional model of the new paradigms of green infrastructures can radically change the viability of a city, generating important environmental, social and economic effects that comply with the model of smart cities [30, 31, 32, 33, 34, 35]. The realised analyses focused on a particularly emblematic area of coastal cities, which sees the water-front as a connection point between the city and the sea. To do this, the document presented a series of both national and international projects.

Firstly, these analyses served to understand how, in the case of a coastal city, the relationship between roads, city and waterfront must be the basis of the redevelopment. In other words, the study of these cities - relating to overpasses (Table 1) and underpasses (Table 2) - constituted an important basis of analysis to identify the positive and negative aspects of these transport infrastructures. Furthermore, these analyses have shown that in these areas the solution of the underpass is much better not only from a viewpoint of sustainability of the infrastructure itself but above all in respect of the landscape and also in the visual connection between the city and the waterfront. In fact, from the analysis of national and international examples it was possible to reflect on two key points related to the viability of a coastal city: [1] the relationship between city, waterfront and water: the viability can allow the waterfront to become the keystone of any social, urban and political process due to the gravitational effects that these structures projected onto the water have on the cities and the territory behind them. The waterfront organized with a double viability (at the city level, soft mobility and vehicle underpasses) becomes the focal point of meeting for citizens, welcoming the needs related to the mobility that the city needs in a port, maritime or railway area.
[2] The visibility of the city by those arriving from the sea and those who live in the city: it is necessary not to damage the visual and landscape connection between city and sea with invasive structures. The underpass, unlike the overpasses, allows in a coastal area to maintain the urban horizon without changing the skyline with a linear building such as that of the infrastructure. Conversely, from the city, the underpass allows to enjoy the maritime area, strengthening the link between city and sea, without creating visual and physical barriers between one area and another.

These reflections made it possible to have a first approach to the Cagliari waterfront redevelopment. This focused on a particularly critical area of the city, from *piazza Matteotti* to *via Ferrara*, which still today, despite the redevelopment works that took place in recent years, shows strong problems of connection and interpenetration between the historic city and the sea. Problems of both perception and mobility. This redevelopment is constituted by seven proposals and is based on a system of road infrastructures capable of minimizing travel times and increasing accessibility to slow mobility.

Furthermore, in the ongoing Municipal Urban Plan (MUP) of Cagliari, the analysis developed in this article with the case study of the Cagliari waterfront can be repeated in other similar contexts. In fact, the authors demonstrate how the relationships between built city and nature require adequate accessibility conditions that speed up the passage of vehicles, facilitate soft mobility and respect the city and nature both from a landscape and environmental point of view.

Future research will be oriented in two complementary directions: the first one, more theoretical, involves the study of actions aimed at improving the overall efficiency of transport, through green infrastructures, in coastal cities which by their nature have similar geographical connotations. The second one wants to extend the methodology to other parts of the city, especially as a link between natural areas and urbanized areas, in order to have a complete picture of the strategies to be implemented for the Municipal Urban Plan (MUP) of Cagliari.

Acknowledgments. This study was supported by the agreement with the Municipality of Cagliari – Strategic and Territorial Planning Service (CUP code: G22C20000080006 - CIG ZEA2E99622) entitled “Innovative methods for participatory urban planning in the drafting of the MUP in adaptation to the RLP and the HSP. Preparation of the preliminary environmental report in the SEA process. Study of the infrastructural structure in the light of the new forms of mobility in line with the drafting SUMPS”. This study was developed within the Interdepartmental Center of the University of Cagliari "Cagliari Accessibility Lab".

This study was also supported by the MIUR through the project "WEAKI TRANSIT: WEAK-demand areas Innovative TRANsport Shared services for Italian Towns (Project protocol: 20174ARRHT_004; CUP Code: F74I19001290001), financed with the PRIN 2017 (Research Projects of National Relevance) programme. We authorize the MIUR to reproduce and distribute reprints for Governmental purposes, notwithstanding any copyright notations thereon. Any opinions, findings and conclusions or recommendations expressed in this material are those of the authors, and do not necessarily reflect the views of the MIUR.

References and Notes

1. This paper is the result of the joint work of the authors. ‘Abstract’ ‘Overpass or Underpass? National and International Practices on Green Infrastructure Connecting City and Waterfront’, and ‘Proposals for the infrastructural redevelopment of the Cagliari waterfront for the Municipal Urban Plan (MUP)’ were written jointly by the authors. Chiara Garau wrote the ‘Introduction’. Giulia Desogus wrote the ‘Description of the case study of Cagliari (Italy)’ and Mauro Coni wrote the ‘Conclusions’.
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