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EUROPEAN UNION

Sustainability Plan and Future Prospects of City Ports of Brindisi and Igoumenitsa

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Introduction

The content of this volume is finalized to develop part of the more extensive DOCK-BI project through the contribution of scientific research. The general objective of the project is the modernization of the port areas and the improvement of the cross-border ferry connectivity between the ports of Brindisi and Igoumenitsa. Maritime connectivity refers to the performance of shipping transport networks and comprises facets such as, among others, the number of destinations served, frequency of services, and logistics costs[1]. In this context, port performance is fundamental for competitiveness, with port efficiency translating into savings for ports, carriers and shippers. As is clear, the literature relating maritime connectivity to port efficiency is relatively recent, with only a handful of papers having appeared to date. The implementation of some measures to increase connectivity would be expected to have substantial effects on port efficiency performance. By funding projects related to improvements in logistics efficiency in infrastructure, operational or service provision, digitalisation of processes and intelligent platforms and environmental sustainability the port performances will surely improve. The importance of cooperation between public and private companies is another recommended policy measure with that of widening the hinterland by attracting business from domestic production centres and neighbouring countries, which can be promoted by investment in corridors and the facilitation of cross-border trade and transit[2] .

With particular regard to DOCK-BI, by taking into account that many project outputs are related to infrastructural interventions, the concept idea

[1] B. Tovar, A. Wall, "The relationship between port-level maritime connectivity and efficiency", *Journal of Transport Geography*, Volume 98, 2022, 103213, ISSN 0966-6923, *https://doi.org/10.1016/j.jtrangeo.2021.103213*.

[2] United Nations Conference on Trade and Development UNCTAD, 2019. Review of Maritime Transport 2019. United Nations Publication, New York and Geneva, *https://unctad.org/system/files/official-document/rmt2019_en.pdf*.

behind the project is clearly focused on the direct communication between the two involved ports of Brindisi and of Igoumenitsa. The route between the two ports has been considered for centuries a high-traffic route, a prolongation of the traffic routes arriving to the two cities. This results in the idea to draw a blue route linking the two cities, a kind of "sea highway".

In order to outline the reference context from an economic-geographical point of view, the realities of Brindisi and Igoumenitsa will be presented below, as well as the situation of mobility and environmental conditions, the peculiar elements of the Urban Plans of Sustainable Mobility and the possible interventions.

In the present volume, although the theoretical-methodological approach is to be considered common, the elaboration of chapter 1 "The Cross-Border Cooperation Programme Interreg V-A Greece-Italy 2014/2020 and the DOCK-BI Project" and paragraph 12.4 "Infrastructural Interventions in the Frame of DOCK-BI Project" is to be attributed to Andrea Santoro, the elaboration of chapter 3 "The City of Brindisi: Historical, Urban, and Functional Development" is to be attributed to Mariateresa Gattullo and the remaining chapters to Elisabetta Venezia.

We thank all the project partners for providing the support material for the preparation of the volume.

1.
The Cross-Border Cooperation Programme "interreg V-A Greece-Italy 2014/2020" and the DOCK-BI Project

1.1. Overview of the Interreg V-A Greece-Italy 2014/2020 Programme

Interreg V-A Greece-Italy Programme is a European Territorial Cooperation Programme that aims to help public institutions and local stakeholders to develop cross-border projects and pilot actions and to create new policy, products and services, with the final goal to improve the citizens' quality of life. Strategically, the Programme will enhance innovation in a number of fields such as blue growth, tourism and culture, agro food and cultural and creative industries. Interreg V-A Greece-Italy Programme aims to get maximum return from EUR 123 million financed per 85% by European Regional Development Fund (ERDF) and per 15% by the 2 member states Greece and Italy through a national co-financing.

The Cross-Border Co-operation (CBC) Programme Greece-Italy (GR-IT) links eleven (11) NUTS III level prefectures and six (6) provinces from two different EU Member States, Greece and Italy. The Programme has a total budget of 123.176.896 € and is co-financed by the European Regional Development Fund (ERDF) with a total amount of 104.700.362 € for the 2014- 2020 period. The overall objective is to support strategic cross-border co-operation for a more prosperous and sustainable region across the Ionian Sea. Emphasis will be placed upon developing the foundations for a dynamic economy which fosters smart, sustainable and inclusive growth with the goal to improve the quality of life for those living in the region. This Programme builds on the achievements of the previous 2007-2013 programming period, taking into consideration the results of the on-going evaluation and the current economic, environmental and social challenges across the Ionian maritime border between Greece and Italy.

According to the Commission Implementig Decision of 16/06/2014 (2014/388/EU) setting up the list of regions and areas eligible for funding

from the ERDF under the cross-border and transnational components of the European Territorial Cooperation (ETC) goal for the period 2014-2020, the GR-IT Programme covers the following NUTS III areas:

Fig. 1 – Eligible GR-IT Co-operation Programme Area

Source: Programme and Project Manual Cooperation Programme Interreg V/A Greece-Italy (EL-IT) 2014-2020 March 2022.

The GR-IT 2014/2020 Programme has been structured as follows:

- A core strategy, which includes four (4) Thematic Objectives (TO):
  1. TO 1: Strengthening research, technological development and innovation,
  2. TO 3: Enhancing the competitiveness of small and medium- sized enterprises, the agricultural sector (for the EAFRD) and the fisheries and aquaculture sector (for the EMFF),
  3. TO 6: Preserving and protecting the environment and promoting resource efficiency,
  4. TO 7: Promoting sustainable transport and removing bottlenecks in key network infrastructures.

The selected TOs correspond clearly to the smart and sustainable growth pillars of the Europe 2020 strategy and are translated into the three programme Priority Axes:

1. Priority axis 1: innovation & competitiveness.

2. Priority axis 2: integrated environmental management.
3. Priority axis 3: multimodal sustainable transport system.

Furthermore, as noted earlier, coherence with EUSAIR has been taken into account for the design of this INTERREG GR-IT Programme, in order to ensure that its interventions represent concrete solutions to address common and shared cross-border concerns. The Programme coherence with the EUSAIR pillars envisaged to play a crucial role in creating jobs and boosting economic growth is notable in the projects funded by the Programme, among which the DOCK-BI project.

1.2. The DOCK-BI Project: Objectives, Partnership and Pilot Actions

DOCK-BI "*Development Of Connections between the Key ports of Brindisi and Igoumenitsa*" is an infrastructural project financed by Interreg V-A Greece-Italy Programme 2014/2020 under Priority Axis 3, Specific Objective 3.1 Boosting maritime transport, short-sea shipping capacity and cross-border ferry connectivity.

The project started on 30/10/2018 and ended on 31/10/2023 with a total budget of € 3.562.315,47 of which € 3.027.968,15 from ERDF Unions Support and € 534.347,32 from national co-financing.

DOCK-BI is an infrastructural project with a strong cross border connotation, since its intervention will be carried out in locations that characterize the "privileged relationship" between GR-IT: namely the ports of Brindisi and Igoumenitsa.

DOCK-BI faces a common cross border challenge: the unsatisfactory multimodal accessibility as well as the absence of integration and interconnection of transport modes that affects the competitiveness even though maritime transport plays a key role in local economy.

The project's overall objective is upgrading port areas and cross-border ferry connectivity between ports of Brindisi and Igoumenitsa, filling the lack of integration and interconnection of transport modes between the two ports.

This improvement will be obtained by implementing strategic infrastructural actions which are necessary to:

1) boost maritime transport;
2) improve accessibility and integration with the adjacent areas.

The Consortium of Industrial Development Area of Brindisi (ASI Brindisi Consortium) is the lead beneficiary of this project in cooperation with two Italian partners – the Southern Adriatic Sea Ports Authority and the Municipality of Brindisi – and two Greek partners the Igoumenitsa Port Authority and the Municipality of Igoumenitsa.

ASI Brindisi Consortium is a Body governed by public law that represents six public bodies of the Brindisi area and has had a long and consolidated experience in the management of EU-funded projects. In particular, it has implemented important infrastructure works concerning the development of ports, optimisation of infrastructures and port procedures/operations. All its activities are financed with EU funds with the purpose to improve the accessibility of the industrial area of Brindisi involving the port, the passenger boarding and the transport of good and services. ASI Brindisi Consortium aims to support the multimodal connectivity in order to boost maritime transport, short-sea shipping capacity and cross-border connectivity. Accordingly, the level of management of the Consortium is very high thanks to its streamlined administrative structure. Its operational structure is made up of fourteen employees, with both administrative and technical profiles, very skilful and experienced in the management of complex projects.

Igoumenitsa Port Authority S.A. (OLIG S.A.) is a state-owned company whose main activity is the provision service to ships, passengers, cargos and vehicles in the Igoumenitsa port area. Igoumenitsa port is geographically the closest port of Greece with Italy and the Balkan countries of the Adriatic Sea, thus becoming a major bridge of people and goods to and from Western Europe. Annually, 2.5 million passengers and approximately 250,000 trucks are moving from the port of Igoumenitsa to and from ports both, domestically and abroad. The involvement of OLIG SA is crucial for the DOCK-BI development because of its role in the management of the port domain, development of port services and opening new activities in the maritime sector. Furthermore, it has significant expertise in national, international and EU-funded projects. Its operational structure is constituted by four different directorates and several independent departments with discrete responsibilities, which cooperate closely under the guidance of the board of directors. Its Personnel has extensive experience in projects management.

Southern Adriatic Sea Ports Authority (ADSPMAM) is responsible for objectives, programming, coordination, promotion and control of port operations, including ordinary and exceptional maintenance of the widely used parts of Port area as well as control of activities related to the supply of services of general interest. It also has significant expertise in national, international and EU-funded projects; particularly, thanks to European-level projects, it has played an important role for the development of port security and accessibility. These experiences have also allowed the Southern Adriatic Sea Ports Authority, through the signature of agreements between the various institutions participating to the projects, to overcome possible difficulties for the unification of the procedures; these actions have also evidenced the capacity of Port Authority to influence local, regional and national policies.

Brindisi is situated on a natural harbour that penetrates deeply into the Adriatic coast of Apulia. Historically, the city has played an important role in trade and culture, due to its strategic position on the Italian Peninsula and its natural port on the Adriatic Sea; the city still remains a major port for trade with Greece and the Middle East. The Municipality of Brindisi is divided into 14 sectors and has about 350 employees as staff. The Body has had a long experience with EU-funded projects, managed and implemented by the EU Policies & International Cooperation Department with 3 skilful employees.

Igoumenitsa is a coastal city in north-western Greece. It is the capital of the regional unit of Thesprotia. Igoumenitsa is the chief port of Thesprotia and Epirus, and one of the largest passenger ports of Greece connecting north-western Mainland Greece with the Ionian Islands and Italy, with direct connections to Brindisi, Bari and Ancona. The city is built on easternmost end of the Gulf of Igoumenitsa in the Ionian Sea and primary aspects of the economy are maritime, transport, services, agriculture and tourism. The Municipality of Igoumenitsa has the financial capability to implement co-financed programmes and has had strong experiences in EU cooperation projects.

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2.
Analysis of the Macro-Territorial and Territorial Context Referring to the Territory of Brindisi and Igoumenitsa

2.1. The Strategic Importance of the Adriatic-Ionian Region

The connection between land and sea in Europe is reflected on the extent of maritime activities which are developed through the years. The activities developed on marine and coastal areas shape a type of an economic sector which could be considered as the 'Blue Economy' of Europe. At the Mediterranean level 'Blue Economy' constitutes an advantage for the development of the region. Amongst the uses with the highest importance for the Mediterranean 'Blue Economy' is maritime transport. Both passenger and cargo flows support the socioeconomic development of the region while ensuring the spatial cohesion of insular and continental parts of the region. Additionally, maritime transport generates significant pressures on the environment. These issues highlight the importance of maritime transport and the pressures that are generated by this activity on the social, economic and natural environment. Taking into consideration sustainability aspects and because of the high intensity of the use, there have been remarkable efforts aiming at the regulation and promotion of the use both at the EU and Mediterranean level. The policy and legal frameworks related to maritime transport refer to various spatial levels (international, regional, national). Additionally, the aims of each framework do not necessarily address all pillars of sustainability (social, economic and environmental). Thus, spatial overlaps among policies and low levels of integration are issues that should be highly considered in order for the regulation of maritime transport to become more effective[1].

[1] S. Niavis, T. Papatheochari, T. Kyratsoulis, H. Coccossis, "Revealing the potential of maritime transport for 'Blue Economy' in the Adriatic-Ionian Region", *Case Studies on Transport Policy*, 2017, Volume 5, Issue 2, pp. 380-388, ISSN 2213-624X, *https://doi.org/10.1016/j.cstp.2017.03.002*.

2.2. Brindisi and Igoumenitsa: Economic and Mobility Dynamics

In recent years the Italian port system, while continuing to represent the third port system at European level for overall volumes of goods handled, has progressively lost competitiveness and market shares, both compared to its own traditional competitors, which to the emerging ports of the Mediterranean, in particular in transshipment segment. Until now, an overall vision of the national infrastructure system has been lacking, with the consequence that each port continues to operate in isolation and, often, in competition with other ports. Monitoring maritime traffic in the Adriatic-Ionian area can contribute to the propulsion of macro-regional strategies, which recognize the maritime modality an important connecting role.

Since 2014, strategies have been developed and incorporated into the Union action plan European Union for the Adriatic-Ionian Macroregion (EUSAIR), which are based on four pillars:

- Blue Growth: grow the maritime and marine system to create new businesses and employment areas;
- Connecting the Region: minimizing connection difficulties between countries, develop transport and improve the interoperability of internal and maritime corridors;
- Environmental quality: improve and preserve the quality of the marine environment;
- Sustainable tourism: enhance tourism in the area by improving services and deseasonalising demand.

An adequate infrastructure and transport system is a key element for the economy and its growth; therefore, to achieve this objective, the European Commission identified a series of objectives to pursue in the 2011 White Paper by 2050. These include the gradual shift of freight transport from road modes to other modes (by 2030, 30% of goods, which travel more than 300 km, will have to travel by rail or waterways, and by 2050 it will have to reach 50%) and the creation, by 2050, of a European high-speed rail network (ISTAO, 2014, Osservatorio dei Traffici Marittimi).

2.3. The Role of EUSAIR and EU Transport Policies

With specific reference to the Adriatic Region the new European Union strategy provides four fundamental pillars:

- drive maritime and marine innovative growth;
- connect the Region;

- preserve, protect and improve the quality of the environment;
- increase regional attractiveness.

Within the second pillar "Connecting the Region" finds space also the maritime role of the area as a source of economic development.

In fact, the rigorous implementation of European regulations is identified as a crucial element for the qualitative improvement of maritime transport of both passengers and goods, also through a containment of criminal trafficking involving illegal trafficking. The strategy identifies connections, and sustainable land and sea transportation as key to strengthen social and commercial ties within the micro-area and in its vicinity.

Among the various objectives of the maritime strategy of this Adriatic area the following are envisaged:

- improve cooperation between national and regional maritime authorities of the European Union, establishing mechanisms to ensure the exchange of maritime information between traffic control systems vessels;
- improve the compliance culture of controls on flags and ships international, liability and transport insurance maritime, accident investigation and port security;
- develop modern technologies for the security of the belonging ports to the micro-region;
- improve the resilience of infrastructures;
- guarantee the safety of the environment and its sustainability.

Cross-border cooperation among the port cities of Brindisi and Igoumenitsa requires synergistic work which, starting from the strengthening of the peculiarities and the reduction of the critical issues present on a local scale, tends to direct efforts towards the construction of a port region in the Southern Adriatic-Ionic area.

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3.
The City of Brindisi: Historical, Urban, and Functional Development

3.1. The City of Brindisi: An Overall Vision

The complexification of urban spaces has made the scientific debate around them very complex; in fact, while on the one hand it is also difficult to find an agreement on what can be defined as a city[1],on the other hand there is a tendency to decree the end of cities based on the development of ICTs which have created new centralities and new marginalities[2] from the capacity for virtualisation of urban functions[3]. However, in the collective imagination, cities continue to be "places of work, consumption, movement, play, creativity, excitement, boredom. They unite, mix, hide, show and determine social practices of enormous variety; juxtapose nature, people, things and the human-built environment in many different ways"[4]. Therefore, each city continues to be a living matter, in continuous transformation in which nothing remains infinitely crystallized in its role and in its functional, cultural and social position: each city presents itself as a highly complex dynamic system that is not easy to investigate in all its components and in the multiple connections between these and their attributes since, in time and space, the continuous changes connected to its "form" and its "functions"[5] (which are linked to material elements of the milieu[6] which often directs

[1] Cfr A. Amin, N. Thrift N., *Città. Ripensare la dimensione urbana*, il Mulino, Bologna, 2002.

[2] S. Sassen, *Le città nell'economia globale*, il Mulino, Bologna, 1994.

[3] R Fistola, *Funzioni e trasformazioni urbane. Per una pianificazione della città digitale*, i Atti XXI Conferenza Italiana di Scienze Regionali, I.Pi.Ge.T.-CNR, Napoli, 2000.

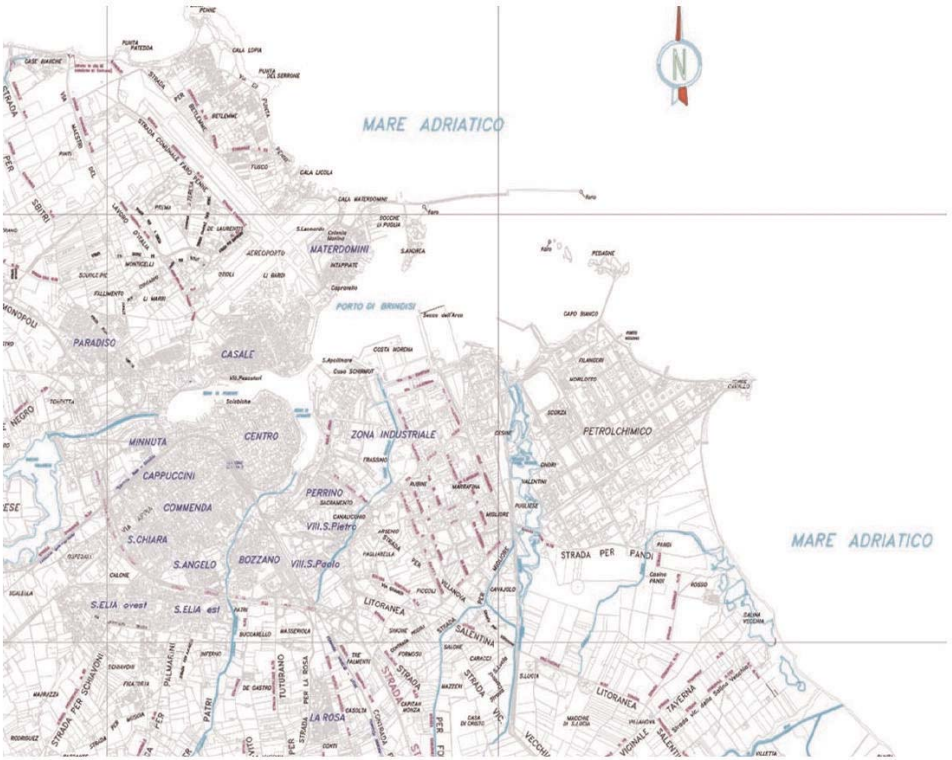
[4] A. Amin, N. Thrift N., *Città. Ripensare la dimensione urbana*, il Mulino, Bologna, 2002, p. 19.

[5] C. Beguinot (a cura di), *La città cablata. Un'Enciclopedia*, CNR-Università di Napoli, Napoli, 1989.

[6] F. Governa, *Il* milieu *urbano*, FrancoAngeli, Milano, 1997.

the trend) modify the "sense" of the same both with respect to the local and supra-local dimensions. Brindisi, a city located along the Adriatic strip of the Salento Tavoliere sub-region, on a squat peninsula, in the only forked inlet on the Apulian coast, does not escape this dynamic. The name was given to it by the Messapians who founded it: it literally means "deer horns" and recalls the topography of the place where the port considered the gateway to the East was built[7]. Currently the city, capital of the province of the same name, occupies a key position between the Salento coast and the Murgia hinterland as it has developed by embracing portions of the traditional subregions of Cimosa Litoranea, Murgia dei Trulli, Salento delle Murge and Tavoliere Salentino. It is divided into 8 districts and 13 neighborhoods (Fig. 2) that arose around the ancient nucleus incorporated into the Centro district.

Fig. 2 – Excerpt from the plan of the city district: the neighborhoods of Brindisi in capital letters-Date Editorial Staff of the Municipality of Brindisi April 2018



Source: https://www.comune.brindisi.it/brindisi/zf/index.php/servizi-aggiuntivi/index/index/idtesto/165.

[7] O. Baldacci, *Puglia*, UTET, Torino, 1972.

The urban plan highlights how the development of the city is characterized by a territorial identity based on certain crucial elements of the milieu, among which there is certainly its natural port which has been the cornerstone of the continuous processes of territorialisation, deterritorialisation and reterritorialisation of space urban, orienting both the directions of the expansion of the physical sub-system and the evolution of the functional sub-system of the city, attributing to it a recognizable imprint internally and at the different levels of the spatial scale.

3.2. Brindisi and Its History

The organization of the urban space of Brindisi, a city with a typical coastal morphology, has been influenced over the centuries by the singular shape of the port bend within which a double ria (Seno di Levante and Seno di Ponente which form the natural port called internal port that surrounds the city) is connected by the Pigonati Canal with the external port first and with the outport subsequently and with the open sea beyond the Pedagne Islands and the coastal opening between Punta Cavallo and Punta Penne[8] (Fig. 3).

After its foundation[9],essentially linked to the presence of the natural port, Brindisi was conquered by the Romans in 267 BC. Located at the end of the Via Appia, it became Rome's port of call for trade with the East and became a Municipium with the right to mint its own money[10]. The port, however, is linked to a poor hinterland that is not able to support trade routes that have a crucial role.

Thus, if the direct link with Rome led to the concentration of economic activities, shipyards and commercial traffic in the city, the fall of the Roman Empire irreparably marked its decline and condemned Brindisi to a process of involution whose fortunes could not even be revived by the peculiarities of its port which takes on secondary importance and remains subservient to a local role.

Subsequently, the city will be subjected to a process of devastation by the passage of Barbarians, Byzantines and Saracens and, only with the arrival of the Normans (1071), will it flourish again to reach a dimension of great prosperity with Frederick II of Swabia, a prosperity which still revolves around the port; the latter engages in competition with Venice and becomes a

[8] D. Novembre, *Geografia urbana della Puglia*, Adriatica Editrice, Bari, 1973.

[9] For the reconstruction of the historical-geographical events of Brindisi see O. Baldacci, *Puglia*, cit.; U. Toschi, *I porti dell'Abruzzo e della Puglia*, Zanichelli, Bologna, 1942.

[10] The presence of Messapi and Romans is attested by the remains of the megalithic walls found in Corte Capuzziello together with other elements of the Roman monumental heritage present in different areas of the city. Cfr. O. Baldacci, *Puglia*, cit.

port for pilgrims towards the Holy Land; however, "Saracenic intransigence prevented Brindisi from carrying out its coveted and profitable function as an intermediary with the Holy Land"[11].

During the Angevin and Aragonese domination, the city was plagued by a series of disasters (plague, malaria, looting, earthquake, Turkish assaults, occupation by the Venetians). Despite this, the Angevins ensured the reconstruction of the eastern sector of the city, where the arsenal was located. They will build a castle surrounded by 37 buildings and complete the city's defense plan. However, during the Aragonese domination the conflict between Alfonso of Aragon and the Prince of Taranto Orsini dal Balzo for the control of the port area led to the closure of the port mouth and decreed an acceleration of the city's decline. Thus, as Baldacci underlines, Brindisi goes through a "centuries-long agony"[12] and finds peace only after Spanish domination settles in southern Italy.

The recovery of the city, still entirely centered on its port, occurred starting from 1844, when Ferdinand II promoted an urban planning plan and one for the port with the creation of the free port. The works, concentrated on the western part of the city, will lead to the rebuilding of the city walls, the construction of the castle on the Seno di Ponente and the restoration of the arsenal to efficiency.

In 1775 the construction of the Pigonati Canal, commissioned by Ferdinand IV, reconnected the port with its functional dimension and initiated a series of variations and alterations of the coastline with the aim of adapting the structure and making it functional for passenger traffic and commercial (Indies Suitcase). These variations will continue during the two world wars, when the city will acquire a series of military functions, and will have a significant acceleration after the fifties of the twentieth century when, following the industrial and energy policies oriented towards the development of the South, the construction of dams, piers and new docks.

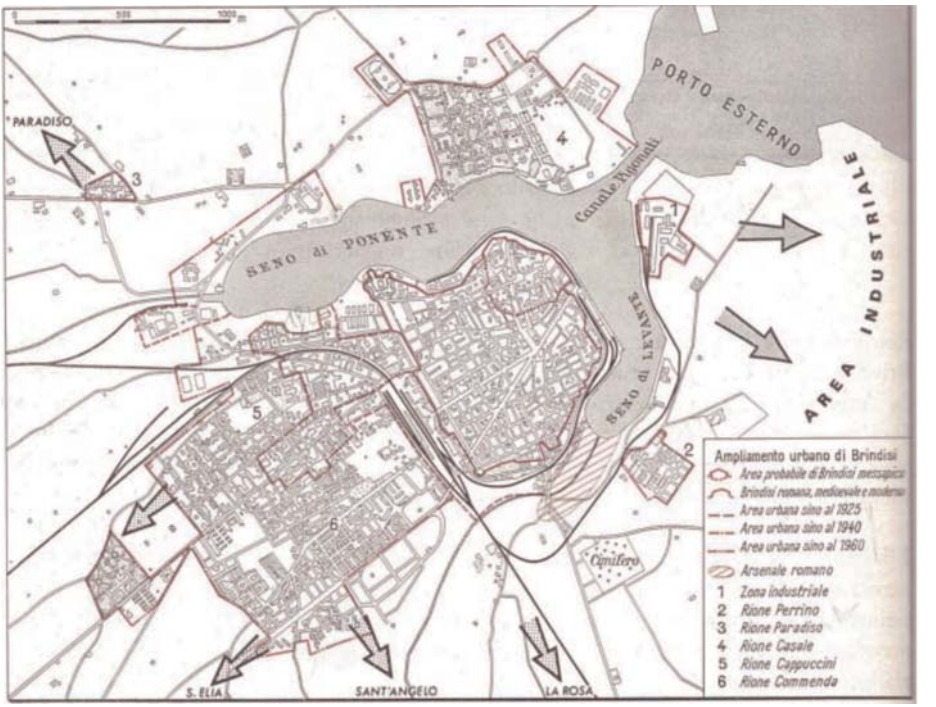
However, it was with the unification of Italy that Brindisi changed its face. The opening of the Suez Canal (November 1869) brought new traffic to the port (on the routes to India, Australia and the Middle East). However, "at the time of the unification of Italy Brindisi was reduced to a ghost of that important classical city (...) but, due to its geographical position, it was destined for a secure future"[13].

The history of the "new Brindisi"[14] begins with the construction of the railway connection which places the city at the hub of a hinterland to which it had acted as a pivot at the beginning of its history and redefines its function within a provincial space of which, in 1927, became the capital.

[11] O. Baldacci, cit., p. 472.
[12] *Ibidem*, p. 473.
[13] *Ibidem*, p. 479.
[14] *Ibidem*, p. 480.

From this moment on, the economic dynamics mark the relationships of Brindisi, not only with its urban space, but also with the coast and the hinterland, with the Salento Peninsula and the urban centers of Taranto and Lecce, with the Adriatic and the Mediterranean.

Fig. 3 – Brindisi: phases of urban expansion in the period 1925-1960



Source: O Baldacci, (cit.), p. 470.

3.3. Brindisi and the Expansion of the Physical Sub-System of the City

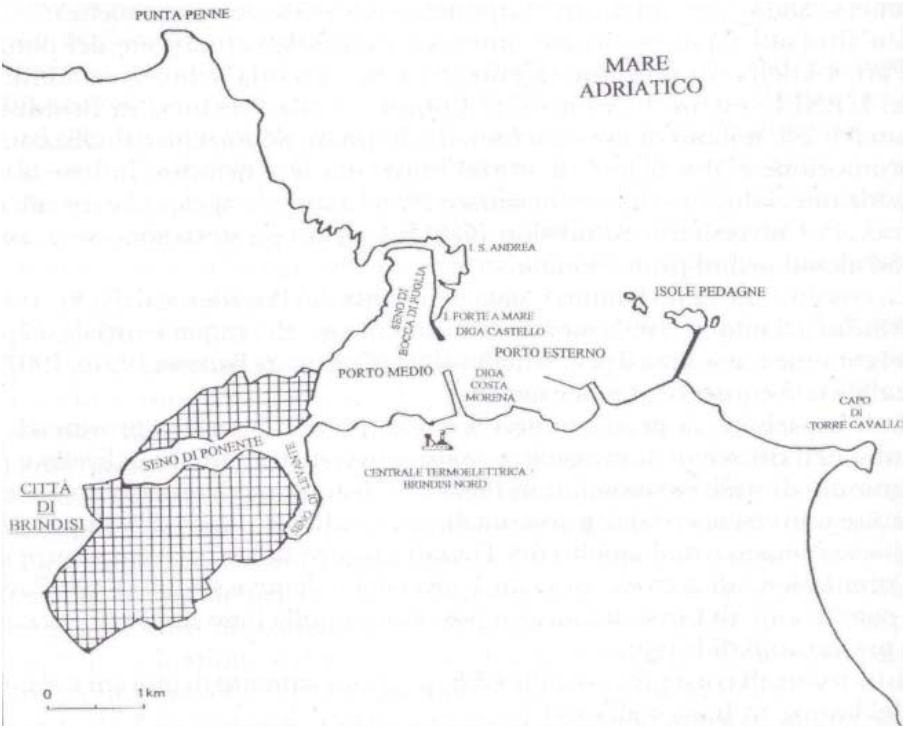
Starting from the current structure of the Brindisi urban space, it can be observed how the morphology of the port has oriented the expansion of the city since ancient times, both in relation to the typical shape of the port bend and in relation to its development connected to expansion and modernization works[15] (Fig. 4).

The port is made up of three basins which, over the centuries, have marked the physical and functional development of the city. The Internal Port is the

[15] Cfr. D. Novembre, *Geografia urbana della Puglia*, cit.

oldest port, it corresponds to the natural port and embraces the city from west to east in a double ria (Seno di Ponente and Seno di Levante). The western part, over time, was used for military works linked to the needs of the Royal Navy, while the eastern part was intended for commercial functions and constituted the mercantile port of the city[16].

Fig. 4 – The port of Brindisi and the borders of the three basins



Source: A. Rinella, *Energia, Ambiente, Sviluppo, Il caso della centrale termoelettrica di Brindisi Sud*, Bari Progedit, 1999, p. 104.

It was connected through the Pigonati Canal (250 meters long and 1,000 meters wide) first to a "subtriangular body of water"[17] currently called Porto Medio and delimited to the south by the Costa Morena pier and to the north by the Bocche di Puglia dam which connects the island of S. Andrea with the eastern part by the Cava Mater Domini and, subsequently, with the External Port, part of the sea beyond the Pedagne islands (NE), whose borders are

[16] E. Corbino, I porti dell'Italia Meridionale, *Giornale degli Economisti e Rivista di Statistica*, luglio 1923, Serie quarta, vol. 64 (Anno 34), n. 7 (luglio 1923), pp. 345-370.

[17] D. Novembre, *Geografia urbana della Puglia*, Adriatica Editrice, Bari, 1973, p. 86.

marked by the island of Sant'Andrea, the Costa Morena dam and the Castello dam and the Pedagne islands[18].

Starting from 1975, the first Port Master Plan, together with subsequent amendments, strengthened this physical organization of the port structure by supporting the functional aspects of the individual portions by providing for expansion works. At the same time, it has started construction and strengthening works on the road connection structures between the urban and extra-urban network and the port and the industrial area. Alongside these, he also added those for the construction of a railway network directly connected to the port and industrial area.

The latest Port Master Plan, approved in March 2023, defines the three bodies of water that currently characterize the port infrastructure of Brindisi, underlining that they actually constitute the specific areas within which a series of characterizing functions that more clearly establish the link between port space and urban space. In the document the internal port (surface area 727,000 square metres) is identified with the part made up of the water body of the Seno di Levante and the Seno di Ponente including the related land areas involving the city and which ends at the Pigonati Canal; the medium port (surface area 1,200,000 square metres) is approved with the part that extends from the Pigonati Canal to the Alfonsino Castle/Sporgente Colmata Costa Morena Est; the external port (surface area 3,000,000 square metres) with the one that develops from the previous limit up to the port entrance[19] (Fig. 5).

In this space dominated by the port vocation of the area, the oldest part of Brindisi is located in the "old city"[20] which developed until 1927 between the two natural inlets that surround it to the north and east, the Seno di Levante and the Seno di Ponente.

[18] In the geographical writings of November 1973 (cit.) the natural port bend called Porto Interno identified with the one between Seno di Ponente and Seno di Levante, the one connected directly to the internal port by the Pignonati Canal is called External Port and the developed part is called Outport. beyond the Pedagne Islands which leads towards the open sea in the coastal notch between Punta Cavallo and Punta Penne. Corbino. In the same year, Corbino, describing the port of Brindisi, says that it is made up of three basins: Porto Interno corresponding to the natural port; the External Port delimited to the North-East by the Pedagne cliff which, after the interruption created by the port access gate, extends to the island of Sant'Andrea, the Middle Port which communicates with the internal port through the Pigonati Canal. This subdivision was also proposed by Toschi in 1945 (cit). In 1975 the first Master Plan of the Port of Brindisi established this distinction between the three bodies of water, making it official within the planning documents and in the collective imagination.

[19] Autorità di Sistema Portuale del Mare Adriatico Meridionale, *Piano Regolatore del Porto di Brindisi, Relazione Generale*, 2023, in *https://www.adspmam.it/owncloud/index.php/s/g5M12AkBYWmUaBC?path=%2FRelazioni#pdfviewer.*

[20] Cfr. D. Novembre, *Geografia urbana della Puglia*, cit.

Fig. 5 – The three areas of the Port of Brindisi identified by the 2023 Port Master Plan

Source: Autorità del sistema portuale del mare Adriatico Meridionale, p. 7.

Inside, as Baldacci underlines[21], signs of the Messapian civilization can be found between the Cathedral and the Bishop's Palace and those of the Roman civilization whose city walls had the same width as that of the medieval and modern city of which[22] traces remain only in the names of the streets located on the border and in the gates from which the main roads that connect the city to Bari, Taranto and Lecce depart.

The topography of the urban center shows a main nucleus delimited by the two sea inlets and, subsequently, by the railway beyond which the "new Brindisi" extended to the West and South which, due to the presence of marshy areas and military zones arranged along the coastal stretch of the internal port, it developed towards the hinterland following the stretch of the Appian Way along the streets that radiate from Porta Mesagne and Porta Lecce (Fig. 6).

In 1865 the inauguration of the railway station gave a push towards the expansion of the "new Brindisi", however until 1927 urban growth remained closed within the bastions[23]. After this date, the city, which became the provincial capital, proceeded with a major process of building renewal in the traditional area and, for the first time, following the direction of the overpass outside Porta Mesagne, expanded beyond the ramparts, extending the two neighborhoods Cappuccini and Commenda which are located close to the

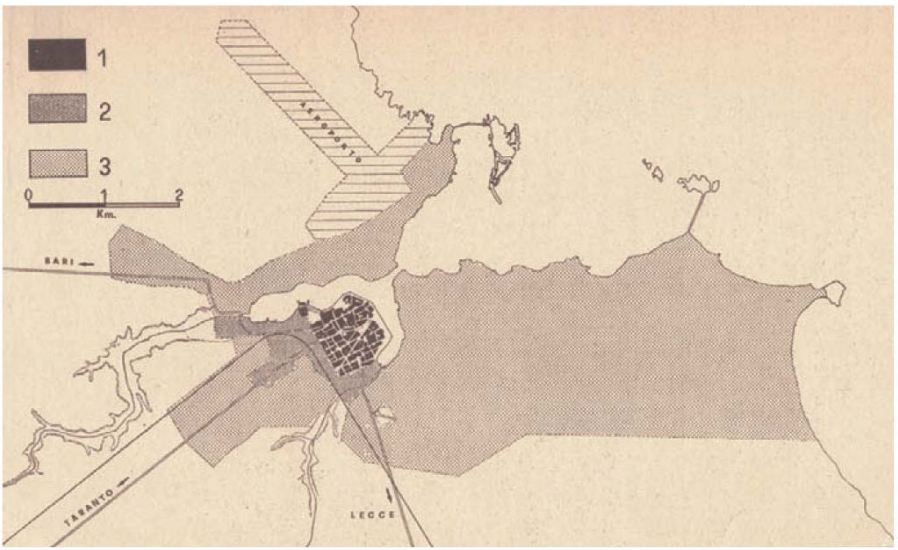
[21] O. Baldacci, cit.
[22] *Ibidem*, p. 480.
[23] *Ibidem*.

railway in continuity with the old city[24]. Defined from November[25] "sprouting of the medieval neighborhood", they push urban expansion towards the hinterland also favored by the extension of the urban road network.

The northern bank of the Seno di Ponente is also affected by urban growth where the Casale and Paradiso districts take shape and acquire the appearance of garden cities and the construction of the airport begins, while on the southern bank of the Seno di Levante, it is topographically reorganised. the ancient Perrino district. Built in the post-war period by some "sinister" families who had first built makeshift accommodation and then uncomfortable brick houses, it was connected to the city but retained its "humble social individuality"[26].

Beyond the Seno di Levante, there is also the new free port and the new industrial area which, as will be seen in the next paragraph, will welcome Montecatini and will become the cornerstone of the industrial identity of the city.

Fig. 6 – The topographical development of the city of Brindisi. 1) Walled Area (until the end of the 19th century); 2) Urban expansion until the end of 1940; 3) Urban expansion after 1940



Source: D. Novembre (cit.), 1973, p. 49.

Starting from 1934, various urban planning tools including the PRGs will guide the expansion of the built environment, favoring a radial development

[24] Cfr. D. Novembre, *Geografia urbana della Puglia*, cit.
[25] *Ibidem*, p. 89.
[26] *Ibidem*.

of the city with apexes in the La Rosa, S. Angelo, S. Elia, Bozzano districts to which the hamlet will be aggregated of Tuturano and subsequently S. Chiara (Fig. 2).

These tools will aim at the maximum expansion of the city by defining a series of conflicts for the use of the land, especially with respect to the planning of the port and the industrial area which since 1957 has undergone a significant reorganization process subordinated to national development policies. This expansion makes urban traffic management complex and defines a series of interventions relating to the railway station which remains a crucial node for connections between the capital and the other municipalities of the province and between the capital and the spaces with which it has commercial relations.

The last General Master Plan, approved in 1985, establishes the state of the places and still remains today the only reference for the planning and management of urban spaces. It was supported by the Regional Territorial Landscape Plan (PPTR which replaced the PUTT/P) and the Strategic Plan of the Vast Brindisina Area.

Specifically, the PPTR includes Brindisi and its territory in the landscape area 9 Campagna Brindisina[27] and highlights a series of specificities connected to the landscapes present in the municipality. It defines an adaptation of the current General Town Plan (PRG)[28] considered fundamental for the drafting of the General Urban Plan (GUP)[29]. In the general report of the adaptation document, in fact, it is stated that "the project contents of the GUP are divided into Structural Forecasts and Programmatic Forecasts (Art. 9 paragraph 1, Regional Law 20/2001). The Structural Forecasts define the strategic choices aimed at protecting, enhancing and redeveloping the territory, projected in the medium-long term, also in line with the PPTR with regard to landscape

[27] Regione Puglia, *Piano Paesaggistico Territoriale Regionale, Elaborato 5-Scheda Degli Ambiti Paesaggistici, Ambito 9 La Campagna Brindisina*, *https://pugliacon.regione.puglia.it/documents/96721/746601/5.9_CAMPAGNA_BRINDISINA.pdf/2497359e-e657-66c5-2b9f-180d53c76e2f*.

[28] Politecnico di Bari, Comune Di Brindisi, *Adeguamento del Piano Regolatore Generale (PRG) vigente al Piano Paesaggistico Territoriale della Regione Puglia (PPTR)-Relazione Generale*, Marzo 2023, in *https://comunebrindisiit-my.sharepoint.com/personal/cloud_comune_brindisi_it/_layouts/15/onedrive.aspx?id=%2Fpersonal%2Fcloud%5Fcomune%5Fbrindisi%5Fit%2FDocuments%2FUrbanistica%2Fadeguamento%2Dprg%2Dal%2Dpptr%5Frid%5F2023%2D04%2D21%5F1044%5Fper%5Ftrasparenza%2Ezip&parent=%2Fpersonal%2Fcloud%5Fcomune%5Fbrindisi%5Fit%2FDocuments%2FUrbanistica&ga=1*.

[29] Politecnico di Bari, Comune Di Brindisi, *Adeguamento del Piano Regolatore Generale (PRG) vigente al Piano Paesaggistico Territoriale della Regione Puglia (PPTR)-Relazione Generale*, Marzo 2023, p. 1 in *https://comunebrindisiit-my.sharepoint.com/personal/cloud_comune_brindisi_it/_layouts/15/onedrive.aspx?id=%2Fpersonal%2Fcloud%5Fcomune%5Fbrindisi%5Fit%2FDocuments%2FUrbanistica%2Fadeguamento%2Dprg%2Dal%2Dpptr%5Frid%5F2023%2D04%2D21%5F1044%5Fper%5Ftrasparenza%2Ezip&parent=%2Fpersonal%2Fcloud%5Fcomune%5Fbrindisi%5Fit%2FDocuments%2FUrbanistica&ga=1*.

resources and part of the environmental, infrastructural and settlement resources".

The adaptation of the PRG to the PPTR (hereinafter PRG/PPTR) has as its objective the protection, valorisation, recovery and redevelopment of the landscapes of the Brindisi area. This objective is aimed at the long-term sustainable socio-economic creation and promotion and the "conscious use of the territory, also through the conservation and recovery of the peculiar aspects and characteristics of the social, cultural and environmental identity, the protection of biodiversity, the creation of new integrated landscape values, coherent and responding to quality and sustainability criteria"[30].

The adaptation document integrates the provisions of the PRG for the landscape aspects but does not introduce changes to the division of the municipal territory into homogeneous territorial zones, for which the urban-building provisions present in the PRG remain unaffected as long as they do not conflict with the provisions of the PRG /PPTR.

The Strategic Plan of the Vast Brindisi Area, however, intervenes on the functional dimension and within it provides for the preparation of the Urban Mobility Plan.

The city is waiting for the approval of the General Urban Plan (PUG) to be concluded, the drafting of which has been in progress since 2008, but with setbacks which saw its recovery in 2018. In fact, the Preliminary Planning Document is being drawn up and approved (DDP) (Brindisi City Council Resolution n.61 of 08/25/2011) but the planning and approval of the Plan has not started. In 2008 the Urban Regeneration Programmatic Document (DPRG) was drawn up[31] (updated in 2022 and definitively approved with City Council Resolution no. 62 of 07.25.2022[32]). The latter, starting from a series of findings present in the Strategic Plan of the Vast Brindisina Area, analyzes the entire urban context "to start a more general reflection on (...) the city, its structure, its vocation towards a new structure capable of enhancing and rebalancing resources, large urban functions,

[30] Politecnico Di Bari, Comune Di Brindisi, *Adeguamento del Piano Regolatore Generale (PRG) vigente al Piano Paesaggistico Territoriale della Regione Puglia (PPTR)-Relazione Generale*, Marzo 2023, p. 1, in *https://comunebrindisiit-my.sharepoint.com/personal/cloud_comune_brindisi_it/_layouts/15/onedrive.aspx?id=%2Fpersonal%2Fcloud%5Fcomune%5Fbrindisi%5Fit%2FDocuments%2FUrbanistica%2Fadeguamento%2Dprg%2Dal%2Dpptr%5Frid%5F2023%2D04%2D21%5F1044%5Fper%5Ftrasparenza%2Ezip&parent=%2Fpersonal%2Fcloud%5Fcomune%5Fbrindisi%5Fit%2FDocuments%2FUrbanistica&ga=1*.

[31] The Document, drawn up pursuant to Reasonable Law 21 of 2008, expresses the result of a broad consultation process which involved institutions, intermediate structures of civil society and the population. It therefore expresses not only the objective dimension of the Brindisi urban context but also the interpretation of the same by its users.

[32] In *https://www.comune.brindisi.it/brindisi/zf/index.php/servizi-aggiuntivi/index/index/idtesto/166*.

accessibility, restoring quality to the urban landscape, sense of belonging and socioeconomic vitality"[33].

Inside, the morphology of the urban context is described as a synthesis of two macro-contexts defined over time by historical events, by the poor valorization of the sea line, by the presence of linear infrastructures that have played the role of barrier in the growth of functional relationships between the urban partitions.

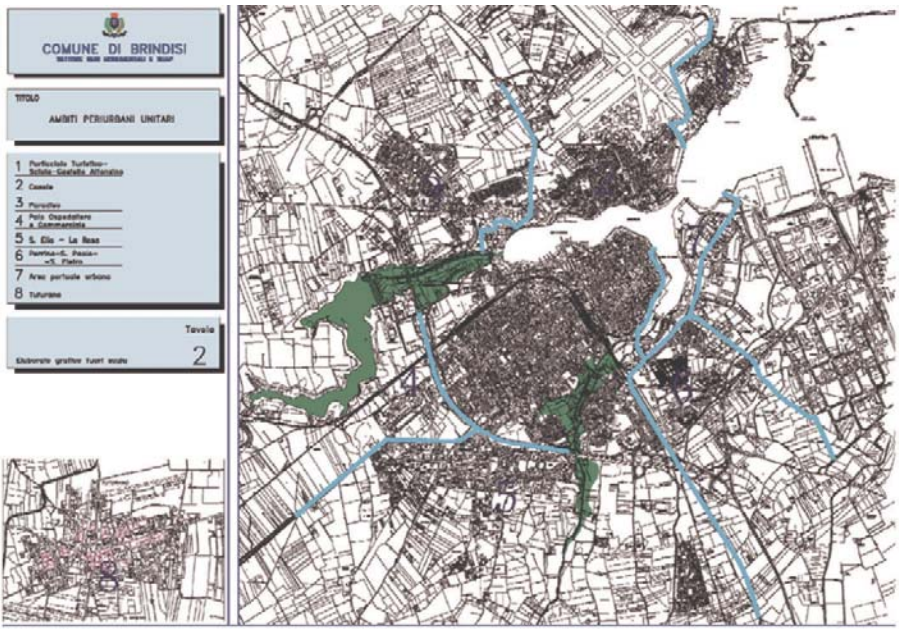
In particular, the DPRG identifies a "consolidated" urban area, represented by the historic center and the "compact modern city" between which there is a dividing line physically placed by the railway station and the development of the tracks, functionally by the concentration of the higher rank in the historic center and by the progressive rarefaction of the same proceeding towards the railway line. This area has clear boundaries represented by insurmountable physical and anthropic elements represented by the coastline, the port area, the various road infrastructures and the Navy area (Fig. 7).

Fig. 7 – Central Areas identified by the DPRG

Source: Documento Programmatico di Rigenerazione Urbana, 2008, p. 35.

[33] Comune di Brindisi, *Documento Programmatico di Rigenerazione Urbana*, 2008, p. 4, in *https://www.comune.brindisi.it/brindisi/po/mostra_news.php?id=1468&area=F*.

Fig. 8 – Unitary peri-urban areas identified by the DPGR.



Source: Comune di Brindisi, Documento Programmatico di Rigenerazione Urbana, 2008, p. 40.

Alongside this area, it juxtaposes another which it defines as a "widespread city of the expanding peri-urban system" made up of urban areas which have developed beyond the linear elements of mobility and which, despite having different characteristics, are united by mono-functionality, sometimes assimilable only to the residential one, and by the distance from the compact city perceived as strong by its residents due to the absence or low degree of connectivity (Fig. 8).

The Document, after having highlighted the significant differences acquired by the city in the territorialization processes, underlines the need to intervene with diversified actions of a functional-representative type for the North-East part of the city (Historic Centre, Piazza d'Acqua, Canale Pigonati, Waterfront) and with social and physical redevelopment actions in the South-West area which extends along the urban ring road.

In the definition of the interventions "an idea of a cohesive city thus materializes, which removes the gaps between urban and peri-urban areas, with countless functional relationships and a widespread system of opportunities, capable of establishing a continuous relationship of mutual exchange with the surrounding territory of the Vasta Brindisina Area, with a widespread system of collective accessibility to the territory and a place in the city capable of synthesizing, exhibiting and conveying the cultural

peculiarities of the province"[34]. It is highlighted how the interventions that have taken place over time, linked to the seafront and the main streets of the city, have defined positive multiplier effects with respect to urban decor and lived space, but alone have not managed to revive the fortunes of those neighborhoods that urban growth functional have placed it in a condition of degradation and progressive social and cultural peripheralization.

In the area characterized as central to urban development, the historic centre, the Porta station, the modern city and the Cillarese and Patri urban parks are identified as regeneration areas, which in the analysis of Novembre and Baldacci of the 1970s constituted central areas of the life of Brindisi. Outside the central nucleus, in areas defined as peri-urban, the areas of intervention are identified with the tourist port – Sciaia – Castello Alfonsino and with the Casale and Paradiso districts (which emerged as garden-city), the hospital and commercial centre, and the S. Elia, La Rosa, Perrino, San Paolo, San Pietro and Tuturano have already arisen with the characteristics of areas detached from the main nucleus and under-equipped compared to the central functions. These are joined by the urban port area. In the regeneration processes, an important role is attributed to interventions on mobility and ecological infrastructures, recognizing that the under-equipment of connections between the center and the peri-urban area has led to an excessive use of private vehicles even over short distances. The improvement of soft mobility between neighborhoods is indicated as a tool for recovering the sense of place by residents and a key factor in policies against degradation.

The resumption in 2018 of the drafting of the PUG by the Urban Planning Department led to a significant update of the DDP approved in 2011 in order to make it responsive to the territorial dynamics present in the city and to the procedural changes that occurred over the decade; furthermore, it filled "the participation gap of the DPP approved in 2011 through the development of a significant participatory activity and listening to the population aimed at the social planning of the plan (activity which led to the further extensive final chapter of the new DPP)"[35]. The GUP (adopted resolution of the City Council no. 8 of 02.14.2023[36]) guides towards a new perspective of reading the urban territory, based on the regeneration of spaces and the participation of communities (already introduced with strategic planning) in planning processes.

[34] Comune di Brindisi, *Documento Programmatico di Rigenerazione Urbana*, 2008, p. 4, in *https://www.comune.brindisi.it/brindisi/po/mostra_news.php?id=1468&area=F*.

[35] Comune Di Brindisi, verbale delle deliberazioni della giunta comunale n. 470 del Registro 31/12/2020 p. 1, in *https://www.comune.brindisi.it/brindisi/images/servizi_aggiuntivi/pug/dlg_00470_31-12-2020.pdf*.

[36] In *https://www.comune.brindisi.it/brindisi/zf/index.php/servizi-aggiuntivi/index/index/idtesto/166*.

Alongside the PUG, there are other tools aimed at strengthening the organization of urban spaces in a sustainable way. Among these we can mention the SUMP (Urban Plan for Sustainable Mobility) currently being drafted and approved, the Masterplan of the suburbs which launched #BRINDISIPARTECIPA, a participatory process aimed at the peripheral and under-endowed neighborhoods of Paradiso, S. Elia and Perrino.

3.4. Brindisi and the Sub Functional System

Within the complex sub-physical system of the city of Brindisi, a functional space has been structured that has shaped its socio-economic face and made it a focal point for the convergence of multiple flows at a regional and sub-regional level.

There are various regional geographical studies and research[37] who analysed, albeit in a fragmentary and non-systematized way, the dense network of relationships (material and immaterial) that have modified the relationship between the city and its real and potential users over time.

Currently Brindisi[38] hosts a population of 82,883 inhabitants[39] (2.12% of the regional population, 21.81% of the provincial population, data as of 1 January 2023). Its demographic dynamics since the beginning of the 1990s, analyzed by Trono and Viterbo, highlights a progressive decline in

[37] Geographical studies and research have dedicated a continuous interest to the potential and organization of the urban space of Brindisi, analyzing a series of peculiar aspects in certain periods of time which are defined as crucial with respect to the development of the entire South. Among the most significant works, to which reference will be made in this research work, they offer a snapshot of some crucial moments of evolution or stagnation, among which are the demographic analysis of Trono and Viterbo in the early nineties (La Puglia Meridionale tra stagnazione e sviluppo, in L. Di Comite, M. Valleri (a cura di), *Urbanizzazione e controurbanizzazione: il caso italiano*, Cacucci Editore, Bari, 1992, pp. 219-240, *The study on the Brindisi Sud thermoelectric power plant*, by A Rinella, *Energia, Ambiente. Sviluppo. Il caso della centrale termoelettrica Brindisi Sud*, Progedit, Bari, 1999, *The impact of the Integrated Territorial Planning*, by Amoruso, Gattullo, Rinella A. and Rinella F., *Puglia: eventi, strutture, processi e gerarchie di una regione mosaico*, in L. Viganoni, *Il Mezzogiorno delle città. Tra Europa e Mediterraneo*, FrancoAngeli, Milano, 2007, pp. 138-174, *The relationship between the sea and internal areas*, by Grumo and Novelli, *Dal mare alle aree interne, integrazione turismo di nicchia*, in A Mininno, *Turismo e sviluppo regionale in Puglia*, Bari, Wip Edizioni, 2005, pp. 129-145, *The evolution of the port system analyzed by Toschi (I porti dell'Abruzzo e della Puglia*, Zanichelli, Bologna, 1942), Novelli (Industria agevolata e portualità, in *Changin Maritime Transport, Proceding of the International Seminar on the Geography of Maritime Circulation*, s.l., Istituto Universitario Navale, 1981, pp. 504-516).

[38] For the division into traditional sub-regions see A. A. Bissanti, *Puglia geografia attiva*, Mario Adda Editore, Bari, 1991.

[39] The data relates to the resident population on 01 January 2023 and comes from the site *www.demoistat.it*.

population growth rates starting from the decade 1961-1971[40]. According to the two authors, the demographic transformation of Brindisi, and of the entire province presided over by it, is closely linked to the economic dynamics that have involved the city since the mid-fifties of the twentieth century when public development policies for the South they started the construction of the industrial center attracting a series of private investments to the city (Montecatini Group). In this period of time, more precisely between 1957-1960 and 1961-65, there was a strong increase in the population (around 13,000 units), with a substantial reduction in emigration, which was followed by a process of urban concentration and an increase in internal mobility.

However, already in the five-year period 1966-1970, this increase suffered a sharp slowdown due to the agricultural and rural exodus which fueled huge emigrations towards foreign countries and towards the regions of the Centre-North with strong industrial growth and which affected not only the capital, but the entire province (- approximately 41,000 units)[41].

After the oil shock, which generated a profound crisis for large, vertically integrated companies, this outgoing trend stopped and then resumed at the end of the 1980s and then resumed in the period 1976-80 when the introduction of the Redundancy Fund and the difficulties of chemical hub give a new boost to population loss. This demographic dynamic, according to Trono and Viterbo, highlights why, over time, Brindisi has not started a process of widespread urbanisation. The latter is attributable to "the limited effectiveness of the urban effect present in Brindisi, where the industrial complex grows «isolated» and the city («like other historic southern cities») incapable of spreading urban impulses in its umpland, establishes a relationship of "breaking" with the territory and "growing on itself"[42]. The industrialization process (started in 1959 as we will see in this paragraph by the localization of Montedison which was followed by that of other industrial groups such as Fiat Aviazione, IAM-SACA), essentially an incomplete urbanization of Brindisi. In fact, if on the one hand it initiated an expansion of the city, on the other with the crisis of the system it blocked its development by limiting the provision of high-level services and limiting its polarizing capacity.

[40] The analysis conducted by the two geographers indicates a halving of the growth values of the resident population which went from 15.7% in 1961-71 to 6.7% in 1971-81 up to reaching 2.8% in the period 1981-1986, A. Trono, D.D. Viterbo, *La Puglia Meridionale tra stagnazione e sviluppo*, in L. Di Comite, M. Valleri (a cura di), *Urbanizzazione e controurbanizzazione: il caso italiano*, cit., p. 222.

[41] *Ibidem*.

[42] *Ibidem*, p. 223.

The hub of the urban functional system is the port, a morphologically unique structure throughout the Adriatic coast whose development, over the centuries, has been favored by its geographical position in relation to the most important trade routes and which has also attracted military functions to the city.

The socio-economic life and development of the city, as well as regional and supra-regional functional relations, gravitate around the port. Its primary vocation is that of a commercial port, but currently it can be defined as a port with a multipurpose vocation, equipped with intermodal road, rail and air connections, which carries out industrial and tourist functions with an important role in the routes to Greece, Turkey, Albania, Balkan area and eastern Mediterranean basin. Inserted in the Port System of the Southern Adriatic Sea starting from , with the ports of Bari, Manfredonia, Barletta, Monopoli and Termoli, in 2022 it handled 10,045,121 tonnes of goods (in and out, of which 21% of refined petroleum products and 35% of coal, equal to 45% of the total cargo traffic of the entire port system) and had a traffic of 487,998 passengers (28% of the passenger traffic of the port system of which 82% were ferries and 18% cruise passengers)[43].

The port modeling works[44] modified the city's Waterfront to encourage the growth of an industrial development area of approximately 4 million sm, separated from the town and interspersed with uncultivated areas and areas used for agricultural use.

The start of construction of the industrial area, which directly overlooks the port and the sea, is linked to the extraordinary policies for the South launched in 1950 which affected the entire province. The latter are aimed at creating areas of industrial development and/or industrialization centers around a city or a port centre, considering the port as an incentive or an element driven by development on a local scale and, although not referring to a policy general port planning, generate an improvement in infrastructure within the areas of new industrial location, defining an interdependence between facilitated industrialization and port development whose multiplier effects will continue into the future[45]. However, the port of Brindisi as well as the industrial ports of Bari and Taranto, in the face of a high overall

[43] Southern Adriatic Sea Port System Authority data available at *www.adspmam.it*, under ports and traffic, statistics.

[44] Since 1907, port works have been regulated with the First Master Plan followed by a series of dedicated planning documents. The works consist of structural works such as the construction of dams, docks, stripping works, construction of the pier on the Northern Arm of the internal port, a maritime station for passengers, the seaplane base, the passenger terminals serving to strengthen the traffic connected to the industrial area.

[45] B. Cori, *Industrializzazione agevolata e sviluppo portuale*, in C. Muscarà (a cura di), *Verso una nuova organizzazione portuale*, Istituto di Geografia dell'Università di Venezia, Venezia, 1974, pp. 149-154.

movement of goods loaded and disembarked, presents little land movement and a tendency of the driving industries towards isolation[46]. Until 1962, the port of Brindisi did not have high traffic. It is from 1963 that it exceeds 2,000,000 tons of goods handled and that begins a process of expansion that will proceed until the seventies of the twentieth century, the year in which it will have a setback due to the national recession and the crisis of Montedison. At the beginning of the 1980s Brindisi was the third main Adriatic port[47] and continues its growth aiming to increase passenger traffic and cargo handling during the 1990s with a specialization in the docking of coal ships[48].

Valleri and Lisi's analysis in 2013[49], shows us a port with a well-defined physiognomy, in which each of the three basins: 1) in the Internal Port, the Seno di Ponente has the function of a military port, while the Seno di Levante has the function of a commercial port where along the quay Porto Franco they move the dry grains. Ro-Ro ships that follow the Brindisi-Vlora route also circulate in the Inner Port. 2). The Middle Port is mainly intended for commercial activities and the docks are structured for the mooring of ships for both dry bulk and liquid bulk (mainly coal and fuel oil which fuel the power plants). 3) the External Port has a substantially industrial use and is the landing point for ships unloading goods for the rice peak industrial area.

A tourist port has also arisen in the port bays, located in an area of the Seno di Bocche di Puglia sheltered and protected by the Punta Riso dam and the Alfonsino castle in 2013 it was equipped with a 7,000 m2 shipyard and due to its proximity to the air port represents a strategic logistics base for reaching the coasts of Albania, Croatia, Greece and Montenegro.

However, the Port System Master Plan Report[50] of 2019, while recognizing the functional specialization just described (Fig. 8) underlines that the link between the port and the urban fabric does not end only in the relations with the industrial center and with the commercial functions, but there is another series of territorial variables on which to establish new relationships. Among these variables, there is evidence of the first settlements of the city falling within the port area and the entire historic center which developed on the peninsula stretching towards the Inner Port. The latter, in the last decade,

[46] A. Celant, *Geografia degli squilibri*, Kappa Edizioni, Roma, 1994.

[47] M.A. Valleri, *Il traffico marittimo nel basso Adriatico e nello Jonio*, in M.A. Valleri (a cura di), *Il sistema portuale del basso Adriatico e dello Ionio*, Società Italiana di Economia Demografia e Statistica, Roma, n. 11, Nuova Serie, 1983, pp. 73-111.

[48] Cfr. A. Rinella, *Energia Ambiente Sviluppo*, Progedit, Bari, 1999.

[49] M.A. Valleri, C. Lisi, *Alcune valutazioni dell'impatto economico territoriale dei porti di Bari e Brindisi: quale strategia attuare?*, *Rivista di economia e politica dei trasporti*, n. 2, 2013, pp. 1-16.

[50] Autorità di Sistema Portuale Del Mare Adriatico Meridionale, *Piano Regolatore Di Sistema Portuale – Processo di Formazione Del Documento Di Pianificazione Strategica Di Sistema Portuale – Relazione*, ottobre 2019, p. 97, in *https://www.adspmam.it/comunicazione/documento-di-pianificazione-strategica-del-sistema-portuale/*.

has been structured as a functional macro-area specialized in military, recreational and fishing activities in the Seno di Ponente part; cruise in the Seno di Levante part. On this latter arm, we are working on a further strengthening in order to increase the entry of large cruise ships in order to increase the positive socio-economic consequences for the entire city and to support use by cruise passengers. of the nearby ancient nucleus and the recently redeveloped Waterfront.

Fig. 9 – Representation of the functional macro areas envisaged in the POT 2017-2019

Source: Strategic Development Plan Report, cit.

Furthermore, the Report highlights another series of elements present in the territorial stratification of the Seno di Levante which could generate and strengthen the links between the port and the urban hinterland. among these there are: 1) the shed of the former Montecatini factory and the Sant'Apollinare area, industrial archeology artefacts qualified as landmarks of the port, to be used after the regeneration[51], to reception functions for passengers and cultural activities of the city; 2) the archaeological area of Punta delle Terrare and the Skimut villa. Alongside these elements, he indicates others falling on the coast to the north of the city, represented by the Island of Sant'Andrea which can only be accessed through the Forte a Mare (object of recovery and conversion) via a state road in the port area and the

[51] See also Comune di Brindisi, *Documento Programmatico di Rigenerazione Urbana*, 2008, *https://www.comune.brindisi.it/brindisi/po/mostra_news.php?id=1468&area=F*.

tourist port connected to other state-owned areas intended for public bathing and recreational use.

The fact, however, that in the collective imagination the port of Brindisi is characterized as an industrial port remains linked to the radical social transformation and the profound processes of territorialization that were defined by the subsidized industrialization of the decade 1959-1960 which substantially changed the face of the port and the entire city. Among the most significant works of the transformation process are those carried out by the Ministry of Public Works after 1953[52], precisely for the construction of the 'Dock for the industrial area' in the Middle Port where the Montecatini-Polymer plant (1962, 29 plants) will be located, which gives the city the role of petrochemical hub, giving rise to product and by-product companies, and the Brindisi Nord thermoelectric power plant (1964, later transformed into a coal-fired power plant today Edipower) which gives it the status of national energy hub, strengthened by the construction in the 1980s of another coal-fired thermoelectric plant in the coastal area of Masseria Cerano south of the town (Enel Federico II power plant)[53] and a third combined cycle (Enipower).

The industrialization process started in this period of time changes the economic identity of the city. Over the years, it increasingly strengthens its secondary system and takes on the face of an industrial city by strengthening the petrochemical sector (Lyondell Basell, Polimeri Europa, Chemgas, Enipower) and energy, for which it has a key role at national level, and favoring the growth of other production sectors of its ASI[54], among which the aeronautical sector stands out, fourth in Italy after Naples (Avio companies, Dema Design, Officine Aero Navali) and the chemical-pharmaceutical sector (Sanofi-Aventis).

However, the industrialization started in the 1950s in the long term failed to generate "an integrated and self-sufficient process of induced industrialization (for which, moreover, the prerequisites were missing)"

[52] The Industrial Development Area of Brindisi was created according to Law 634 of 07/29/1957. In 1966, the Territorial Master Plan of the Industrial Development Area became operational, establishing the creation of a main industrial agglomeration based on the model of the Perrouxian poles in Brindisi and two satellite agglomerations in the cities of Fasano and Ostuni.

[53] For the development of the Brindisi Nord power station, see A. Rinella, *Energia, Ambiente e Sviluppo*, Progedit, Bari, 1999.

[54] Data from the ASI Brindisi consortium on *www.asi.br.it*. Currently members of the Consortium are: the Provincial Administration of Brindisi, the I.A.A. Chamber of Commerce. of Brindisi, the municipalities of Brindisi, Fasano, Francavilla Fontana and Ostuni. According to the Statute, other municipalities in the province can also take part in the consortium as long as they identify areas within their territories to be entrusted to the management of the consortium. Furthermore, cooperative organizations and trade social associations can participate in the same, see Statute of the consortium at *www.asi.br.it*.

and the choice of petrochemicals did not keep the limits in any way which posed to the development with respect to the characteristics of the area[55]. The development of the industrial hub, in fact, did not take into account the impact on the rural economy and, furthermore, "the choice of an industrial sector with a vertically integrated cycle, and therefore with a low degree of interdependencies with other activities" generated economic growth disconnected from the fabric of existing medium-small businesses and, "rather than providing a take-off (...) in the years of maximum expansion it decreed the closure of 400 small artisan businesses"[56]. After the crisis of the hub, Brindisi remains excluded from the Adriatic direction of development, highlighting the structural weakness of its industrial system and, unable to cushion the state of crisis from an economic point of view, it becomes an "unevolved industrial city"[57]. He thus reached the end of the 1980s in a situation of general difficulty "with an identity torn between industry, commerce and tourism (...). Incapable of penetrating the territory and radiating a force of attraction within it, it remains bound to the stereotyped image of "orthogenetic" and "parasitic" common to other southern cities"[58].

This setting of the city, structured as a pole whose centrifugal and centripetal forces are oriented towards the regional and supra-regional scale, has defined an asymmetric territorial organization at the provincial level in which the remaining 19 municipalities have assumed a functional specialization complementary to that of the capital. In particular, the manufacturing sector made up of small businesses specializing in textiles – clothing, developed along the East-West axis between Brindisi and Francavilla Fontana, completes the picture of the secondary sector made up mainly of medium-large businesses concentrated in the capital. Added to these was the concentration of activities in the applied scientific research sector in the Brindisi-Mesagne area and those in the logistics and transport sector in S. Vito dei Normanni.

The municipalities of the coastal strip north of Brindisi have followed a path of tourism development, first based on second homes, then organized on the forms of accommodation typical of mass tourism (tourist villages, hotel complexes, bathing establishments, tourist ports) which have determined a sometimes irreversible process of consumption of the coast connected to its progressive anthropization. Specifically, in 2021, 73.2% of arrivals and 73%

[55] A. Trono, D.D. Viterbo, *La Puglia Meridionale tra stagnazione e sviluppo*, in L. Di Comite, M. Valleri (a cura di), *Urbanizzazione e controurbanizzazione: il caso italiano*, cit., p. 226.

[56] *Ibidem*, p. 226.

[57] *Ibidem*.

[58] *Ibidem*, p. 227.

of presences in the entire province were concentrated on Fasano, Ostuni and Carovigno, with Fasano ranking 4th in terms of number of arrivals and 5th in terms of number of presences from the entire region and which hosts in its territory the majority of the accommodation offer of 5 star luxury hotel facilities which has earned it the title of 'luxury tourist district in Puglia'[59]. In fact, 5 structures out of a total of 13 present throughout the region are located in Fasano; of the latter 4 are housed in prestigious farms: the Coccaro, Maizza, San Domenico farms in Savelletri; the Menola farm, renamed Masseria Relais del Cardinale in Pozzo Faceto di Fasano[60].

The flat southern part and the hilly internal part have retained their agricultural vocation with a specialization in the cultivation of olive trees and the production of DOP "Collina di Brindisi" oil[61]. The primary sector, which is not a driving force in the economic scenario, has generated forms of territorial organization on the basis of community planning and has led, thanks to the LEADER programmes, to the establishment of two provincial LAGs which highlight the different identity dimensions marked by the organization functional and landscape. The 'Terra dei Messapi' LAG brings together 8 municipalities of the Tavoliere Salentino (Francavilla Fontana, Latiano, Mesagne, Torchiarolo, S. Pietro Vernotico, Cellino S. Marco, S. Donaci, S. Pancrazio Salentino); the 'Alto Salento' GAL, to which the city of Brindisi belongs, associates the municipalities of Ostuni, Ceglie Messapica, S. Michele Salentino, Villa Castelli which extend their countryside up to the Murgia dei Trulli and Carovigno and S. Vito dei Normanni i whose lands fall within the Salento of the Murge. To these two LAGs we must add the 'Valle d'Itria' LAG into which the municipalities of Fasano and Cisternino merged. The activities of the LAGs, combined with the regional ones aimed at deseasonalizing tourism, have favored the spread of agritourism activity which has its maximum splendor in the reuse of farms, a distinctive element of the rural landscape.

This state of places, marked by a hierarchical functional relationship of the provincial urban network in which Brindisi constitutes the hierarchically superior economic-social-political node, has also found its expression in the mobility system. If we look at the provincial road system, it has a radial structure designed to converge the movements of the main municipalities of the province from and to the capital: the S.S. 7 covers the internal axis from

[59] Cfr. M. Gattullo, *Le stazioni abbandonate in Puglia: da luoghi marginali a nuove tessere del mosaico turistico?*, in S. Cerutti, M. Tadini (a cura di), *Mosaico/Mosaic, Memorie geografiche*, Nuova serie, 17, Società di studi geografici, Firenze, 2019, pp. 693-702.

[60] Data Osservatorio Turismo Regione Puglia, 2021, in *https://www.agenziapugliapromozione.it/portal/spot*.

[61] The DOP Collina di Brindisi was established in 1996 and embraces the countryside of the municipalities of Ostuni, Fasano, Carovigno, San Vito dei Normanni, Cisternino, Ceglie Massapico, San Michele Salentino and Villa Castelli and is managed by the Collina di DOP oil consortium Brindisi see *http://www.oliodopcollinadibrindisi.it/chi-siamo.html*.

Brindisi to Francavilla Fontana; along the coastal axis, the S.S. 16 Adriatica covers the Fasano-Ostuni-Carovigno-S. stretch. Vito dei Normanni and joins Fasano with the S.S. 379 which ensures the connection with Bari and with the junction of the S.S. 613 which ensures the connection with Lecce. The railway transport system also converges on Brindisi, the cornerstone of connections for the transport of goods and people at a provincial level on the Brindisi-Mesagne axis, at a regional level and at a national level through high speed. The railway system is based on integration with road transport and with intermodal transport systems connected above all to the port system. The presence of the 'Papola-Casale' civil airport (1,853,449 passengers in 2021) completes the infrastructural equipment and enhances the territorial competitiveness of Brindisi.[62]). Located north of the town centre, it rises along the Seno di Ponente and attributes a further strategic role to the city in terms of accessibility of Puglia and the entire Salento peninsula.

Starting from the end of the nineties, the affirmation of new territorial policy instruments, the valorization of local resources as a starting point for self-centered development processes, combined with the paradigm of sustainability, establish new points of view that change the geometries consolidated by long paths of spontaneous evolution and decades of interventions conducted from above. These points of view turn the spotlight on new possible territorial structures that overlap with the previous ones or that replace them also through the creation of new territorial bodies.

In this perspective, the city of Brindisi goes in search of a new, more satisfactory territorial mosaic, which defines a functional reorganization in which transversal and complementary relationships prevail and in which, in addition to its vocation of being a node of territorial systems that develop in the local and supra-local, taking into account the unexpressed or under-appreciated potential of the cultural and environmental heritage. By operating in this direction, Brindisi develops new functional, social, cultural and political systemic relationships that will highlight new traits of territorial identity and that will create a new sense of belonging through the construction of participation processes connected to common projects aimed at continuous multi-scalar integration. An important push in this direction is given by the regional body which, operating as an "initiator and pivot" actor[63] goes beyond the traditional approach aimed at identifying simple territorial areas to divide public spending and introduces significant changes in territorial intervention practices by identifying, through Integrated Territorial Projects (ITPs), areas identifiable as local economic systems[64].

[62] Dati Assoaeroporti in *www.assoaeroporti.com*.
[63] F. Governa, *Il* milieu *urbano*, cit., p. 87.
[64] Cfr. O. Amoruso, M. Gattullo, A. Rinella, F. Rinella, *Puglia: eventi, strutture, processi*

At provincial level, the "PIT 7 Brindisi Area"[65], in addition to the capital it includes all the other 19 municipalities in the province of Brindisi. Recognizing the central position in the region and in the lower Adriatic of the entire province, the strong idea of the territory lies in the development of an integrated system of logistics and distribution services that favor the connection between the North-South axis within Puglia and communication with the other directions of the International Corridors (8 and 10). It places its pre-eminent urban center in Brindisi (leading municipality) which stands out for its industrial endowment (the chemical industry as a strong point of the entire regional system; the aeronautical sector made up of three leading companies, fourth in Italy; point of concentration of the most important energy production factories) and tertiary compared to the medium-small centers among which Ostuni, in the northern part, stands out for its tourist activity and Francavilla Fontana, in the south-western part, for its agricultural activities. The PIT above all favors the strengthening of the railway connection between the port and RFI.

On 2007, the industrial policy of the Puglia Region on production districts (L.R. 23 of 03/08/2007), aimed at supporting aggregations of Apulian companies defined as Production Districts in order to strengthen their competitiveness, innovation and internationalization[66], places Brindisi as a point of reference for two territorial aggregations of companies considered strategic for the entire regional territory: the Aerospace Technological District (57 companies, 8 research centers and universities, 8 public bodies and trade unions and trade associations) and the Nautical District pleasure boats (151 companies, 8 including research centres, universities and training facilities, 18 including public bodies, employers' and trade union associations).

The start of the 2007-2013 strategic planning process accentuates the attention on an endogenous approach and on multilevel governance and leads to the definition of the Brindisi Vast Area, within which the city of Brindisi is recognized as a territorial provincial hub, between the Great Salento (Taranto, Lecce and Brindisi) and the linear system of Adriatic cities. The definition of the Brindisina Vast Area presents itself as a crucial element within a process of functional demographic reorganization of the Apulian cities which leads towards new balances. these find expression in

e gerarchie di una regione mosaico, in L. Viganoni (a cura di), *Il Mezzogiorno delle città. Tra Europa e Mediterraneo*, cit.

[65] Per approfondimenti si veda Amoruso O., Gattullo M., Rinella A., Rinella F., *Puglia: eventi, strutture, processi e gerarchie di una regione mosaico*, in Viganoni L. (a cura di*), Il Mezzogiorno delle città. Tra Europa e Mediterraneo*, cit.

[66] For further information see M. Chieco, A. Fiore (a cura di), *La legge regionale pugliese sui distretti produttivi. Evoluzione, ruolo attuale e prospettive per le aggregazioni di imprese nelle politiche multisettoriali di sviluppo regionale*, A.R.T.I. Puglia, Bari, 2022, in *https://www.arti.puglia.it/wp-content/uploads/volume_ARTI-CONSIGLIO-web.pdf*.

the identification of new territorial administrative bodies represented by the Metropolitan Area of Bari and by BAT, the sixth province of Puglia.

Vast Area planning also pursues the aim of stimulating economic processes within the reference territory by encouraging the creation of local systems that strengthen its strategic position. From this perspective, the aforementioned process works to encourage integration between central, semi-central and peripheral areas and aims on the one hand to strengthen the large infrastructures of transport and communication networks; on the other, to the consolidation of the ability to network in the territorial urban system. Furthermore, it relaunches the role of the city with respect to the rediscovery of the sea as not only an economic, but also a natural and cultural resource and of the historical, naturalistic, cultural and landscape heritage[67]. The planning of the Vast Area also opens up to an identity reading of Brindisi and the province which passes through social construction and solidarity as tools to counteract the process of progressive destructuring of the territory defined by the opposite trend of the relationships between the natural environment and the anthropic environment.

In this period of time, two other elements are crucial in the reterritorialization of Brindisi. The first concerns the planning of the city on the basis of internationalization processes which establish its geopolitical and geoeconomic repositioning. These are linked to the various cross-border cooperation programs (INTERREG IPA CBC Italy, Albania, Montenegro; CBC Italy-Greece and Italy Croatia; UNI CDC Mediterranean) and Transnational (Interreg Mediterranean and Adrion) which starting from the 2007-2013 programming attribute to Brindisi the role of leader with particular attention to the port and its potential on an international scale. The second concerns the start of redevelopment processes of urban spaces starting from the port and the coastal stretch which are affected by the Urban II community programming which in the period 2000-2006 will build a basis for future urban regeneration interventions. Furthermore, the port is included in the Trans-European Transport Corridor VIII (Trans-European Network – TEN), projecting the city towards relations with the Black Sea.

In this process of consolidation and development of the city's potential towards the various extra-urban dimensions, in 2008 work began on the GUP which proposes an urban regeneration document aimed above all at the valorisation of tourist activities based on the use of the hydroma. The GUP, which is moving towards approval in 2022, undertakes the process of forming the Urban Regeneration Programmatic Document (in harmony with the approval of Regional Law 21/2008), a participatory document that

[67] Cfr. Piano strategico dell'area vasta brindisina, secondo sottoprocesso: Costruzione del "METAPLAN Piano Strategico di Area Vasta" e predisposizione del "Piano Urbano della Mobilità in *www.areavastabrindisina.it*.

collects the requests already present in the actions strategic areas of the Vasta Brindisina Area, of the PPTR and in those envisaged in the community programs and aims "at the protection and conservation of the environment, of the historical-architectural-landscape heritage, at the defense and use of the coast, at the redevelopment of the suburbs, at the creation of infrastructures for higher education and knowledge, mobility and transport, tourism and sport"[68].

2013, the approval of the Regional Territorial Landscape Plan (in force since 2015), places emphasis on elements of the patrimonial endowment of Brindisi and its coastal landscape and hinterland. Among these there are the wet areas and the regional nature reserve of Bosco Cerano, the naturalistic area of the Punta Contessa Regional Natural Park, the SCI sites, the stratification of anthropization processes starting from the Paleolithic, the system of towers and castles, the consular roads, the signs of the rural habitat. The document provides important guidelines that constitute project actions for urban planning such as the City/Countryside Pact, the Consolidated City and the waterfront, as well as for other projects that see it as the protagonist of the Regional Ecological Network and the infrastructural system for soft mobility.

Brindisi thus arrives in 2023 with a kaleidoscopic face in which it adds a series of facets to its traditional secondary vocation which preserve its role as the primatial city of its province and give it a fundamental role in the sub-region of Salento and the entire Adriatic area and Mediterranean with respect to traditional functions, but they also give it a new face that could lead it to preside over other roles. The latter are supported by the current territorial planning and organization tools of multilevel governance which propose a reinterpretation of the endowment in terms of sustainability connected to the solution of multiple dimensions of environmental unsustainability defined by secondary specialization processes and focus more clearly on mobility and its strategic role in the construction of alternative territorial routes.

[68] In *www.comune.brindisi.it* consultato a giugno 2022.

4.
The City of Igoumenitsa: Geographical, Economic, and functional Role

4.1. The City of Igoumenitsa: An Overall Vision

Effective transportation is impeded by a number of caveats, including problems of accessibility to the destination, poor infrastructure, social and environmental issues. For all these reasons, the implementation of connectivity and intermodal solutions is essential to meet users' demand and sort out the problems of supply. Intermodality is a key element in the current transport system since it refers to all kinds of transportation interlinkages[1].

In general terms and in accordance with the report written by the Greek partner[2], the Municipality of Igoumenitsa belongs to the Regional Unit of Thesprotia which administratively belongs to the Region of Epirus. The Prefecture belongs to the border prefectures of the country as it borders north with Albania, east with the Prefecture of Ioannina, south with the Prefecture of Preveza and westcoast by the Ionian Sea. Total area of the prefecture 1.515 sq.km.

The Municipality of Igoumenitsa was established under the Kallikratis Programme (Law 3852/2010) by the merger of the former Kapodistrian Municipalities of Igoumenitsa, Margariti, Parapotamos, Sivota and the Community of Perdika (Law 2539/1997). The area of the municipality is approximately 429 km² and its population 25,698 inhabitants according to the 2021 census. It is located in the northwestern part of the Regional Unit of Thesprotia, in the cove of the homonymous bay and is surrounded by mountains. The majority of the local units of the Municipality of Igoumenitsa are classified as mountainous or semi-mountainous areas. In the section of the

[1] A. Papatheodorou, *Travel Behaviour vis-à-vis Intermodality: Greece as a Case Study*, 17th Annual World Conference of the Air Transport Research Society, 2013.

[2] DOCK-BI Deliverable 3.5.5 – Lot 2, "The Digital Intelligent Transformations around Ports – A Sustainability Plan and Future Prospects of Igoumenitsa City 4.0".

Municipality there is a variety of geomorphology and a special combination of mountain and sea, picturesque villages, mountainous, semi-mountainous and seaside, beautiful forests and enchanting beaches.

The administrative center of the Municipality and the Regional Unit of Thesprotia is the city of Igoumenitsa, while the whole municipality borders with the Municipalities of Filiates and Souli (Thersportia region), as well as the Municipality of Parga (Preveza region). In the last decades its area has more than doubled and the city has expanded in all directions, including in the single residential complex the local districts of Nea Seleucia, Ladochori and Graikochori, which are the new residential receptors of the urban complex of Igoumenitsa.

Igoumenitsa is the most important Port between Greece and Western Europe, as well as the second in passenger traffic after Piraeus nationwide. It is connected by ferry with Brindisi, Bari, Ancona, Venice and Trieste in Italy, with Saranda and Vlore in Albania as well as with Corfu and Paxos. The nearest airports are those of Ioannina, Corfu and Aktio. Also, from the Municipality of Igoumenitsa starts the Egnatia Odos, the road axis that connects the Municipality with Ioannina mainly, but also with Thessaloniki and Alexandroupolis. The dominant production sector of the Municipality of Igoumenitsa is the tertiary sector and is more related to transport and tourism activities which focus on the Port of Igoumenitsa and the connection with the Egnatia Odos.

The combination of the operational upgrade of the port, the improvement of transport connections brought about by the construction of the Egnatia Motorway and the opening of the border with Albania, creates significant growth prospects, while at the same time it entails risks if the local production structures are not modernized and if measures are not taken so that development moves within the framework of sustainability.

4.2. Economic and Demographic Aspects

Data from the Operational Program of the Municipality of Igoumenitsa for the period 2020-2023, ELSTAT, the 2011 census data as well as the provisional data of the 2021 census were used to collect data on the current situation.

The economically active population of the Municipality amounts to 42.19%, which is lower than that of the inactive (57.81%) by about 15 percentage points. The municipality of Igoumenitsa does not present the typical characteristics of a rural peripheral municipality, where the majority of residents are engaged in the primary or secondary sector, but differs from the typical Greek periphery, being an urban center with emphasis on services.

As far as productive activity is concerned, the largest sector of activity in the municipality of Igoumenitsa is that of tertiary and is more related to transport and tourism activities. Due to its geographical position, trade is significantly enhanced through the port of Igoumenitsa and the road axes (Egnatia Odos and Ionian Odos).

Despite the particularities of the area and the lack of high-level infrastructure, tourism is considered an important resource for the region, with the tourism industry constantly developing, constituting the great advantage for the development of the tertiary sector.

4.3. Organisational Characteristics and Infrastructural and Mobility Developments

The municipality employs 265 employees, of whom 150 have access to a computer and 17 of them have a digital signature. As far as the organizational chart of the Municipality is concerned, it consists of 6 directorates and 21 departments, including the independent departments of "Programming & European Programs" and "Digital Policy". In the municipality operates the Public Legal Entity under the name "Preschool Education, Social Protection and Culture of the Municipality of Igoumenitsa – P.A.K.P.PO" which is active in the fields of social protection, solidarity, education, culture and sports as well as the Public Legal Entity under the name "Municipal Water Supply and Sewerage Company of Igoumenitsa – DEYAI" and aims to study, maintain, exploit, manage and operate water supply and sewerage networks, dirt and rainwater, as well as the wastewater treatment plants of the Igoumenitsa area.

In total, the municipality is responsible for the management of 125 buildings (municipal, school and facilities). Within the municipality operate among others 11 kindergartens, 35 primary schools, 14 secondary schools, the Public IEK, the KDVM of Igoumenitsa, 2 health units, social service, social grocery, social pharmacy, 5 support centers for the elderly-KAPI, 2 Day Care Centers for the Elderly, a nursing home, the center for the prevention of the use of addictive substances "Ariadne" as well as the structures "Help at Home" and "Social Care". As far as cultural infrastructure is concerned, there are the Archaeological Museum, the Pantheon event hall, the National Youth Foundation (E.I.N.), an open-air theater with 1,200 seats, the cultural center of Nea Seleucia and the "Sarah Foundation" in Kastri. Finally, regarding sports infrastructure, these include, among others, two gyms (indoor gym of Igoumenitsa and indoor gym of Perdika) as well as fourteen courts.

The critical issues of this Municipality per sector of activity are as follows:

A. *Infrastructure – Environmental protection & quality of life*

A.1: Infrastructure/ Networks/ Projects/ Regeneration

- Need to mature "major projects" and large-scale interventions for the wider area of the Municipality, in cooperation with neighboring local authorities.
- Need to complete ongoing and implement new techniques for environmental protection.
- There is a need to develop effective cooperation with the competent bodies and bodies for the monitoring of any kind of pollution from the operation of the port.
- Public spaces do not fully meet the increasing needs of the population, especially in the city of Igoumenitsa.
- Extension of wireless internet to all municipal districts.
- There is a need to raise citizens' awareness of environmental issues.
- There is a voluntary initiative towards the protection of the natural environment which needs to be strengthened and further organised.
- There is a need to protect and promote important environmental areas and important historical sites and monuments.
- Need to utilize existing public areas.
- Utilization of building infrastructure in the Communities of the Municipality to improve the quality of life of citizens.
- Need for the involvement of the Municipality in the operation of the port to prevent the environmental impact of its operation.
- Need to grant the Land Zone for its mild and environmentally friendly utilization.

A.2: Energy

- The utilization of the Sustainable Energy Plan of the Municipality for the inclusion of actions in energy saving programs of the Municipality.
- Implementation of energy saving programs in households and services of the Municipality and expansion of the use of renewable energy sources.
- Improvement of lighting throughout the Municipality.

A.3: Urban mobility

- Making the most of the Sustainable Urban Mobility Plan.
- Need to complete the ring road in the city of Igoumenitsa.
- Need to complete projects that facilitate traffic in the districts of the Municipality.
- Need to expand bicycle lanes in Igoumenitsa and other Municipal Units.

- The increase of the population in the city of Igoumenitsa creates increased demands for the creation of parking spaces and the implementation of controlled and/or paid parking areas.
- Need to raise awareness among citizens about the use of alternative means of transport in the city center of Igoumenitsa and sensitization of car drivers for behavioral change.
- Need for further traffic arrangements (junctions, traffic lights, etc.).

A.4: Cleaning and Waste Management
- Need to complete infrastructure and use the Waste Transfer Station.
- Implementation of recycling programs with sorting at source (e.g. glass, paper, aluminium).
- Need to create "Green Points" and apply methods of utilization of deposited sectors and green waste by creating biofertilizers.
- There is a need for general application of circular economy methods in the recycling of household and municipal waste.
- Utilization of the available financial tools for the renewal of the fleet of vehicles and its replacement with corresponding electric vehicles
- Need to inform and sensitize citizens on environmental issues.

A.5: Natural environment/Green Spaces
- Expansion of green spaces and reinforcement of the staffing of the green spaces maintenance department.
- Control and treatment of factors that burden the environment (air pollution, noise pollution, poster pollution).
- Promotion of environmental and awareness-raising actions of citizens.

A.6: Urban planning / Urban interventions
- Urban planning applications.
- Land-use management.
- Development of real estate owned by the Municipality for social and other applications.

A.7: Civil Protection
- Preventive control of the static of municipal buildings.
- Implementation of fire protection projects.
- Design and implementation of a civil protection program with the participation of citizens.

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5.
The Environmental Situation: Environmental Challenges and Sustainability Strategies in Brindisi and Igoumenitsa

5.1. Environmental Risks, Criticalities and Environmental Sustainability Efforts

The territory of Brindisi was declared, with Prime Ministerial Decree of 30/1/2009, "Area at high risk of environmental crisis" and as such constitutes "an area characterized by serious alterations of the environmental balance in water bodies, in the atmosphere or in the soil and which pose a risk to the environment and the population". It is clear that this "declaration", following a study by ENEA, presents a contribution also due to city traffic which, in the overall environmental criticality of the territory, has its own explicit relevance. It is no coincidence that the subsequent Presidential Decree 04/18/1998, relating to depollution interventions, identifies the mass quantities of pollutants released into the atmosphere and provides for the creation of a monitoring system aimed at controlling the aforementioned quantities released into the atmosphere, through a series of control units. In the city of Brindisi, a control system has been activated since 2004 through a network of control units which, following current legislation, are differentiated into two different typologies, "urban" and "suburban"; it is clear that the control units typified as "urban" are intended, in particular, for monitoring pollutants coming from traffic and/or from any additional sources, such as, for example, biomass burning in the autumn-winter periods, while the "suburban" ones are intended, in particular, for monitoring coming from outside urbanized areas (industrial), or constitute "background" measurements, far from sources of pollution[1].

As for Igoumenitsa, the Igoumenitsa Port Authority S.A. (I.P.A. S.A.)[2] is constantly striving to improve the quality of the services provided for

[1] Report Urbanets – Sustainable urban mobility management information technologies – CUP J89H11003560006, 2013.

[2] Igoumenitsa Port Authority S.A., Environmental Sustainability Report, 2019.

mooring of ships and boats, the transport of passengers, vehicles and cargo on domestic and international routes and on cruise ships in a way that contributes to sustainable development and environmental protection.

In this context, I.P.A. S.A. implements an Environmental Management System in accordance with ISO 14001: 2015 and Regulation (EU) 2017/1505 (EMAS) & PERS (Port Environmental Review System) with the aim of preventing environmental pollution, limiting the impact climate change, aim at the sustainable use of resources and the protection of the biodiversity and ecosystems of the region in which it operates.

In this effort, the management of the organization is committed to:

- fully comply with current international, European and Greek environmental legislation and all relevant generally accepted best practices for the management of Ports;
- implement ESPO (European Sea Port Organisation) policy and guidance documents;
- inform, educate and encourage all staff and users of the Port for their involvement in environmental protection activities of competence;
- systematically identify, evaluate and control all environmental aspects and impacts arising from its activities and services;
- minimize and safe disposal of waste generated by the activities of the organization;
- establish, document and review environmental objectives by applying stable procedures or environmental programs such as avoiding soil, sea and air pollution from hazardous and nonhazardous waste from ships and boats, and from port operations, promoting packaging recycling, minimizing electricity, fuel and water consumption, improving aesthetic area, informing stakeholders, disseminating environmental policy and reducing carbon footprint;
- inform suppliers and contractors who cooperate with the company for the Environmental Policy that is being implemented and to ensure that they comply with relevant environmental management principles;
- aim at creating and maintaining an open and creative relationship of trust with the local community and the general public;
- strive for the continuous improvement of the organization's environmental performance o publish an annual environmental report available to the public. The organization's Environmental Policy is communicated to all employees, it is available to the public and those working on behalf of the company and reviewed and amended periodically by the top management of the organization.

6.
Traffic Analysis Between the Two Areas Involved

6.1. Overview of Maritime and Passenger Traffic and Long-Term Mobility and Connectivity Trends

The most recent data made available by the Southern Adriatic Sea Port System Authority highlights the relationships between the port of Brindisi and the port of Igoumenitsa, with reference to both freight and passenger transport. The table ... refers to the 2019-2023 time frame. The certainly significant data clearly highlights the effect of the pandemic situation on traffic data. The years 2020-22 are certainly the most critical years for both components of mobility, passengers and goods, while in 2023 the data highlight a total recovery of traffic volumes compared to the values recorded in 2019 which were, indeed, fully overcome.

Tab. 1 – Traffic volumes expressed in units

route Brindisi/Corfu/Igoumenitsa/Patrasso		2019	2020	2021	2022	2023
pax	in	168.666	73.986	100.492	107.868	196.086
	out	170.435	83.681	106.018	106.045	194.788
	tot	**339.101**	**157.667**	**206.510**	**213.913**	**390.874**
cars	in	34.175	10.335	18.729	22.831	42.516
	out	37.675	13.513	21.275	23.253	45.238
	tot	**71.850**	**23.848**	**40.004**	**46.084**	**87.754**
bus	in	5	80	52	-	-
	out	-	7	80	-	-
	tot	**5**	**87**	**132**	**-**	**-**
camion	in	44.068	43.364	46.581	42.118	54.559
	out	44.883	43.681	43.982	41.173	51.761
	tot	**88.951**	**87.045**	**90.563**	**83.291**	**106.320**
trailers	in	2.696	3.435	2.233	2.871	3.676
	out	3.389	4.163	2.121	2.589	3.759
	tot	**6.085**	**7.598**	**4.354**	**5.460**	**7.435**

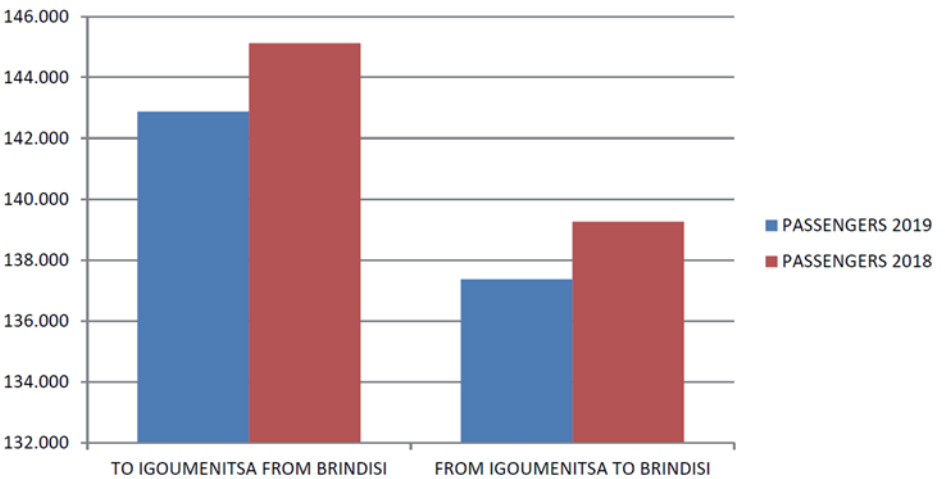
Source: Port System Authority of the Southern Adriatic Sea.

Within the DOCK-BI project[1], as part of the sustainability Study, the direct connection between the port of Brindisi and that of Igoumenitsa was supported by provision of data for the passenger and vehicle traffic between the two ports.

To provide a clearer picture supporting the creation of a cross-border development model between the two ports, the maritime traffic data of the two port authorities were considered over the period 2018 and 2019 according to an integrated reading, under the following considerations:

- geographical dimension, to define the origin/destination of passengers and cargoes from the point of view of maritime traffic;
- time dimension, to examine, by means of quarterly segmentation of trades, the seasonality of demand;
- flow direction, to grasp, through the distinction between landing flows and embarkations, the degree of balance;
- the technological dimension, to draw some considerations concerning the organization of transport chains, digitization and automation of the two airports under consideration.

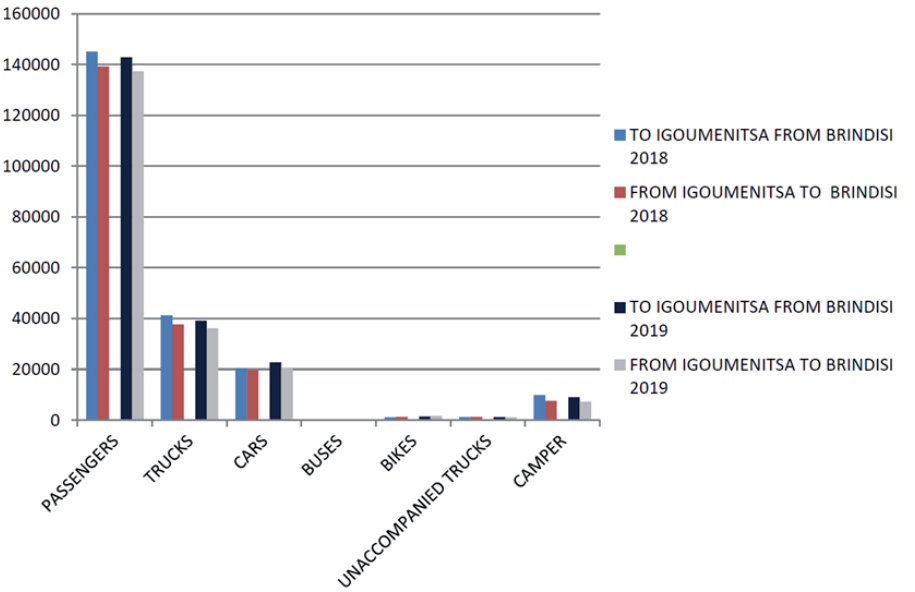
Fig. 10 – Total passengers between the two ports



Source: *www.adspmam.it*.

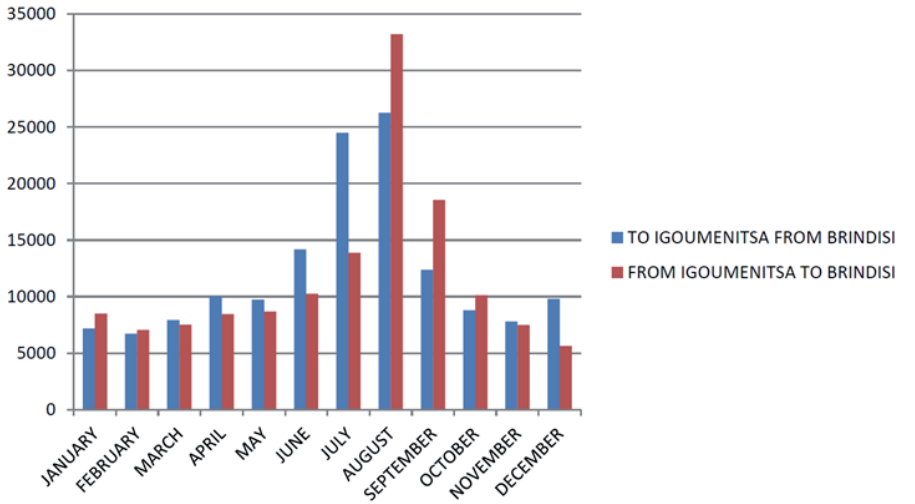
[1] DOCK-BI Deliverable 3.5.5 – Lot 2, "The Digital Intelligent Transformations around Ports – A Sustainability Plan and Future Prospects of Igoumenitsa City 4.0".

Fig. 11 – Movements in absolute value - Year 2018 and 2019



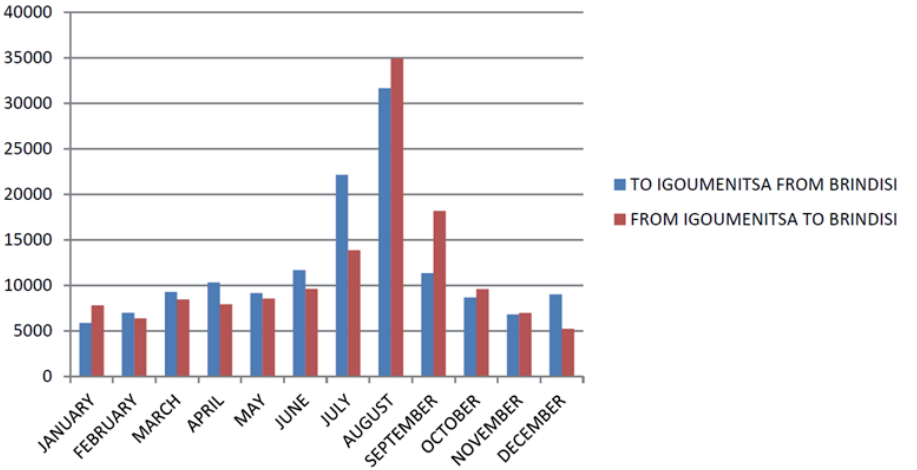
Source: www.adspmam.it.

Fig. 12 – Monthly passengers between the two ports 2018



Source: www.adspmam.it.

Fig. 13 – Monthly passengers between the two ports 2019



Source: *www.adspmam.it*.

7.
The Mobility Situation: Current Mobility Landscape and Challenges in Brindisi and Igoumenitsa

7.1. Mobility Dynamics and Challenges in Brindisi and Igoumenitsa

Medium-sized cities like Brindisi tend to be communities oriented towards the use of private cars with a low share of public/collective transport, so getting around by car is often the simplest option, although it is neither economically convenient nor sustainable from an environmental point of view. Residents of these cities very often find themselves in the real situation of dealing with distances covered on foot and with micromobility tools within the city. However, very often the use is made of private cars, especially when the routes involve medium distances due to the need to satisfy home-work and home-study commuting mobility.

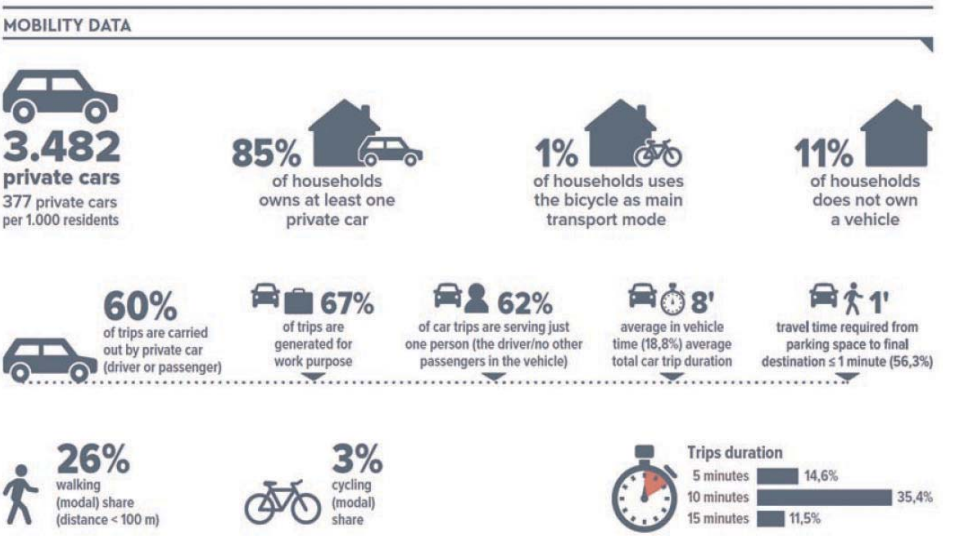
An observation that must be made is that of the infrastructures which are lacking for pedestrians and for those who would like to use individual means of transport as an alternative to the car. So, in addition to trying to intervene in this sense, it is essential, to achieve sustainability objectives, providing attractive and reliable public transport is often a challenge to achieve in these smaller cities. With respect to this point, however, it should be highlighted that the management of collective transport must necessarily involve a supra-municipal sphere given the significant extra-urban movements that affect Brindisi for study and work reasons, as well as for tourism[1].

With regard to Igoumenitsa, although it is located to a geographically strategic point, it has not yet been developed as a touristic center or as a "destination" point for visitors. Both the lack of appropriate infrastructure that could promote the city as an attraction pole and the lack of alternatives to private cars and transport modes are the main weaknesses of the city.

[1] PROGETTO SUMO, Linee Guida per la redazione del Piano Urbano della Mobilità Sostenibile per la Città di Brindisi, 2022.

Igoumenitsa's SUMP, with a 20-year horizon, focuses on passengers providing a long-term vision and a clear implementation plan. Residents, visitors, and entrepreneurs are part of the solution since Sustainable Urban Mobility Planning is tailored to people's needs and not a bureaucratic and impersonal city operation framework. In the next figure some data are presented[2].

Fig. 14 – Mobility data for Igoumenitsa



Source: DOCK-BI Deliverable 3.5.5 – Lot 2, "The Digital Intelligent Transformations around Ports – A Sustainability Plan and Future Prospects of Igoumenitsa City 4.0"

[2] DOCK-BI Deliverable 3.5.5 – Lot 2, "The Digital Intelligent Transformations around Ports – A Sustainability Plan and Future Prospects of Igoumenitsa City 4.0".

8.
The Context of Planning: Urban and Regional Planning Frameworks for Sustainable Development

8.1. Urban and Regional Planning Frameworks for Sustainable Development

The reality of Brindisi is characterized by limited resources and capabilities and these can constitute a substantial obstacle not only to planning, but above all to the implementation of the plans drawn up. This results from weaker coordination of planning activities in the reference area and the measures to be adopted can be selected ad hoc with limited consideration of the strategic objectives. However, what may seem like negative characteristics actually turn out to be a potential given the lower institutional complexity that can facilitate the processes of drafting SUMP and make them particularly effective. Under the right conditions, governance can be simplified as a limited number of institutional and non-institutional stakeholders need to be involved in the decision-making process. The possibility of achieving the broader sustainable development objectives is therefore facilitated precisely by the dimensional element and the subjects involved, despite the simultaneous pursuit of economic, social and environmental objectives being necessary[1].

As a primary Local Government Organization, the Municipality of Igoumenitsa exercises responsibilities at local level to better serve citizens. Municipal authorities manage and regulate all local affairs, in accordance with the principles of subsidiarity and proximity, with the aim of protecting, developing and continuously improving the interests and quality of life of the local community.

Consequently, the mission of the Municipality, as it has been incorporated into the institutional framework, is: "the governance of local affairs and the

[1] PROGETTO SUMO, Linee Guida per la redazione del Piano Urbano della Mobilità Sostenibile per la Città di Brindisi, 2022.

provision of public goods and services to meet the needs of residents and local bodies, with the ultimate goal of sustainable social, economic and environmental development of the area".

For the formulation of the development vision of the Municipality, its particular physiognomic characteristics, local needs and priorities and general trends and directions in national, regional and wider local environment, as well as the particular conditions prevailing today and described in detail in the previous section, were taken into account and evaluated.

In this context, the vision of the Municipal Authority is shaped as follows: to make the Municipality a modern organization, which claims and exploits every possibility for the improvement of the quality of life, social welfare, environmental protection, local and cultural development.

Fig. 15 – Venn Diagram Representing the Standard Dimensions of Sustainable Development

Source: Adapted from World Commission on Environment and Development, Our Common Future, 1987.

During the period 2020-2023 and beyond, the Municipality of Igoumenitsa:

- aspires to become a dynamic transit center of national scope with the development of accompanying support services;

- highlights and promotes its tourist product by utilizing the modern roads and routes of the Adriatic Basin;
- strengthens and highlights the products of the primary sector;
- utilizes technology and modern organization to achieve the optimal effectiveness of its services and the optimal service of the citizen;
- seeks and strengthens cooperation with municipalities/cities in neighbouring EU countries to achieve economic and social cohesion in the Adriatic Basin Region;
- it mobilizes citizens in the management of its affairs and ensures their active participation in all institutional or non-institutional forms[2].

[2] DOCK-BI Deliverable 3.5.5 – Lot 2, "The Digital Intelligent Transformations around Ports – A Sustainability Plan and Future Prospects of Igoumenitsa City 4.0".

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9.
The Benefits of Adopting Sustainable Urban Mobility Plans (SUMP)

9.1. The Strategic Benefits of Implementing a Sustainable Urban Mobility Plan (SUMP)

The Sustainable Urban Mobility Plan (SUMP) has been identified as the privileged tool for addressing economic, social, and environmental issues in transport policy at the urban scale from a long-term strategic perspective[1]. European Commission has adopted an integrated policy centred around SUMPs. In fact, it has created an observatory on urban mobility (Eltis) so to facilitate information, knowledge, and experiences exchange among European cities. Broadly speaking, the main goal of a SUMP is the reduction of traffic flows. This translates into reducing the number and length of motorized trips, abating the impact on the environment (noise and air emissions) and on the economy (loss of time). Coping with congestion is difficult. In fact, notwithstanding vehicle technological improvements might address pollution-related issues, congestion might still rise since it is often positively correlated with economic growth.

As highlighted in the Rupprecht report[2], to which we will refer in the structuring of these guidelines, a sustainable urban mobility plan can help cities like Brindisi and Igoumenitsa to actively shape their future if they want to remain economically prosperous and attractive places to live and work. Bicycle-friendly, walkable and attractive public spaces have become key strategic locations for attracting and retaining residents. These first elements have also been detected by a preliminary survey being carried out by the SINTAGMA company which also highlights the appreciation by the resident

[1] I. Maltese, V. Gatta, E. Marcucci, "Active Travel in Sustainable Urban Mobility Plans. An Italian overview", *Research in Transportation Business & Management*, Volume 40, 2021, 100621, ISSN 2210-5395, *https://doi.org/10.1016/j.rtbm.2021.100621*.

[2] Rupprecht Consult (a cura di). 2021. Topic Guide: Sustainable Urban Mobility Planning in Smaller Cities and Towns.

population of Brindisi of some of these elements of fundamental importance for the SUMP.

A winning element, which plays in favor of active mobility tools, such as bicycles and pedestrian areas, is represented by the improvement of citizens' health. The city shows decreasing levels of daily activity, which negatively affects their health. This is partly due to car dependence in cities. The SUMP instead must intervene in this sense, leverage this component, also returning the city to full enjoyment by residents.

Another benefit of the SUMP is to provide a welcoming city system for an aging society, in order to provide accessibility for all. The SUMP helps to improve access to services (shops, school, healthcare, culture) and work, in particular for non-motorised people. This includes not just older people, but anyone who doesn't own a car, such as children, young adults, low-income families and people who can't drive for health reasons.

Also consider that using transportation and land use planning tools offers better opportunities for getting around without a car, to make life easier for almost everyone, even those who have a car. Any family will benefit if their children can walk, cycle or take the bus to school instead of using a private car for this purpose of travel. A reduction in mobility through the SUMP therefore allows us to fully address the problems of congestion, safety and liveability[3].

[3] PROGETTO SUMO, Linee Guida per la redazione del Piano Urbano della Mobilità Sostenibile per la Città di Brindisi, 2022.

10.
What Can Be Done

10.1. Recommendations for Enhancing Sustainable Mobility and Connectivity

'Rediscovering' constitutes one of the key words introduced by the sustainability paradigm in the processes of using spaces, a paradigm that significantly refers to the role played by territorial identity and the ability of the communities settled in the places to define new links with it. Among the different ways of rediscovering identity to achieve sustainability there is certainly the reinterpretation of territorial heritages that can favor new configurations of mobility characterized by the adjective 'slow' and/or 'gentle'. The latter not only allow original ways of using spaces, but have the power to define new forms of rooting which "above all concern the future of local societies and, more generally, the reproduction of cultural diversity on a geographical basis"[1].

In Puglia, the Regional Authority has structured a series of initiatives to attribute a different meaning to sustainable mobility, seen not only as the compatibility of transport with the natural and anthropic environment and as a process to reduce traffic and its negative effects on spaces, but also as an opportunity to enhance in a conservative way certain cultural, environmental and social resources present in the area. By operating in this direction, starting from 2005, the organization presents itself as an initiating and pivot entity in the promotion of strategies that attribute a decisive value to pedal mobility on an urban and supra-urban scale, considered a medium in the construction of new functional relationships between mobility and daily space and between mobility and recreational and tourist use of spaces.

[1] G. Dematteis, "Note sul concetto di radicamento riferito allo sviluppo locale", *Rivista Geografica Italiana*, 125, 2017, pp. 159-161.

This commitment is attested by planning and programming work begun in the period 2006-2010 aimed at creating the Integrated Cycling Mobility Network. In this first five-year period, a significant push towards the recognition of the potential regional cycle network came with the creation of the cross-border cooperation project Cy.Ro.N.Med (Cycle Route Network of the Mediterranean), financed by the pic interreg iii b 2000-2006 ArchiMed of which Puglia is the promoting and leading body for the Mediterranean area. Cy.Ro.N.Med, in fact, is committed to structuring a feasibility study of a cycle network that crosses the countries of the south-eastern Mediterranean. This is an analytical census of existing and potential cycling resources whose itineraries will have to integrate with those of the Eurovelo European cycling network and with those of the national Bicitalia network (Puglia Region, 2007). The Puglia feasibility study was approved in 2008. The document proposes for Puglia a precise reading of the local resources (environmental, cultural, landscape, historical and architectural) that intersect, from time to time, the itineraries and then addresses the issue of tourist accommodation along the routes, remembering that Puglia is a crossroads in the South and in the Euro-Mediterranean space. Furthermore, it identifies 5 itineraries that touch 126 municipalities, attributing a strategic role to certain cities, nodes of travel in the history of Puglia from the 12th to the 15th century, on which the routes converge and intertwine. Furthermore, it intercepts internal areas of Puglia lacking or poorly endowed with a "vigorous image" (imageabillity) (Lynch, 1969) on a local and supra-local scale.

Thanks to Cy.Ro.N.Med, the foundations of the Memorandum of Understanding between the Puglia Region and AQP S.p.A. are laid. aimed at studying a sample route belonging to the service routes of the Aqueduct (CGR 963 of 06/09/2009).

In 2010, the Region adopted its own program for sustainable mobility 'Create-Activate-Mind', in which it attributes a key role to pedal mobility, recognized as a privileged area within which to promote and plan multi-level transversal interventions and in the 2007-2013 POR it launches a reflection on the poor interconnection between the different forms of mobility; in the POR 2014-2020, it encourages the use of the bicycle for habitual and short-distance travel and soft mobility as a basis for local development processes and defines the construction of velostations near railway stations to increase sustainable mobility in urban and sub-areas-urban.

2013, Regional Law n. 1 "Interventions to promote cycling mobility" marks the step towards a significant turning point by introducing a new tool, the Regional Cycling Mobility Plan (PRMC) (drawn up by ASSET – Strategic Regional Agency for the Eco-sustainable Development of the Territory), whose general objective is to build a regional cycle network "continuous and uniformly spread across the territory" by defining long-

distance itineraries that enhance those already consolidated or planned and favor low-traffic roads (p. 10). In the document, it clearly emerges that the regional cycle network must develop in coherence with the identity of the territory, respecting both the morphological and hydrographic characteristics of the places, and the anthropic values through the reuse and conversion into cycle paths of infrastructures and artefacts already present in the landscape. Seven years later, in 2020, the PRMC is approved and the main backbones of the regional cycle network are defined within it; it is not only "a planning document for the regional cycle network but also a tool for landscape enhancement and tourism promotion"[2].

Acting in harmony with the orientation of the Puglia Region, Brindisi could consider pedal mobility, also expressed in the form of slow and/or gentle use of urban and extra-urban spaces, an opportunity to give a new face to the city in the imagination collective and to capitalize on its environmental and cultural assets overshadowed by its identity as an industrial, energy and port hub. The city, in fact, could become a hub for direct connections with cycle routes in its territory, in the province and in Salento.

To operate in this direction and particularly evaluate the process of recovering certain itineraries to be used for daily slow/soft mobility in a tourist-recreational perspective, we could start from an interpretative path inspired by the paradigm of local territorial systems[3], used in a procedural key and dynamic and aimed at:

1) identify the elements of the cultural and environmental heritage of territorial identity, both urban and extra-urban, to which value has been given and/or can be attributed through slow mobility. To this end, a series of planning tools already developed can be used (e.g. Documents from the Area Vasta Brindisina, Regione Puglia);
2) identify the tourist and cycling routes that cross the city of Brindisi and which could cross it to evaluate whether they are integrated with the European Eurovelo cycle network and with those of the national Bicitalia network;
3) identify elements of the territorial heritage to arrive at an analytical census of existing and used cycling resources and potential ones to be allocated to daily and tourist itineraries and verify integration with existing ones;
4) research the institutional and non-institutional actors, with particular attention to the self-organised aggregations born from civil society, which have structured cycle itineraries and understand the motivations that pushed them to create such itineraries, giving value to the

[2] ASSET, Piano regionale delle ciclovie di Puglia, Adda Editore, Bari, 2020, p. 9.

[3] G. Dematteis, "Per una geografia della territorialità attiva e dei valori territoriali", in P. Bonora (a cura di), *S.Lo.T. Quaderno 1*, Baskerville, Bologna, 2003, pp. 11-30.

processes of self-organization and participation which are at the basis of the birth of local and supra-local networks. Define everyone's role in the construction of vertical and horizontal relationships both with respect to the use of the itinerary and with respect to the material and immaterial, qualitative and quantitative sediments of the milieu chosen for regeneration and reuse;

5) work on the development of an urban and nodal Biciplan, to be included in the SUMP and in a public summary cartography, to define an integrated and integrable cycle network extended to the city and the countryside of the municipality and projected as a hub towards the province and the Salento, with particular attention to the development of the cycle tourism network. The Biciplan, therefore, will have to contain both the existing and potential network of the municipal area, and the network that connects the capital with the provincial territory as a basis for the development of cycling connections and will be able to model the structure of the Biciplan of the city of Bologna which harmonizes the daily mobility network with the cycling tourism network[4].

Points of reference for the operational work aimed at evaluating the existing equipment in the city of Brindisi and its province are certainly the Regional Cycling Mobility Plan, the documents of the Puglia region on greenways, the PPTR and the strategic project for the regional landscape on the soft mobility system. However, to develop a cognitive analysis of potential routes and to aim for reconnaissance, organization and adaptation interventions, third sector associations and subjects involved in the field of pedal mobility can be involved (for example FIAB, Cicloamici and/or or carry out a reconnaissance in the city) valorising the work already carried out in the area and their skills and knowledge for the benefit of the common good.

In the project work, also aimed at territorial regeneration, reference can be made to informal routes structured within platforms dedicated to cycling such as Komoot, a planning and navigation platform born in Germany, which offers 20 routes that have the city as their fulcrum of Brindisi.

A useful document for the capitalization of identity elements but, above all, for designing Brindisi as a hub for the slow use of spaces in a systemic process of integration is the Atlas of Soft Mobility in Italy, edited by the Alliance for Soft Mobility (A.MO .DO, 29 associations). The atlas, currently being published, was developed using big data that systematizes railway stations with cycle paths, paths, greenways, paths, cycle and pedestrian paths, villages with Italy's artistic and naturalistic heritage. Born from the

[4] In *https://pumsbologna.it/Biciplan_metropolitano*.

A.MO.DO cooperation. and RFI, the atlas proposes a complete collaborative mapping aimed at creating an integrated sustainable mobility model that involves not only the tourism dimension but the entire local economic system. The aim of the work is precisely to identify intermodal hubs for soft mobility connected with interchange services with attention to the attractive nodes of the territories and the network of stations.

On the other side, the Municipal Authority of Igoumenitsa has formulated an integrated and coherent strategic plan for the period 2020-2023, structured on four (4) priority axes, each of which is specialized in a series of measures and general objectives[5].

The Axes of the operational program of the Municipality of Igoumenitsa, for the period 2020-2023 and beyond, are defined as follows:

- Axis 1: strengthening infrastructure-environmental protection & quality of life;
- Axis 2: social care, health, education, culture & sports;
- Axis 3: sustainable economic development;
- Axis 4: improvement of administrative capacity of the municipality.

Measures

Measures are the next subdivision of an Axis.

Each Axis is broken down into a set of related measures.

Each measure shall include one or more relevant general objectives.

General Objectives

The general objectives are the intended changes of the current situation of the area and the internal environment of the Municipality, aimed at fulfilling the mission and achieving the vision. The individual objectives defined per measure essentially constitute groups of actions (projects, functions, programs) that will be specified in the second phase of the preparation of the Business Plan of the Municipality of Igoumenitsa. Based on the conclusions of the analysis and the investigation of the framework of development interventions, the following axes, measures, and sub-objectives are proposed as components of the vision.

[5] DOCK-BI Deliverable 3.5.5 – Lot 2, "The Digital Intelligent Transformations around Ports – A Sustainability Plan and Future Prospects of Igoumenitsa City 4.0".

Tab. 2 – Strengthening infrastructure-environmental protection & quality of life

Measures	*Specific Objectives/Groups of Actions*
1.1. INFRASTRUCTURE - NETWORKS - URBAN REGENERATION	Regeneration of Areas, Squares, Playgrounds and in general Actions related to public spaces Urban Regeneration Completion of the reconstruction of the playgrounds according to ELOT specifications Improving accessibility of buildings, roads and common areas for people with mobility difficulties Completion of the Lakka stream management project Completion of Goura stream management project
1.2. ENERGY	Energy upgrading and energy saving in schools, public spaces and municipal buildings Upgrading of the municipal street lighting network with modern luminaires and LED lamps, aiming both to achieve significant energy savings, but also to increase the safety of citizens and vehicles, as well as to upgrade the aesthetics of urban landscape spaces Raising public awareness on energy saving issues
1.3. URBAN MOBILITY	Upgrading of existing infrastructure and creation of new ones to enhance sustainable mobility in the city center of Igoumenitsa Upgrade transit stops Development of sustainable urban mobility networks Improving accessibility of roads and pedestrian walkways Traffic arrangements Car parking study Implementation of road construction projects Tackling traffic congestion and discouraging car use through the development of a network of pedestrian walkways Creation of necessary parking infrastructure
1.4. CLEANING AND WASTE MANAGEMENT	Improvement of the cleanliness of the city and the management of citizens' requests-complaints Replacement of old vehicles of the fleet of the Municipality of Igoumenitsa, with commission six (6) totally new energy-efficient, low-emission vehicles Supply of new project machinery Underground waste bins and replacement of old waste bins Restructuring of waste management system based on source separation, recovery and recycling Renewal and improvement of cleaning equipment Sensibilisation of residents on cleaning and recycling issues

Tab. 2 – Continued

Measures	*Specific Objectives/Groups of Actions*
1.5. NATURAL ENVIRONMENT – GREEN SPACES	Increase and upgrade of green areas and common areas, implementation of automatic systems where possible Environmental upgrading interventions of public areas of the city of Igoumenitsa Construction of "Green Points" in the Municipality of Igoumenitsa Renewal of green spaces equipment Control and treatment of environmental factors (atmospheric pollution, noise pollution, poster pollution) Forwarding, Environmental Actions and awareness-raising actions for citizens Completion of abandoned vehicle removal process
1.6. URBAN PLANNING DESIGN AND INTERVENTIONS	Urban planning applications Land-use management Development of real estate owned by the Municipality for social and developmental applications
1.7. CIVIL PROTECTION	Preventive control of the statics of public buildings, (Interventions for static reinforcement of school buildings of the Municipality of Igoumenitsa) Implementation of fire protection projects Design and implementation of a civil protection program with the participation of citizens Preparation and implementation of the Forest Fire Emergency Response Plan "IOLAOS" Development and implementation of the Emergency Response Plan due to Flooding "DARDANOS" Elaboration and implementation of the Emergency Response Plan due to Seismic Phenomena "ENCELADOS" Preparation and implementation of an Emergency Response Plan needs due to the Covid-19 Pandemic

Source: DOCK-BI Deliverable 3.5.5 – Lot 2, "The Digital Intelligent Transformations around Ports – A Sustainability Plan and Future Prospects of Igoumenitsa City 4.0".

Tab. 3 – Social care, health, education, culture & sport

Measures	*Specific Objectives/Groups of Actions*
2.1. SOCIAL SOLIDARITY	Development of structures – services – actions to combat poverty and social exclusion. Strengthening social solidarity and promoting citizen awareness actions Building networks and developing partnerships at national and European level
2.2. SOCIAL PROTECTION AND CARE	Strengthening the structures of the Municipality (Social Grocery and Pharmacy) and improving the level of provision of welfare services Upgrading of infrastructure for people with disabilities (Ramps and WCs for people with disabilities on the beaches of the Municipality) Strengthening the structure of the HEALTH Service Point and strengthening preventive medicine actions Development of intermunicipal and social partnerships for the upgrading of health and welfare infrastructure
2.3. EDUCATION AND LIFELONG LEARNING	Addressing the problems of "school accommodation" so that students can enjoy education in modern classrooms Construction of a Kindergarten – Kindergarten in the O.T. of the 3rd Regional Unit of Igoumenitsa Construction of a Special School Expansion of the institution of school traffic wardens where required. Claiming funds for maintenance, repairs and energy upgrading of older buildings Training and creative employment programs Strengthening of Lifelong Learning programs Support of training and supplementary education applications with distance and eLearning systems
2.4. CULTURE	Upgrading of cultural infrastructure (Reuse, conversion of an EIN building into a multipurpose cultural space of the Municipality) Completion of the Open-Air Theatre Support of cultural programs and actions Support of actions of cultural institutions Synergy with the Central Administration on issues of conservation, promotion and promotion of cultural resources
2.5. SPORTS	Creation of mass popular sports infrastructure throughout the Municipality Improvement and expansion of sports structures and services Improvement, Cleaning and Maintenance of sports facilities Support of actions of sports bodies Creation of a sports multiplex (tennis courts, etc.) in Drepano Open swimming pool study
2.6. GENDER EQUALITY – HUMAN RIGHTS	Development of Actions for fighting domestic violence Actions to raise citizens' awareness on issues of bulling, racism, fascism, gender equality with particular focus on youth Development of intermunicipal partnerships Establishment and activation of the Municipal Committee for Gender Equality

Source: DOCK-BI Deliverable 3.5.5 – Lot 2, "The Digital Intelligent Transformations around Ports – A Sustainability Plan and Future Prospects of Igoumenitsa City 4.0".

Tab. 4 – Sustainable local economic development

Measures	*Specific Objectives/Groups of Actions*
3.1. ADVOCACY AND MAKING THE MOST OF IT PUBLIC PROPERTY	Renovation and reuse of Public Buildings Health Centre of Igoumenitsa Utilization of the "designed" "Student Residence» Recovery of municipal property from any arbitrary occupations Restoration of ownership of municipal buildings, including school buildings
3.2. DEVELOPMENT DECLINING SECTOR	Support of Agricultural, Livestock and Fisheries Sector Improvements-Interventions in Technical Infrastructure (Rural roads, etc.)
3.3. BUSINESS/TOURISM DEVELOPMENT	Elaboration of a local action plan for employment, in cooperation with local social, professional and business actors Elaboration of a study for the tourist development of the Municipality. Business advisory support and promotion and promotion of local businesses with the use of new technologies Strengthening networking and collaboration between local businesses Supporting the professional world with a socially fair fee policy and upgrading the services provided (cleaning etc.) Promotion and improvement of tourism infrastructure & areas like Drepano, Sivota, Perdika, NATURA areas etc. Tourist promotion of the Municipality of Igoumenitsa

Source: DOCK-BI Deliverable 3.5.5 – Lot 2, "The Digital Intelligent Transformations around Ports – A Sustainability Plan and Future Prospects of Igoumenitsa City 4.0".

Tab. 5 – Improvement of the administrative capacity of the municipality

Measures	*Specific Objectives/Groups of Actions*
4.1. UPGRADING OF ADMINISTRATIVE FUNCTIONS AND IMPROVING THE EFFECTIVENESS OF THE SERVICES	Adequate staffing of services with staff with a permanent and stable employment relationship Improving working conditions Upgrading of management systems and reorganisation of management systems services incorporating new technologies Development of human resources skills Creation and upgrading of citizen services and operation of a citizen information and service office Maintenance and upgrade of vehicles, mechanical equipment and other equipment
4.2. INTEGRATED DIGITAL SERVICES – DIGITAL MUNICIPALITY	Free internet access in public places and municipal buildings Enrichment and upgrade of Hardware, Software and telecommunications equipment Use of new means of communication with the citizen Full exploitation of the potential of the national SYZEFXIS system Development of interoperability and interconnection of existing municipal systems Utilization of all existing GIS applications
4.3. FINANCIAL MANAGEMENT	Widening Sources Funding with the Utilization of funded programs (European, regional, national) Increase and development of real estate Improving revenue collection Improvement of the management of the logistical equipment of the Municipality

Source: DOCK-BI Deliverable 3.5.5 – Lot 2, "The Digital Intelligent Transformations around Ports – A Sustainability Plan and Future Prospects of Igoumenitsa City 4.0".

11.
The Supporting Elements of the SUMP: Key Pillars and Strategic Components Supporting the Sustainable Urban Mobility Plan

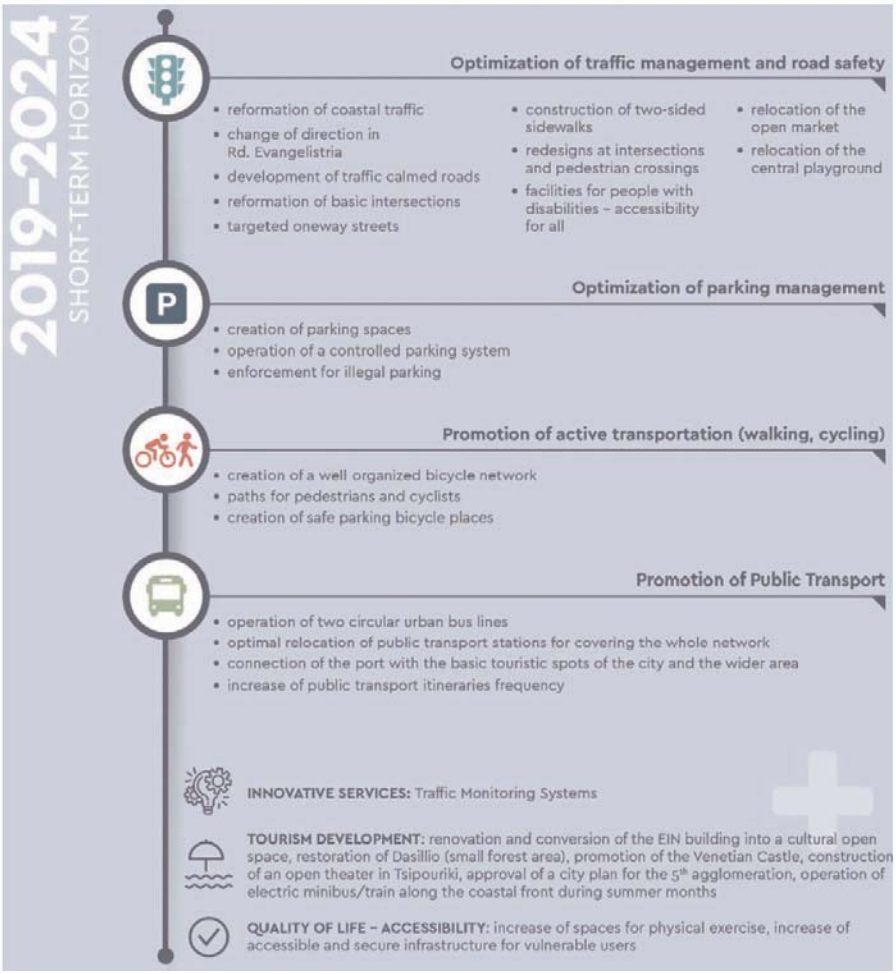
11.1. Main Strategic Elements for the Creation of a SUMP

In light of the characteristic elements of the city of Brindisi, it is suggested to base the drafting of the SUMP on four essential pillars:

- Sustainable mobility
  - Ensure high accessibility.
  - Reduce dependence on private motorized vehicles.
  - Redistribute public space in favor of active mobility.
  - Encourage compliance with vehicle circulation and parking rules.
- Equity, security and social inclusion
  - Guarantee services and accessibility to all components of the population.
  - Reduce accident rates.
  - Reduce the population's exposure to the number and air pollutants.
  - Reduce barriers to access mobility services.
  - Increase freedom of choice in favor of sustainable mobility tools.
- Environmental quality.
  - Reduce polluting air emissions.
  - Reduce energy consumption and climate-changing gas emissions.
  - Prevent and contain noise pollution.
  - Improve the quality of the urban landscape.
- Innovation and economic efficiency.
  - Guarantee the economic balance of the mobility system.
  - Internalize environmental, social and health costs through the use of public policies.
  - Promote the economic efficiency of commercial traffic.
  - Optimize the use of resources intended for mobility.

As for Igoumenitsa, these are the short-terms interventions by 2024.

Fig. 16 – Specific SUMP Actions until 2024



Source: DOCK-BI Deliverable 3.5.5 – Lot 2 – The Digital Intelligent Transformations around Ports – A Sustainability Plan and Future Prospects of Igoumenitsa City 4.0 – Iapetos S.A. and Municipality of Igoumenitsa – September 2023.

In more details, the Municipality of Igoumenitsa is planning the following interventions for the period until 2024:

- Gradual reform of the traffic structure of the coastal front. Pedestrianisation of the traffic flow of Ethnikis Antistaseos Street in a northerly direction, in its section from 8th December Street to Evangelistria Street. The proposed intervention connects the existing pedestrian streets in the central area (Gr. Lambraki, El. Venizelou) with the coastal front of the city and creates new common areas that will be given to pedestrians and cyclists. The traffic of

vehicles in the direction of Evangelistria Street will be carried out through the route 8th December – Cyprus – Evangelistria – Ethn. Resistor.

- Change direction of Evangelistria Street, towards Ethnikis Antistasis Street.
- Creation of parking spaces with a capacity of about 500 vehicles in the coastal zone, parking space on Sellon Street (in the area of the open-air market) and parking space in the area of the city's Stadium.
- Conversion of all roads of local importance, in Igoumenitsa and Ladochori, into roads of mild traffic, one-way, with frequent changes in the direction of traffic, so as to prevent through movements through them. The network of roads with light traffic will only serve access to the adjacent properties, at low speeds (20-30 km/h) and at the same time will harmonize the coexistence of pedestrians, cyclists and cars.
- Construction of bilateral sidewalks on all collector streets.
- Configurations of intersections and pedestrian crossings.
- Ensuring movement conditions for people with disabilities.
- Creation of parking recesses to clearly define legal parking spaces and eliminate illegal parking.
- Operation of a Controlled Parking System.
- Ensuring the parking of residents, by converting all spaces on local roads and a large number of spaces of the collector road network into exclusive parking spaces for residents. It is proposed to introduce approximately 520 dedicated parking spaces for residents.
- Creation of approximately three hundred (300) short-term visitor parking spaces on the street, with payment of a parking fee and a permitted duration of up to three hours.
- They are located within walking distance from the central core, only on the main streets, so as to eliminate the movements to find a free place in the streets of mild traffic of the neighborhoods.
- Creation of approximately two hundred and twenty (220) long-term parking spaces (up to 24 hours) for visitors and employees, on the street, with low pricing on the main road network within walking distance from the central core.
- Elimination of illegal parking, with geometric configurations to prevent it at the points of prohibition and with simultaneous systematic and strict policing.
- Establishment of specific loading and unloading locations.
- Geometric redesign of key nodes – creation of roundabouts at selected points:
  - ❖ at the intersection of Ethnikis Antistaseos Street with Parga Street (PETH junction),
  - ❖ at the intersection of 28th October Street and Kyprou Street,

- ❖ at the intersection of 28th October Street with Ippokratous Street (connection with N. Seleucia),
- ❖ at the intersection of 28th October Street with Konstantinoupoleos Street (connection with National Resistance),
- ❖ Graikochori junction,
- ❖ at the intersection of Filellinon/Grammou/Patr. Athenagoras,
- ❖ at the intersection of 28th October Street with Irini and Filias Street (connection with Drepano), in order to arrange movements to/from the beach, especially during the summer months, but also access to the marina in the near future,
- ❖ at the intersection of Ethnikis Antistaseos Street with Dagli Street, as part of the new traffic,
- ❖ organization of the coastal zone to be redeveloped,
- ❖ at the intersection of the ring road with Parga Street, in order to upgrade the connection of the central core of the city, through Sellon and Pindou – Eleftherias streets and to avoid through traffic through local neighborhood streets, with poor geometric characteristics,
- ❖ on Ippokratous Street in the area of Nea Seleucia,
- ❖ at the junction of Ethnikis Antistaseos and Ioannina streets,
- ❖ at the junction of Grammou, Patriarchou Athinagoras and Rodon streets.

- Reduction of permitted movements / points of engagement, with *targeted one-way routes* that are the following:
  - ❖ in the direction North – South, access to residences and educational spaces will be via Kyprou Street in the direction to the North and additionally,
  - ❖ for the area bounded from Dasilio to Markos Botsari, by the complex of one-way roads Red Cross – Souli – Philellinon,
  - ❖ in the opposite direction to the South, traffic will be served through the complex of Grammou – Patra streets. Athinagoras Vassilakou,
  - ❖ for movements on the East-West axis, pairs of 3 one-way conjugates are created with opposite times: Ioannina – Tzavelenas, D. Skylosofou – M. Botsari, Eleftherias and Pindos – Sellon,
  - ❖ relocation of farmers market,
  - ❖ relocation of the Central Playground (near the tennis courts) to the coastal zone and the conversion of its space into a car park.

It is also planned to enhance travel on foot and by bicycle:

- Creation of a network of new bicycle lanes, 19 km long, throughout the city, which is added to the existing cycle paths (towards Drepano and 49 Martyron Street) with a length of 3.9 km. The proposed integrated network of cyclists gives life to the beach and recreational uses.

- Extensive hiking routes, on foot and by bike, both to the beach of Drepano and to the other side of the bay and specifically to the cove, where the biological treatment facilities are located.
- Creation of safe bicycle parking spaces, in order to ensure safe bicycle parking spaces on the coastal front and near the main land uses.

In addition, the following actions are planned to enhance transportation by public transport:

- Creation of 2 circular urban bus lines. The frequency of the routes, in the first phase, can be every 30', with the ultimate goal and if there is a corresponding connection to reach 15'.
- Location of urban bus stops**,** in order to provide adequate geographical coverage, based on the desired acceptable walking distance of up to 300 m**.** and up to a maximum of 500 m.
- Connection of the port with the main tourist spots of the wider area and the beach of Drepano by public transport.
- Increase of the frequency of daily services to the surrounding settlements. The itineraries to Drepano can run every 30 minutes during the summer months.

It is also planned to introduce innovative services and information collection systems, such as the reopening and expansion of the traffic monitoring system.

The development of tourism is expected to be facilitated, among other things, by the launch, mainly during the summer months, of a means of public transport (train), which will run from end to end along the coastal front[1].

In medium and long terms vision the interventions for Igoumenitsa are the following[2].

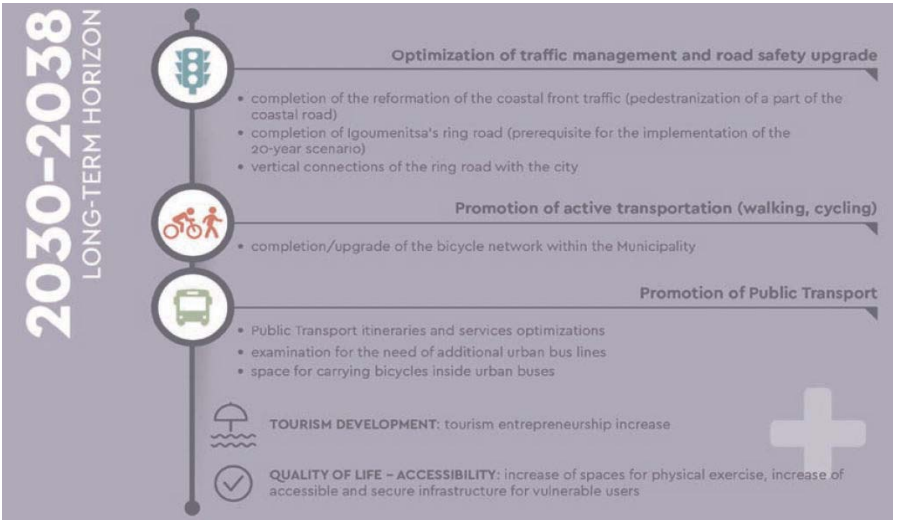
[1] DOCK-BI Deliverable 3.5.5 – Lot 2, "The Digital Intelligent Transformations around Ports – A Sustainability Plan and Future Prospects of Igoumenitsa City 4.0".

[2] *Ibidem.*

Fig. 17 – Interventions for Igoumenitsa - Medium term vision

Source: DOCK-BI Deliverable 3.5.5 – Lot 2, "The Digital Intelligent Transformations around Ports – A Sustainability Plan and Future Prospects of Igoumenitsa City 4.0".

Fig. 18 – Interventions for Igoumenitsa - Long term vision



Source: DOCK-BI Deliverable 3.5.5 – Lot 2, "The Digital Intelligent Transformations around Ports – A Sustainability Plan and Future Prospects of Igoumenitsa City 4.0".

12.
Analysis of Problems Related to Mobility and Study of Existing Projects to Improve the Situation

12.1. Best Practices and Infrastructure Strategies for Sustainable Mobility

This section is summarising the EU best practices in drafting strategies al local, regional and EU level, acting as a pool of replicable ideas for the long term city 4.0 strategy of the city of Igoumenitsa in its core strategic priorities[1].

The overview start with the European Covenant of the Mayors where Igoumenitsa is an acting and awarded member and is continuing with several that includes a catalogue of key initiatives, projects, guidelines, case studies and tools in five cornerstone areas: public transport, urban logistics, active mobility, electromobility, and the integration of SECAPs (Sustainable Energy and Climate Action Plans) and SUMPs (Sustainable Urban Mobility Plans) across European Union Municipalities and Regions.

The second part of the overview is the global actions that connect cities with ports with their ports and the best practices associated with a sustainable co-existence and co-development between the two stakeholders.

12.2. The European Covenant of Mayors

The Covenant of Mayors is a European initiative (*https://eu-mayors.ec.europa.eu*) that solicits voluntary commitments by local governments to implement EU climate and energy objectives. With transport as one of its key sectors, the Covenant plays a significant role in climate mitigation. Transport accounts for approximately 16% of actions submitted by Covenant

[1] *Ibidem.*

signatories and contributes to 26-28% of total emissions, according to the Joint Research Committee's Baseline Emission Inventories (BEI, Covenant of Mayors 2019 Assessment). The Covenant also tackles transport in its climate adaptation pillar by using transport-related indicators such as the vulnerability of transport infrastructure to extreme weather events.

Fig. 19 – Policy Options to Reduce Emissions from The Mobility Sector: Inspiring Examples and Learning Opportunities. Useful Resources for Covenant of Mayors – Europe Signatories

Source: *https://eu-mayors.ec.europa.eu*.

In 2022, the Covenant of Mayors further expanded its focus by introducing an Energy Poverty Pillar, which includes indicators related to transport poverty. These metrics assess the accessibility and availability of public transport services, giving insights into how mobility influences social inclusion.

The Coalition of the Willing (*https://www.coalitionofthewilling.eu*) was officially created on 6 July 2022. Initially, the Coalition gathered around the four major groups the European Commission worked with in 2021 to impact the New European Innovation Agenda: European Unicorns, European Innovation Ecosystem Leaders, Women in Venture Capitals, and newly formed Women founders groups. This initial groups have since then been extended with innovative companies, innovative local authorities and innovative universities.

The *Coalition of the Willing on Sustainable Mobility* is an offshoot of the Covenant of Mayors, established in conjunction with 11 other organisations and initiatives. The coalition aims to deepen expertise in the decarbonisation of the mobility sector. Between 23 June 2022 and 18 September 2023,

the coalition hosted a series of webinars titled 'Policy options to reduce emissions from transport – Towards climate-neutral mobility in Covenant cities». These webinars, linked under each topic below, served as platforms for sharing practical strategies and success stories across these five key areas.

12.3. Best Practices in Policy Options to Reduce Emissions from The Mobility Sector: European Initiatives

The first section includes the most important European Initiatives, Organisations and Projects depicting the current state of the art in sustainable mobility policies, services and strategies related to the next generation of city mobility services.

ALICE
(*www.etp-logistics.eu*)

The European Technology Platform ALICE develops and implements a comprehensive industry lead strategy for research, innovation and market deployment in the field of logistics and supply chain management in Europe. Leading experts and companies in implementing supply chain and logistics innovation formed ALICE with the aim to accelerate the transition to net zero emissions transport & logistics operations, where interdisciplinary and multi-stakeholder collaborative innovation is needed.

CIVITAS
(*www.civitas.eu*)

CIVITAS is one of the flagship programmes helping the European Commission achieve its ambitious mobility and transport goals, including the European Green Deal goals. It does so by acting as a network of and for cities dedicated to sustainable urban mobility. Through peer exchange, networking, and training, CIVITAS fosters political commitment and boosts collective expertise, equipping cities to put mobility at the centre of their decarbonisation efforts.

EIT URBAN MOBILITY
(*www.eiturbanmobility.eu*)

EIT Urban Mobility is an initiative of the European Institute of Innovation and Technology (EIT), a body of the European Union and Europe's largest network for transport innovation in cities. Their mission is to accelerate change towards a sustainable model of urban mobility and liveable urban spaces. They connect public and private actors and provide them with access to markets, talent, finance, and knowledge in four ways:

- Match and connect – Bringing together people, funding, knowledge and markets.
- Talent to business – Educating next generation entrepreneurs.
- Innovations to market – New solutions to transform mobility in cities.
- Start-ups to scale – Boosting growth for long-term impact.

EUROCITIES
(*www.eurocities.eu*)

Eurocities is the network of more than 200 cities in 38 countries, representing 130 million people, working together to ensure a good quality of life for all. Eurocities works across a wide range of urban policy areas, including sustainable mobility, road safety, intelligent transport systems, energy efficiency, environment, climate change, air quality, social affairs, green economic development and cohesion policy, culture and digital transformation.

EUROPEAN MOBILITY WEEK
(*www.mobilityweek.eu*)

Every year, from 16-22 September, the European Commission invites towns and cities to raise awareness on sustainable urban mobility. During the week, almost 3,000 townsand cities in Europe, including Igoumenitsa, and beyond encourage behavioural change in favour of active mobility, public transport and other clean, intelligent transport solutions by organising activities and events with local stakeholders. The annual theme for September 2023 was 'Save energy'.

ERTICO
(*www.ertico.com*)

ERTICO is a public-private partnership organisation with more than 124 members, connecting eight different stakeholder sectors including service providers, suppliers, the traffic and transport industry, research institutions and universities, public authorities, user organisations, and the connectivity industry, as well as vehicle manufacturers. It also fosters stakeholder engagement. Together with leading pioneering and innovative partners, ERTICO develops, promotes, and connects Intelligent Transport Systems and Services (ITS) through activities including European co-funded projects, innovation platforms, international cooperation advocacy, and publications such as Making Europe's transport smarter with innovative technologies.

POLIS
(*www.polisnetwork.eu*)

POLIS is a network of European cities and regions working together to develop technologies and policies for local transport. They aim at improving

local transport through integrated strategies that address the economic, social and environmental dimensions of transport. Some of the activities carried out by this organisation are the support for exchange of knowledge between European local and regional authorities, fostering cooperation and partnerships across Europe to promote research and innovation in cities and regions, and engaging in dialogue with European institutions to provide them with the perspective of sustainable mobility.

IURC
(*www.iurc.eu*)

The International Urban and Regional Cooperation programme (IURC) leads and develops a form of decentralised international urban and regional cooperation in the fields of sustainable urban development and innovation in key partner countries and regions in line with the external dimension of 'Europe 2020.' The project facilitates knowledge-exchange through a combination of online tools and face-to-face support such as study visits, participation in thematic and networking events or capacity building contributing to international strategic frameworks through city-to-city diplomacy and collaborative regional efforts to overcome common challenges.

MOBILITY AS A SERVICE (MAAS) ALLIANCE
(*www.maas-alliance.eu*)

After having been created under the umbrella of ERTICO, the MaaS Alliance is now an independent public-private partnership dedicated to creating and advancing the foundations for a common approach to mobility as a service (MaaS) by unlocking the economies of scale needed for successful implementation and take-up of MaaS in Europe and beyond. Their vision is to facilitate a single, open market and full deployment of MaaS services globally.

CLEAN BUS EUROPE PLATFORM
(*www.uitp.org/projects/clean-bus-europe-platform*)

The Clean Bus Europe Platform is an initiative under the European Commission's Clean Bus Deployment Initiative that aims to support the deployment of clean bus technologies across Europe. The Platform brings together European cities, transport authorities and operators, together with relevant stakeholders like social dialogue partners, industry, financing and funding institutions, associations, etc. to boost and support the exchange of knowledge and expertise on clean bus deployment.

EU CYCLISTS' FEDERATION
(*www.espo.be*)

Founded in 1983, ECF is a Brussels-based NGO that is the single umbrella organisation for cycling in Europe. ECF's core mission is to achieve more

and better cycling in Europe. It has more than 65 member organisations in over 40 countries, uniting Europe's cycling movements as the only civil society voice at the pan-European level, and as the world's largest and best-known cyclists' advocacy organisation. ECF maintains close ties with European cities through its Cities & Regions for Cyclists network, which counts over 40 cities and regions as members, working with them on EU-funded projects, advocacy initiatives, knowledge-sharing and networking sessions, and publicising the benefits of cycling. ECF is a leading member of the European Commission's Expert Group on Urban Mobility (EGUM), and serves as co-coordinator of the sub-group focusing on active mobility and safety of vulnerable road users. Among ECF's priority advocacy aims are to integrate cycling in the urban nodes of the Trans-European Transport Network, improve cycling in sustainable urban mobility planning and increase the amount of EU funds for cycling to cities and regions in Europe.

SUMO Project

The SUMO Project – *Sustainable Mobility in the Port Cities of the Southern Adriatic Area* – is a project funded by the Interreg IPA CBC Italy-Albania-Montenegro Programme 2014/2020, one of the most important European Transnational Cooperation Programmes which encourage and support the creation of highly integrated partnership of public and private entities aimed at providing joint solutions to common problems and challenges.

The main objective of the project is to improve sustainability and mobility in some of the main port cities of the programme area, through developing a cross-border Adriatic system to reinforce the use of more sustainable means of transport, alternative to cars (hybrid/electric motorboats and buses, bicycles) and to generate a positive change in the behavior of citizens and stakeholders about the sustainable use of transport means, the reduction of CO_2 emissions and the halt of climate change. The spread of a more sustainable mobility represents the overall objective of the project that partners – Società Trasporti Pubblici Brindisi S.p.A., Port of Bar, Municipality of Vlorë and Municipality of Termoli – want to achieve by planning and implementing specific measures for enhancing travel experience of local and international tourist and citizens while reducing carbon emissions.

The SUMO project poses two important challenges: to improve transport efficiency, in terms of stainability and quality, through pilot actions in each area of the programme involved, and to develop an efficient planning circuit for sustainable mobility to favor the sustainable movement of the increasing number of people travelling for different reason, work, tourism, business, etc.

Sustainable mobility aims to reduce the environmental impact associated with transport means, improve public health and accessibility, and promote greater social equity. The transition to sustainable mobility requires the

joint commitment of governments, companies, and citizens, and is crucial to address the challenges of climate change, improve quality in urban areas, and create more resilient and inclusive communities. The issue of sustainable mobility is especially critical in port cities with high level of maritime traffic: for Europe, the maritime transport has been considerate a catalyst for economic development and almost 90% of the EU's external freight trade is seaborne and short sea shipping represents one third of intra-EU exchanges in terms of ton-kilometers. For this reason, to ensure a high quality of life to port cities, it is crucial to align with good and green maritime transport services in peripheral maritime regions, with the aim of meeting the Europe Strategy and contributing to the achievement of Agenda 2030 for Sustainable Development which envisages a significant improvement in the quality, efficiency, and sustainability of transport by 2030.

The SUMO project aims at supporting this shift worldwide, starting from the involvement of the main port cities of the Southern Adriatic area – Termoli, Brindisi, Bar and Valona – in the prospective of spreading good practices on sustainable mobility beyond and ensuring transferability and replicability of the outputs and results even by other Regions.

To enhance both efficiency and sustainability in the internal port, Società Trasporti Pubblici Brindisi S.p.A. pilot action consisted in the purchase of a CAT39 model electric catamaran to be integrated into the public transport service operating in the inner and medium port areas, replacing the traditional motorboat relying on a conventional diesel engine.

For more than three decades, Società Trasporti Pubblici Brindisi S.p.A. has been the steadfast provider of public transport services in Brindisi and across the expansive territory of its province, extending its reach to include sea transport within the internal harbour waters of the port. The city of Brindisi remains a major port for trade and passengers with Adriatic Sea and the Middle East, in which Società Trasporti Pubblici Brindisi S.p.A. plays a crucial role as one of the most important public transport companies in Puglia.

In accordance with the Territorial Sustainable Urban Mobility Guidelines, the electric/hybrid Motorboat, as an innovative equipment able to improve sustainability and mobility in the port of Brindisi, was purchased in order to replace the use of traditional motorboat based on conventional diesel engine and contribute to a relevant reduction of air pollution emissions in the port area.

The passenger motorboat presents the following features:

- Length: 11.99 m;
- Width: 5.51 m;
- Draft: 0.95 m;
- Capacity: 40 people (crew included);

- 2 Ocean Volt SD10 Dual Propulsion System electric motor with a power output of 10 kW;
- Lithium-ion Valence DC Battery pack featuring a capacity of 14 kWh and a voltage of 48 volts;
- 1.5 kW photovoltaic system integrated into the boat's awning;
- 5-kW back generator.

The methodology used in the preparation of the pilot actions firstly provided a comparison of the above model with a catamaran equipped with the Volvo 50 HP internal combustion engines, to evaluate and compare their environmental impact in terms of CO_2 emissions.

Environmental impact analysis conducted during the *testing phase* have indicated a substantial 80% reduction in fuel consumption, translating into an estimated annual CO_2 savings of 76 tons based on a diesel emission factor of 2.64 kg per litre. This preliminary testing of the pilot action not only underscored the tangible benefits of the transition to electric propulsion, in line with the Programme objectives and EU strategies, but also underlined its alignment with global efforts to mitigate the adverse effects of climate change.

Beyond the reduction in carbon emissions, the pilot action testing phase has demonstrated the CAT39 electric catamaran cascading effect on the environmental landscape of the harbor, consisting in the substantial reduction in noise pollution, which is a prevalent issue in bustling port areas. This not only contributes to a more harmonious harbor environment but also signifies a commitment to fostering sustainable and eco-friendly practices in the maritime sector, as well as preserving the community welfare.

12.4. Infrastructural Interventions in the Frame of DOCK-BI Project

As indicated in paragraph 1, the DOCK-BI project foresees the upgrade of port areas and cross-border ferry connectivity between ports of Brinidisi and Igoumenitsa. Particularly, the main project output concerns infrastructural interventions aimed at improving ports system.

Particularly, the infrastructural intervention realized in the frame of DOCK-BI, that represent the tangible outputs (central deliverables) are:

1) *ASI Brindisi Consortium:* Construction of a parking in Costa Morena (medium port) in Brindisi for trucks and cars in transit to and from Greece;
2) *Igoumenitsa Port Authority S.A.:* Completion of the 3rd Passenger Terminal in Igoumenitsa;

3) *Southern Adriatic Seaport Authority:* Requalification of the adjacent area to Costa Morena western access (lighting efficiency of the areas of Costa Morena Ovest, with the structural safety of the existing light towers and the replacement of obsolete lighting fixtures that are currently equipped);
4) *Municipality of Brindisi:* Improvement of access roads to the ferry port area in the Municipality of Brindisi through the construction of a safer roundabout on the crossroad existing in the main street, which goes from the city centre to the port;
5) *Municipality of Igoumenitsa:* Upgrade of the street lighting at the main roads of the Municipality of Igoumenitsa: change of all the streetlights with new automatic LED lights with sensors at the two main roads of the city that connect the Port with the City Center improving the city viability.

EU ports and their cities

Ports have always been an important asset to Europe, serving as gateways to the rest of the world and as connection points to rivers across European territory.

For centuries, ports and their cities developed hand in hand, the port generating prosperity for the city. This has changed with the industrial revolution, globalization and the rapid development of containerisation. Most ports moved out of their cities and their mutual relationship began to suffer.

Today, this relationship experiences a new dynamism, driven on both sides by the aspiration to revive ports after the recent crisis, while at the same time making the most of their potential as a stimulus for city life and regeneration. In recent years, a variety of policy options have been identified and their efficiency tested. Port authority organisations were among the first to realise that for ports to flourish in the long term, their cities also need to prosper, and began taking steps towards improving their mutual relations. The progressive development of the EU's urban policies can pave the way to further joint development of ports and cities and offer new solutions to urban challenges, essential for achieving the smart, sustainable and inclusive society envisaged in the Europe's long term digital strategy.

The European Union (EU) depends on its seaports for trade with the rest of the world (74 % of goods imported and exported), for exchanges within the Union (37%) and for transporting 400 million passengers per year. Directly or indirectly, EU ports employ over 3 million people. At the same time, the EU also recognises the increasing importance of ports along inland waterways and their contribution to sustainable mobility in Europe. Therefore, the general issues dealt with in this briefing relate to some extent both to seaports and inland ports; more information, however, is currently available on seaports.

After centuries of close relations between ports and their cities, the link between the port and city prosperity has weakened. The rapid growth in vessel size and volume of cargo transported over the past 30 years has led to ever-growing demands on port space, not only for new berths to accommodate bigger vessels, but also for cargo-handling and storage facilities, cargo-related industries and the necessary transport infrastructure. Gradually, ports have moved out of city centres, leaving the port-city with fewer direct economic benefits, but having to cope with various negative local impacts, such as on air and water quality, noise and traffic. It is no longer taken for granted that a wellfunctioning port automatically has a net positive impact on the city. The already challenging port-city relationship has further intensified with globalisation and related industrial restructuring.

In the last decades, urban waterfronts have been rediscovered for urban redevelopment. No longer used for port industry activities, many derelict port areas have been transformed into upcoming neighbourhoods. Often, these projects resulted in a uniform type of architecture being developed, without any link with the actual port.

Options available for port development being limited by the lack of available sites and strict environmental requirements, the struggle for space between the port and the city has sharpened. Some ports have been obliged to maintain their activities near, or return them to, urban areas. Social acceptance of port operations remains low, and security measures require strengthening due to the increased risks of terrorism.

The role of port authorities

The scope of action of port authorities has expanded. They have come to play a more important role in the community outside the port itself. By taking a broader perspective on their corporate social responsibility, strategic relations with stakeholders and environmental management, they improve relations between the port and the surrounding society to defend the port's 'license to operate'. This involves dealing with conflicting interests linked to environmental protection, urban development, labour conditions, residents' interest, the overall economic development, and recently also dealing with migrants.

According to a 2016 survey conducted by the European Sea Ports Organisation (*www.espo.be*), European port authorities are developing different ways to connect with their stakeholders. To counter the tensions triggered by the proximity of the port to urban areas, they implement initiatives promoting good cohabitation (81%), explaining positive effects of the port activity, such as on employment, taxes paid to the region and connectivity (80%) and attracting young people to work in the port (36%). Only 10% of ports report no such initiatives. Most (64%) have adopted, in consultation

with public authorities and key stakeholders, a port master plan, outlining the port's strategic planning for 15-30 years and potential impacts on the surrounding community.

To some extent, port ownership influences the readiness of the port authority to cooperate with the city administration. In Europe, the majority of seaports (87%) remain under public ownership, mostly owned by the state or by the municipality, as mixed public-private partnership is still rare (7%), while full private ownership is common in the United Kingdom (6% of EU). However, more ports are moving towards private-like management structures and comply with normal commercial law.

Balancing the impacts of ports on their cities

Differences among European port cities are considerable. Due to the diverse nature of ports (in terms of size, function and geographical characteristics) and cities, each port city faces its particular mix of challenges. They all, however, share one common objective: to increase the net positive impact from their ports and, in this way, support the local urban economy. For the EU, a coherent response to urban challenges is critical for achieving the smart, sustainable and inclusive society envisaged in European Strategies.

Negative environmental impacts of ports comprise air and water pollution; solid and liquid waste from ships and cargo; noise; dust; and harmful aquatic organisms from ballast water impact on biodiversity. Depending on their proximity to urban activities, the odours and visual impacts produced, related to stacking of bulk cargo, containers, and artificial lighting for 24 hours a day, are also problematic. Ports generate heavy traffic and congestion, with associated public health consequences.

Other impacts are of a mixed nature and concern the space occupied by the port and its land use, impacts on the social life of local communities, recreational activities and tourism. Moreover, due to their location in low-lying areas and deltas, ports are particularly vulnerable to climate change and can be affected by rising sea levels, floods, storms and strong winds. Recently, security risks have become more of a concern.[2]

In ports, a variety of good practice on mitigating environmental impacts exists. Many ports provide shore electricity to ships, have introduced differentiated port charges based on the environmental ship index, replaced old polluting trucks operating in the port and encourage modal shift (for instance by giving a discount on port dues for containers arrived by train). The port-cities limit these impacts by creating buffer zones. They restrict urban development in the proximity of the port to within a certain distance and provide either a nature-linked compensation (a golf course in Helsinki) or create areas with mixed development (creative workplaces in Amsterdam, a maritime training institute in Rotterdam). Alternatively, they allow port and

urban functions to co-exist, but mitigate the impacts using dust covers, sound walls and exhaust filters.

Opportunities

Ports and port-cities take action to increase the economic benefits from ports while mitigating the negative impacts. The process of generating economic benefits may be described with reference to three economic policy models:

- *Maritime clusters* are key to the maritime domain, as shipping and port industries depend heavily on subcontracting and require a specialised local workforce. As maritime clusters can generate high added value to the surrounding city and region, governments use a range of instruments to support them. However, as the success of these instruments depends on the local context, the cluster policy should respond to locally identified needs. Clusters typically bring together the port and logistics, shipping and maritime services, shipbuilding and repair.
- *Port-industrial development* creates linkages with the local economy. The circular economy can seize opportunities for ecological synergies offered by the proximity of industrial firms from different sectors (such as for heating or waste treatment). Also, renewable energy can be developed, in particular offshore wind energy, which however requires a competitive institutional framework set by the national government.
- *Port-related waterfront development* transforms former industrial port sites into urban places. Successful projects have achieved a mix of functions that make the waterfront economically vibrant. This typically includes port functions, recreational and cultural activities, as well as food markets or restaurants. They rely on a master plan agreed by the different actors involved, which should provide public access to – and enjoyment of – water, as well as solutions for transport and water and land use.

As an over-reliance on the performance of the port can be risky, some port-cities reduce their dependence on the port through economic diversification (Antwerp: fashion business; Hamburg: local media industries; Rotterdam: architecture centre). To face common challenges, neighbouring port-cities engage in regional networking.

Policy approaches

Given that a 'typical port-city' does not exist, the impact of concrete measures depends on local circumstances. Therefore, an effective policy mix needs careful balancing, building on existing strengths and developing new capacities and assets. The chosen policy mix should be coherent.

Nevertheless, in the market-driven environment of global shipping, the room for manoeuvre for public policies is limited.

Port authorities and city governments usually differ in their goals and perception of challenges. Port authorities focus on aspects that make the port competitive, such as connections to other ports, effective port operations, quality of inputs (labour, equipment and land), efficient organisation and strong hinterland connections.

Tab. 6 – Policy aims for typical ports and cities

Area of interest	*Port*	*City*	*Port-city*
Economic	Port volumes	Value added, diversification	Smart port growth strategies Maritime clusters
Transportation	Freight	Passengers	Dedicated freight corridors or smart coexistence of freight and passenger traffic
Labour	Efficiency	Employment	High value added portrelated employment
Environment	Limit impacts	Quality of life	Green growth
Land use	Cargo handling, industry	Urban waterfront as opportunities for housing	Mixed developments, with a role for port functions
Structural logic	Closed industrial cluster	Open networks with pure agglomeration effects	Mix

Source: The Competitiveness of *Global Port-Cities*, OECD, 2014.

While port policies enhance port traffic performance, the prosperity of the port-city derives from high value-added and jobs generated by the port.[3] Many cities have tried to stimulate port-city development by public policies, some being more successful than others in increasing the prosperity of both ports and port-cities.

According to the OECD, the most effective policies for both sides are transportation and R&D. What is more, policy effectiveness (even in highly successful port-cities) could be further increased by focusing more on transportation. On the other hand, policies aimed at creating port-city synergies have proven relatively ineffective. City prosperity directly depends on port activity, but not so much on port-city policies. Similarly, spatial and communication policies also have mixed results.

These findings complement the concept of 'soft values', developed by Professor Eric Van Hooydonk of the University of Antwerp.[4] It values the non-socioeconomic assets of ports, whether spiritual (ports are perceived, for example, as places of refuge or sources of artistic inspiration), or tangible (ports as collections of built heritage, tourist attractions or recreational resorts). While management, promotion and development of soft values are key to achieving ports' societal integration, they need to be complemented by hard values, such as attracting employees by investing in educational infrastructure. The port city renovation should exploit the *genius loci* of port city centres, to 'tell the port story' and promote port heritage and culture. It should also break through the port boundaries, invite people to experience port life, and broaden the port community's perspective.

Main factors to be considered

Having realised that the long-term economic prosperity of ports can be safeguarded only with equal growth in societal innovation, port organisations are actively promoting cooperation between ports and cities. Port development depends on future demands on space, energy generation and transition, climate change adaptation and the needs of the next generation of consumers, making it essential that societal integration should be an established element of port management.

The *International association of cities and ports* (IACP), together with a number of EU port cities, compared good practices for the redevelopment of city-port linking spaces.[5] In its view, to develop a functional and spatial mix of ports and cities, planners should:

- Respect access to port areas and manage accessibility to city-port interface sites, exploiting all the potentials provided by the water.
- Reduce reciprocal impacts, communicate and obtain acceptance for certain nuisances.
- Treat the port like an urban space, be flexible and not 'freeze' spaces, organise blending of spaces that link and benefit ports and cities.
- Render the port visible, open to people and integrated into the city life, and prepare for tomorrow's jobs.

Building on these elements, ESPO (*www.espo.be*) published the *Code of practice on societal integration of ports* in 2010, followed by the *Code of good practices for cruise and ferry ports* in 2016. The goal is to improve port image and general public support, foster education and labour market initiatives and develop port-city relationships. In addition to limiting negative port impacts and involving people who live close to the port, ESPO offers further recommendations on port-city regeneration:

- *Waterfront regeneration projects should combine residential urban actions with port activities*, to maximise the port-city feeling, but also to allow for logistic solutions for both passengers and traffic. For instance, Marseilles has carried out a development programme sustaining port operations, while renovating old port districts. One of the renovated buildings now provides a combined space for culture and offices, while the space underneath is reserved for port operations.
- *Offer transport and logistic solutions to cities, for cargo and people*. Opt for shared waterfront use instead of surrendering waterside transhipment space entirely to residential property development, which reduces the use of rivers and puts more trucks on roads. In London, for example, after years of development pressure, the Port of London Authority in 1990 reserved several strategic wharves along the Thames for cargo-handling, reversing the trend towards less river transport. Similarly, passenger transport needs investment in dedicated berths and waiting zones.
- *Exploit the potential of cruise tourism and ferries***.** Cruise traffic is on the rise, both maritime and on inland waterways, and together with ferries form an important part of the economy. Cruise tourism generates revenues for the city. Good practice consists, for instance, in transforming the cruise terminal into a multipurpose centre, which during the low tourist season can be used for conferences, exhibitions, educational activities, while also offering services to passengers.

AIVP Good practices

The Worldwide network of port cities (AIVP) published a very detailed guide of good practices on how to plan cities with ports and, every two years, organises a world conference for port and urban decision-makers to develop and share know-how.

The study is summarizing the 4 pillars of potential sustainable and cross beneficial cooperation between ports and their cities, with great paradigms from port-cities around the world:

- *Spatial organization* – City/port interfaces are complex territories where the inherent competition and complementarity between city and port play out in the face of limited spatial resources. The search for the right balance calls for solutions that guarantee a good spatial and functional mix capable of transforming and rejuvenating not only the city/port interface but also the entire territory of the port city.
- *Environmental challenges* – Climate change and rising water levels are a major consideration in large-scale projects for port city developers. A new approach to waterfront planning is gradually emerging, which could see the development of pioneering solutions, not just to protect the environment

but as an opportunity to create new spaces. However, planning the city with the port necessarily means optimizing environmental performance. In this too, the city-port is a useful place for rolling out strategies and measures to reduce the environmental footprint, with a clear emphasis on anticipation and cooperation.

- *Economic development strategies* – The economic potential of city/port territories goes well beyond cruise business alone. It is now based around the development of new traditional or highly innovative activities, driven by the specific features of city/port interfaces. Alongside fishing, boating, etc., the creation of a more comprehensive range of tourist attractions and services is a driving factor in the area's economic development, attracting both local visitors and tourists from further afield. In addition to providing an opportune location for creating cultural clusters, port-city territories are also well suited to the creation of economic clusters built around maritime businesses – such as offshore wind power, recreational sailing, etc. – which currently occupy a dominant place in many port cities. In order to succeed, however, these projects require strategies to make them possible and profitable over the long period needed to realise them.
- *Governance and project management* – Housing development strategies or plans to fill in dock basins can pose an irreversible threat to the future of existing port activities. One way to avoid such pitfalls involves clearly identifying the port's current footprint and the ways in which it is likely to be altered under various port development scenarios. The findings can then be used to examine compatibilities and incompatibilities – between port expansion or redevelopment projects on the one hand, and urban development projects on the other. This example alone illustrates the need to consider the range of options available for urban and port (re) development, and to ensure adequate means of dialogue and consultation are in place. In addition to this, however, the challenge is to secure the engagement of civil society, ensuring that the population properly understands and supports projects as they progress.

One of the most important aspects of cooperation is to "*formalise framework agreements regarding development projects that affect the city and the port*", in cases where the city and port have adopted projects that are likely to come into conflict, but where local realities mean that current plans are already set in motion, consultation bodies and forums are necessary but not in themselves sufficient. The creation of a joint structure, formally laying the foundations for harmonious and sustainable development, can provide guarantees and ensure success for the territory.

The port should be turned into an active player in the City Strategic Planning through common actions or dissemination from each stakeholder.

From the other hand lack of knowledge about the port's activities and contribution to city life, especially in economic terms, is often a source of misunderstanding, indifference or even hostility on the part of citizens. In addressing this, the authorities have a crucial role to play which may entail:

- regular participation by the port authority in the city's cultural and/or social activities (exhibition, charity, etc.);
- organising regular events (music, cinema, sports, sailing, "port days", etc.) in city/port interface areas. The impact of such events can be maximised by holding them at sites with direct views of the working port or where port activities have been preserved.

The creation of structures enabling port and urban authorities to set out their requirements and redevelopment strategies represents an opportunity to compare urban and port projects side by side, and to identify any functional incompatibilities or technical impossibilities at an early stage. Dialogue may be opened up to include the wider community affected by projects (private partners, population, etc.), helping to anticipate potential conflicts and move projects forward. A strategy of regular, tangible communication can bring the project to life and help dispel the impression of inertia.

City 4.0: A theoretical framework

The purpose of a Smart City is to solve its inherent problems while simultaneously reducing its expenditure and improving its quality of life. Through the 4th Industrial Revolution technology, the advantages of Smart City are estimated to overcome the city's expenses with city platformization. While a city traditionally is the subject of creation and not consumption, a Smart City currently is the key industry in generating more than 60% of its GDP in value creation from a production viewpoint.

According to the UN (2018), 55% of the total population of the world live in urban areas and it is expected to increase to 68% by 2050. As benefits that city offers increase, the urban population is growing along with it. Traffic, environmental problems, and crimes are naturally increasing as well. Around 2010 major countries around the world, have started to build 'smart' cities in order to lower costs and improve the services offered.

There are, however, several different perspectives on how 'costs' and 'benefits' should be defined. From a cost perspective, the recognition that a Smart City should be considered a 'platform' and that led to attempts to design cities with that in mind were made.

Moreover, with the expansion of online-offline convergence, cities can grow without limitation on its size, where connectivity and innovation determine the inclination of the city's benefit-cost curve. As a city platform

is responsible for connectivity, its value drastically increases through the 4th Industrial Revolution's O2O (online to offline convergence) platform.

When a city reflects on its own as a Digital Twin in the Cloud and when complete information becomes accessible through citizen's participation through smartphones (Edge), Self-organization takes place, an ideal linkage between the city and citizens.

Lastly, EU and global countries are pushing for technology R&D to build Smart Cities, and companies are also providing Smart City services using their new technologies. In particular, the transportation and energy field are emerging as the main areas of technology development.

Is the strategy of Smart City a technology development and a utilization strategy? Many cities have strategies for individual sector technologies, but key strategies for the overall platform ecosystem are lacking. Smart City is not a smartization through individual technology but accesses the city as a platform of human life that encompasses production and consumption. Moreover, the rules that share the common components of the city platform will be the key to Smart City policy, and this is the error of 'technologies'.

The fundamentals Smart City models

Before adopting Smart City strategies and models *to small port cities like Igoumenitsa and Brindisi*, we can start with the principal question of what the fundamental elements of a city are.

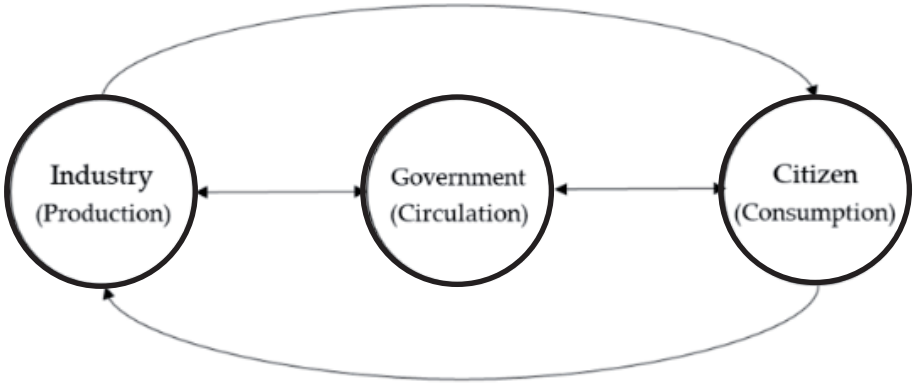
Since Smart Cities are the smartization of cities, we must first define which factors that cities are composed of and then lead to the derivation of models that implement Smart Cities. A city, a large human settlement, consists of three elements: people, business, and government organizations (Wikipedia). Nam and Pardo (2011) analyzed various words that refer to a city, such as Digital city, and found that they resulted in three factors: technology, human, and institutions. Also, Yigitcanlar et al. analyzed various definitions of Smart Cities and suggested 'sustainability', and 'sustainable and knowledge-based development' as keywords as comprehensive definitions.

In addition, Hollands has suggested that a holistic approach that facilitates the interaction between components of Smart Cities is required. Given the above, the essential elements of the city are defined as a space in which production and consumption circulated, and correspondingly, they present as industry, citizens, and government as representative elements as seen in the following figure.

In our case, small port cities of the Adriatic Ionian area, the Industry is including as well the ecosystem of port related businesses, activities and entrepreneurship generated by the Ports of Igoumenitsa and Port of Brindisi, thus expanding the model with more specific production, circulation and consumption stakeholders. Since the relation of the city and the Port

Authorities are of different nature in each country, this relationship should be analyses with specific legal and cross-lateral agreements for different aspects of the cities' smart smartization.

Fig. 20 – Fundamental elements of Smart City



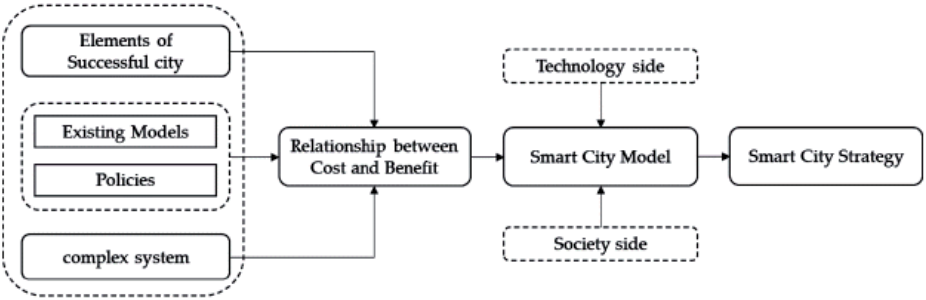
A global view of the City 4.0 blueprint

Based on the above basic model, we will follow a systematic methodology to draft a conceptual model for a Smart City blueprint and then draft the future implementation strategies.

- Stage 1. Derivation of future Smart City evolution through analysis of existing Smart City evolution model based on best practices from EU and current situation in city of Igoumenitsa.
- Stage 2. Derivation of comprehensive Smart City blueprints that are drawn through Smart City-related policy analysis of similar cities, in our case the EU cities with focus on small port cities.
- Stage 3. Derivation of requirements for urban sustainability and growth by analyzing the elements of a successful city.
- Stage 4. Through cost–utility analysis, the city's possibility of implementing the blueprint is elicited.
- Stage 5. Developing Smart City social element model and Smart City implementation technology model.
- Stage 6. Modeling the applicable model to implement the actual Smart City and presenting its core strategies and actions.

To derive the Smart City 4.0 model, we can start with the analysis of various costs and benefits that the city entails. It has been suggested that the limit to growth of a city is reached when it becomes unsustainable as increases in costs become greater than those of benefits as it grows.

Fig. 21 – Model derivation process of the smart city



For this reason, Smart Cities until now, have focused on solving urban problems from the cost perspective. However, online platforms appeared with the emergence of the internet, and they started to take on the role of a hub of connections and sharing leading to the creation of values online. Then, the improvements in technologies that spur connections in the 4th Industrial Revolution ignited the transformation of the city to a platform, and the platform as a city makes both cost reductions and value maximizations possible. This is because a platform allows sharing of common elements that lowers costs and creates value by making it possible to concentrate on core competencies. If these changes are considered, the function between costs and benefits must be reconfigured.

The real world is made up of materials of the 1st and 2nd Industrial Revolution, based on the value system of ownership that is inconsistent with the shared value system of the platform that makes creation of values difficult, and the network effect of an offline city was minimal.

When the PC was introduced during the first stage of the 3rd Industrial Revolution, the rate of connectivity increased and offline automation was realized, but the platform was still offline. Sarnoff's law applies to the benefits of a city like convenience, productivity, etc., but the model where the costs of a city, such as crime, traffic congestion, etc. increase faster than the growth rate defined Smart City 1.0. It meant that there is an optimal city size and that raised the need to decentralize the city.

The wired internet of the 3rd Industrial Revolution activated the online platform and made sharing of information possible. The online information revolution made sharing of information easier to connect information and that made a great impact on 'creativity'. The benefits of a city increased due to the increase in creativity and made the application of Metcalfe's law, which lowered the cost corresponding to the level of informatization at a rate equal to the square of the size of the city possible. As a key element that improves connectivity, the platform effect is low in the offline city, but massive amounts of effects could generate in the online city.

The 4th Industrial Revolution made it possible for cities to overcome the online world of information by transforming to the offline world of materials to becoming a shared platform. Then the O2O platform became possible with the introduction of wireless internet and Internet of Things (IoT) and that rapidly expanded the O2O region.

The traditional economy could be considered an economy of manufactured goods consisting of hardware and software. With the introduction of smartphones and IoT, it became possible to lower the cost of connectivity to steadily converge on zero. In addition, the network effect of a platform is such that a city benefits exponentially while its costs increase at a lower rate than the rate of growth of the city because of intelligentification. In other words, such as a platform where its consumers actively interact with each other, Reed's law is applicable which states that the value of the Social Networking Service (SNS) platform is the n-th root of the number of participants.

The O2O platform of the 4th Industrial Revolution expanded the connection between the physical and information and made it possible for Reed's law, where benefits increase dramatically due to the network effect, to be applied. The level of innovativeness affects the magnitude of changes in benefits, and the wireless internet and IoT lower cost propitiously, the converging area between online and offline expands, and the limit to the city size is removed and starts the drive to bulk up its size.

The convergence of the real and the virtual is allowing a stage of the development of a city to *enter the low-cost, high-efficiency stage*. The digital transformation technologies of the 4th Industrial Revolution, such as cloud computing, big data, etc. makes constructing a virtual city that corresponds 1 to 1 to the real city possible. If this kind of cloud-based Smart City is defined as Smart City 3.0, the next stage will be Smart City 4.0 which would be an evolutionary outcome where 'Cloud' and 'Edge' self-organize as a Holon.

Self-organizing is a city's own optimal connection structure. If a city evolves smoothly, the capacities converge the problems. There is a need for a structure where each section of a city – such as shops, shopping districts, streets, etc., – change flexibly as needs arise. The condition that is assumed is the Holon structure where the part and the whole converge.

Cloud exists in virtual space and possesses all information, and Edge exists in the real world and reflects a part of information. It means that when pieces of partial information, which is edge, are combined to construct cloud, which contains the whole information, but core data of the whole cloud should always be reflected in Edge (i.e., part). In the real world, it is comparable to people using smartphones to get possession of the core information of the cloud (and 'things' from chips) and utilizing it whenever a need arises (e.g., the Smart City in my smartphone).

Edge that is decentralized reality, and cloud that is integrated whole reflect each other to form a Holon structure to build a complex adaptive system. Smart City 4.0 is going to self-organize as a blockchain platform of decentralization where Reed's law would apply--i.e., as the effect of self-organization is added creating more values along the way. It means the network effect of super-connectivity increases productivity, intelligentification lowers costs of resolving issues, and ultimately the city evolves to the stage where it possesses life as it goes through the self-organization stage when it recognizes problems and solves them on its own.

The Fig. 22 below shows the conceptual development of technology and the evolution of Smart City Models.

Fig. 22 – Smart City evolution model

	Smart City 1.0	Smart City 2.0	Smart City 3.0	Smart City 4.0
Connectivity	Until emergence of PC	Wired Internet	Wireless internet, IoT	Cloud + Edge Blockchain
Human	Five senses	Neural network	Brain	Behavior (Life)
City	Sensors	Sensors + Communication	Sensors + Communication + AI	Sensors + Communication + AI + Citizen
City size (Cost/Benefit)	Limited (Optimization)	Expansion	Giantization	Self-organizing
Value	Sarnoff's Law N	Metcalfe's Law N^2	Reed's Law 2^n	

If Smart City 4.0 is to be realized, it is first necessary to build a social model that consists of all the elements of Smart City.

A city consists fundamentally of the interaction of urban space and citizens. This interaction results in a cycle of production and consumption which we suggested as a research model. The three pillars of the city are industry (production/entrepreneurship), Citizen (consumption) and Government (circulation).

First, in the economic-society field, production consists of industrial activities while consumption means citizens' life. Then, they are connected by mobility, which can be redefined as the interaction between humans, space, and time. For these three elements of economic society to circulate and develop, the environment that a city offers should be provided.

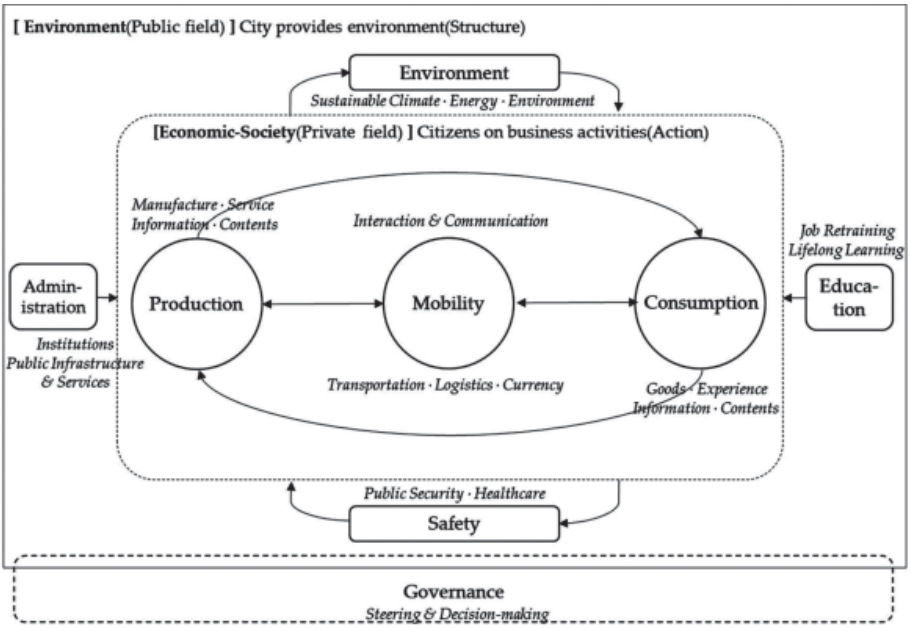
The environment consists of four elements—environment, institutions, education, and safety. The environment raises the issue of urban development

while supporting sustainable economic and social development. Safety is an element provided by cities for the safe and healthy wellbeing of citizens.

Education is also an important element of sustainable development connected with citizens' job retraining and lifelong learning. Then an efficient administration must support the city as a system. Finally, the driving force that steers strategic directions is governance.

These seven elements are presented as seven elements of the Smart City social model, and they are the basis for the Smart City Social Model in below (KCERN, 2018):

Fig. 23 – Smart City 4.0 Implementation Technology-Social Model



Source: KCERN, 2018.

Based on the above model, the Smart Cities of global major city leaders are combined to confirm that both mobility and environmental issues and strategies are essential elements. What it means is that major cities consider urban sustainability and connectivity as the core of a Smart City.

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13.
Identification of Tools and Indicators to Support Policy Makers

13.1. Methodological Overview

The OECD defines smart cities as "cities that leverage digitalisation and engage stakeholders to improve people's well-being and build more inclusive, sustainable and resilient societies". This definition underlines that digitalisation and digital innovation are not an end in itself, but rather aim to improve people's lives to achieve greater inclusion, sustainability and resilience[1].

By seizing the opportunities offered by the digital transition, including those coming from artificial intelligence, cloud computing and Big Data, smart cities can improve the lives of millions of urban residents, by enhancing people's safety, increasing energy efficiency in housing, facilitating people's access to goods and services, boosting participatory policymaking – and many more.

And yet, there is no guarantee that all smart city initiatives automatically improve everyone's well-being. In some instances, digitalisation may bring about challenges and threats, including:

- Privacy risks: while data offers a remarkable asset and opportunity for smart cities, it also entails both a weakness for those cities that have a weaker capacity to collect, store or use data, and a threat when considering privacy concerns related to the storage and use of personal data.
- Regulatory challenges: the advent of smart cities is disrupting established models of urban governance because data-driven smart city initiatives may shake traditional notions of urban governance, notably in terms of fair competition, labour laws, government contracts and regulation. The wealth of data that could be collected in cities has the potential to help

[1] DOCK-BI Deliverable 3.5.5 – Lot 2, "The Digital Intelligent Transformations around Ports – A Sustainability Plan and Future Prospects of Igoumenitsa City 4.0".

deliver services more efficiently, but only if the right policy frameworks and regulations are in place to harness benefits and avoid risks.

- Widening inequalities: more fundamentally, if the needs of all population groups are not taken into account, smart city initiatives may deepen the digital divide between people who have access to technologies, digital skills and information – who can therefore reap the benefits brought by digitalisation – and people who lack the necessary access and find themselves left behind.

Fig. 24 – SWOT Analysis of Smart Cities

Source: OECD, 2020.

Measuring the performance of smart cities is therefore essential to ensure their effectiveness. Assessing smart city performance also helps ground policy intervention in solid evidence by guiding decision makers, both at

national and local levels, in setting realistic targets, understanding where cities stand vis-à-vis their objectives, tracking progress and adjusting policy interventions for greater efficiency and effectiveness. Ultimately, smart city measurement enhances accountability and helps citizens monitor how governments deliver on their commitments.

Many institutions, organisations and sometimes cities themselves have worked on measuring smart cities through a variety of frameworks. In particular:

- *Measurement frameworks tend to use a large number of indicators.* A recent literature review of smart city indicators identifies as many as 1 152 different smart city indicators (Petrova-Antonova and Ilieva, 2018). For example, the indicator framework for sustainable, resilient and smart cities, called "Sustainable development in communities – indicators for smart cities" developed by the International Organisation for Standardisation (ISO) has 85 indicators. Another example lies in the 91 Key Performance Indicators (KPIs) for Smart Sustainable Cities (SSC), developed by the United for Smart Sustainable Cities (U4SSC), a UN initiative co-ordinated by ITU (International Telecommunication Union), UNECE (United Nations Economic Commission for Europe) and UN Habitat. CITYKeys has also developed a measurement framework on the performance of smart cities targeted at European cities and includes 75 indicators.
- *Smart city indicators often cover many different dimensions***.** For example, Petrova-Antonova and Ilieva (2018) classify the 1152 indicators that they identified into six main categories: nature, governance, economy, mobility, people and living. In their analysis of six internationally applicable standardised frameworks of smart cities, (Huovila, Bosch and Airaksinen, 2019) list the following dimensions: natural environment, built environment, water and waste, transport, energy, economy, education, culture, innovation and science, health, well-being and safety, governance and citizen engagement, and ICT. The ISO indicator framework for smart cities has 19 dimensions, including economic, environmental and social dimensions (ISO, 2019). The KPIs for SSC developed by U4SSC (2020) cover three dimensions – economy, environment, and society and culture – and each of these dimensions is broken down into sub-dimensions. The CITYKeys (*www.cityeys-project.eu*) framework is broken down into five dimensions: people, planet, prosperity, governance and scalability/replicability.
- *Measurement frameworks also differ in the type of indicators that they use.* Some frameworks measure the *inputs* related to smart cities, i.e. the amount of resources that are allocated to smart cities. Some others assess the *outputs* of smart cities, which evaluate progress in implementing

smart city solutions, for example via the percentage of households equipped with smart electricity metres. Others measure the *outcomes* of smart cities, i.e. the impact of smart city solutions on achieving smart city objectives. For example, the ISO indicator framework focuses on smart enabling technologies, while the KPIs for SSC include both output and outcome indicators. CITYKeys' indicators are mostly outcome indicators, i.e. they measure progress towards policy objectives such as CO_2 emissions per capita per year or the percentage of population living in affordable housing.

- *The reach of measurement frameworks varies in practice,* particularly in terms of geographic focus, scale of analysis, main target audience (city authorities, smart city developers or investors), and if and how any evaluation is carried out. For example, while CITYKeys' framework focuses on European cities, ISO's and U4SSC's frameworks aim at reaching cities globally. Many frameworks provide self-assessment tools, such as the U4SSC KPIs, CITYKeys and the ISO standards, together with recommendations for their implementation.

Indicators can be classified into three broad categories according to what they measure: input indicators, output indicators and outcome indicators (OECD, *www.oecd.org*):

- *Input indicators:* Input indicators measure the amount of resources that are allocated to a policy. Typical input indicators are the funds spent on a certain policy or the number of people working on a project. Input indicators therefore provide a measure of the effort that is devoted to pursuing a policy but they do not give any information whether the resources are efficiently spent or whether a policy is effective in achieving an objective.
- *Output indicators:* Output indicators measure quantities produced by a policy in order to achieve its objectives, but not progress towards the policy objectives. Outputs are therefore means to achieve a policy objective, but no ends in themselves. Typical output indicators might show the number of motorway kilometres built, the number of people trained to fulfil a task, or the percentage of households equipped in smart energy metres. Output indicators do not tell whether a policy is effective in achieving its desired objective or not.
- *Outcome indicators:* Outcome indicators monitor the effectiveness of a policy in achieving its objectives. While outcomes are the underlying motivation behind policies, they can only be affected through the inputs and outputs. Typical outcome indicators might be the reduction in commuting time to the place of work, satisfaction with life or the city, or energy savings.

13.2. Smart City Measurement Framework

Advancing the measurement of smart city performance calls for a comprehensive, multi-dimensional and flexible framework that serves local and national strategic priorities, as well as global sustainable development objectives. In our approach, we are selecting to apply the OECD Smart City Measurement Framework, that endeavours to respond to fundamental questions such as what to measure and how, and for whom the framework is intended. It aims to encompass not only the degree of digitalisation in cities, but also the level of stakeholders' engagement, and how both contribute to improving the well-being of all urban residents and building inclusive, resilient and sustainable cities. The measurement framework needs to serve as a tool to guide local and national governments in their efforts to reshape city governance, business models and stakeholder engagement through digital innovation.

The Smart City Measurement Framework proposed here will therefore revolve around these three aspects, which are mirrored in the following three pillars:

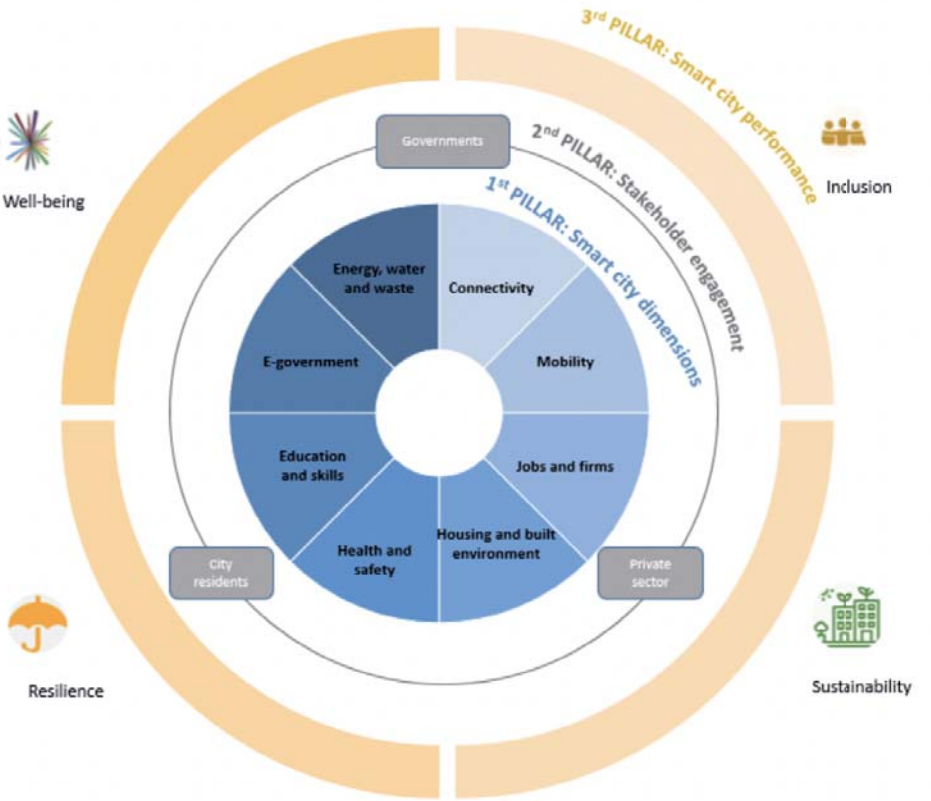
- *Pillar 1* – Indicators of the degree of digitalisation and digital innovation implemented at the city level (input and output indicators), i.e. the smart city tools.
- *Pillar 2* – Indicators of the engagement of various stakeholders in building the smart city.
- *Pillar 3* – Indicators of the four core objectives of the smart city (mainly outcome indicators), namely well-being, inclusiveness, sustainability and resilience that are shaped by the smart city tools and engagement (from Pillar 1 and Pillar 2).

Bringing these three pillars together, the Smart City Measurement Framework proposes to:

- focus on people and consider urban residents not only as recipients or users of smart cities, but also as designers of smart cities;
- encompass not only digitalisation in cities, but also how digital innovation can improve well-being outcomes, inclusion, sustainability and resilience to address local and global urban challenges through digital innovation;
- enable benchmarking of cities across countries;
- allow monitoring over time.

The three pillars are briefly outlined in the sections below, together with preliminary sets of indicators proposed for each of them. Indicators should meet the following criteria: simplicity, measurability, availability and comparability across places and times.

Fig. 25 – Smart City Measurement Framework



Source: OECD, 2020.

Pillar 1 – Smart city tools

The first pillar of the Smart City Measurement Framework addresses the first component of the definition of smart cities, i.e. **the degree of digitalisation and digital innovation implemented at the city level**. As shown in the analysis of existing measurement frameworks of smart cities (see previous section), a wide range of indicators already exist on the degree of digitalisation in a city, covering a variety of areas.

The first step in the definition of Pillar 1 of the Smart City Measurement Framework consists in identifying the needs of urban residents and what matters most to people in cities. Digital technologies are radically transforming the way people communicate, move around in cities, work, live in their homes, get healthcare and education, vote, and consume energy and water, among many other aspects of their lives.

The proposed dimensions for the classification of the indicators on smart city tools therefore include: connectivity; mobility; jobs and firms; built

environment; health and safety; education and skills; egovernment; energy, water and waste.

The second step is the selection of indicators for each of these dimensions. Importantly, these indicators can be input or output indicators of digitalisation. Table below proposes a preliminary set of possible indicators on smart city tools. This selection of indicators will need to be further discussed and refined, particularly regarding their availability at the city level.

Tab. 7 – Suggested indicators for smart city tools

Dimensions	*Indicators*
Connectivity	% households equipped with internet, wireless broadband coverage; % of households who use digital apps or platforms to connect to local community.
Mobility	% of smart traffic lights; % of public transport equipped with real-time information; number of users of sharing economy transportation per 100.000 population; % of public parking spaces equipped with epayment systems.
Jobs and firms	% of job seekers who have access to e-career centres; expenditure in R&D.
Housing and built environment	Open-source cadastral data; digital land-use and building permits.
Health and safety	% of medical appointments conducted remotely; % of population registered with public alert systems for air and water quality; % of population with online access to their unified health file; % population equipped with real-time alert systems.
Education and skills	% of children who have access to e-learning platforms; number of computers, laptops, tablets, or other digital learning devices available per 1.000 primary school students.
E-government	% of city services available online; number of municipal smart stations installed per 100.000 population; % of payments to the city that are paid electronically.
Energy, water and waste	% of households equipped with smart energy meters; % of buildings with smart electricity meters; % of smart street lights; % of households equipped with smart water meters; % drinking water under water quality monitoring by real-time water quality monitoring station; % of buildings equipped with smart waste systems.

Pillar 2 – Stakeholder engagement for smart cities

The level of stakeholder engagement as an *input* to the process of shaping a smart city is also central to the smart city definition. Key stakeholders of a smart city include:

- the city/local government (including co-operation with all levels of government);
- the city's residents (including NGOs and knowledge institutions such as universities); and
- the private sector (firms and entrepreneurs).

Stakeholder engagement and partnerships to boost civic engagement and leverage the role of the private sector in decision-making at the city level play a critical role in building smart cities. Stakeholder engagement can take place in different ways, ranging from basic communication and stakeholders' participation and feedback, to full co-production, co-delivery and co-evaluation, which implies a balanced sharing of powers among stakeholders. Digital innovation and technologies can also facilitate new forms of engagement with a broader range of urban residents and other stakeholders, and co-production throughout the policy design and implementation process.

Evaluating stakeholder engagement can have several benefits, notably because it can help:

- Strengthen the accountability of decision makers by measuring whether public and institutional resources, including stakeholders' time and efforts, are properly used.
- Help determine whether the engagement process was successful and to inventory lessons learnt to improve practice in the future.
- Contribute to anticipating and managing some risks.
- Help map out the different views held by different stakeholders at the start of a process and identify potential challenges that the process may face.

Table below outlines a set of indicators that can help gauge stakeholder engagement. Moving forward, a survey to collect data from cities could also be envisaged, considering that stakeholder engagement is often difficult to measure and compare across countries.

Tab. 8 – Examples of indicators on stakeholder engagement

Dimensions	*Indicators*
Inclusiveness and equity	Informed and transparent identification and selection of stakeholders to be involved in the engagement process; Broad outreach to inform individuals and organisations; Stakeholders' motivations and expectations have been clearly identified (e.g. survey); Equitable share of representation among categories of stakeholders.
Clarity of goals, transparency and accountability	Clear understanding of the framework of the engagement process in terms of line authority, proposed timeline, targeted objectives, expected outcomes, etc.; Development of a master schedule; Consistent and appropriate communication between promoters of the engagement process and the stakeholders involved; Dissemination of concise summaries of stakeholder meetings.
Capacity and information	Establishment of a website to educate stakeholders about how they can contribute; Number of training sessions; Summary reports are prepared using non-technical language; Existence of mediation mechanisms;
Efficiency and effectiveness	Regular monitoring throughout the engagement process; Definition of performance measures to gauge the extent of stakeholder engagement; Successful use of the inputs from the engagement process to achieve the desired outcomes agreed by stakeholders; Fulfilment of the agreed-upon purpose of the engagement process.
Institutionalisation, structuring and integration	Requirements for stakeholder engagement are in place within the organisation; Charters and the rules of the game are clearly established.
Adaptiveness	Outcomes of engagement processes cover short- and long-term issues ; Regular reassessment and establishment of new methods to address gaps where the engagement process is not meeting expectations.

Pillar 3 – Smart city performance

The degree of digitalisation of a city does not make a city "smart" in itself. What is central to the smart city definition is how digitalisation helps achieve four core objectives, i.e. improve people's well-being and foster more inclusive, sustainable and resilient societies. However, at the city level, measuring the impact of digital innovation on well-being, inclusion, sustainability and resilience may face conceptual and practical limitations, in particular:

- Impacts of digital innovation are difficult to isolate (i.e. there is no clear counter-factual), as technologies are evolving rapidly over time and digital transformation coincides with many other economic and social changes that affect well-being, inclusion, sustainability and resilience at the same time.
- The introduction of one smart city tool can have an effect on several outcome indicators at the same time. For example, public transit apps can improve people's mobility and reduce commuting times, while also decreasing pollution if it fosters more use of public transportation modes. Smart energy meters can help optimise energy consumption, thereby decreasing greenhouse gas emissions and helping people save money on their energy bills at the same time.
- Smart city tools can have both positive and negative impacts at the same time. For example, the installation of surveillance cameras can increase safety, but may also raise privacy concerns.

Despite the difficulty of measuring the impact of digital technologies on well-being, inclusion, sustainability and resilience, evidence of the impact of smart city tools does exist, such as: telemedicine and remote patient monitoring on health outcomes; car-pooling and bike-sharing applications on air quality; smart surveillance on crime rate; water leakage smart detection on water consumption; job e-platforms on job market efficiency; real-time transport applications on commuting times, etc. (McKinsey Global Institute, 2018).

The indicators suggested for smart city performance aim to reflect the four smart city objectives mentioned above, i.e. well-being, inclusion, sustainability and resilience. These indicators will determine what effect, if any, smart city initiatives in a given city have had on multiple dimensions of residents' lives.

Tab. 9 – Suggested indicators for smart city performance

Smart city objectives	*Dimensions*	*Indicators*
Well-being	Jobs	Employment rate (%)
		People satisfied with their job (%)
	Income	People with enough money to cover their needs (%)
	Housing	Overcrowding conditions (rooms per inhabitant)
		People satisfied with affordability of housing (%)
	Access to services	Performance of public transport network (ratio between accessibility and proximity to amenities or people)
		People satisfied with public transport (%)
		Average commuting time to place of work (minutes)
	Education	People from 25 to 64 years old with at least tertiary education (%)
	Political participation	Voter turnout (voters in the last national election as a% of the number of persons with voting rights)
	Health	Life expectancy at birth (years)
		People declaring good or very good health (%)
	Environmental quality	Exposure to PM2.5 in µg/m³, population weighted (micrograms per cubic metre)
	Personal safety	Percentage of population that feel safe walking alone at night around the area they live
		Transport-related mortality rates (deaths per 100.000 people)
		Percentage of population that have been assaulted or mugged in the previous 12 months
	Community	People satisfied with their city (%)
		People with someone to rely on in case of need (%)
	Life satisfaction	Satisfaction with life as a whole (from 0 to 10)
Inclusion	Economic	Gini index of disposable income (after taxes and transfers) (from 0 to 1)
		Ratio between average disposable income of top and bottom quintiles
	Gender and LGBT+	Gender gap in employment rate (male-female, percentage points)
		Female research and development personnel as a percentage of total research and development employment
		People that believes their place of residence is a good place to live for gay or lesbian people (%)
	Migrant and ethnic	Migrant gap in employment rate (native-foreign, percentage points)
		People that believes their place of residence is a good place to live for migrants (%)
		People that believes their place of residence is a good place to live for racial and ethnic minorities (%)
	Inter-generational	Children poverty rate (%)
		Elderly poverty rate (%)
		Youth unemployment rate (%)
		Young population (from 18 to 24 years old) not in education, employment or training (NEET) (%)

Tab. 9 – Continued

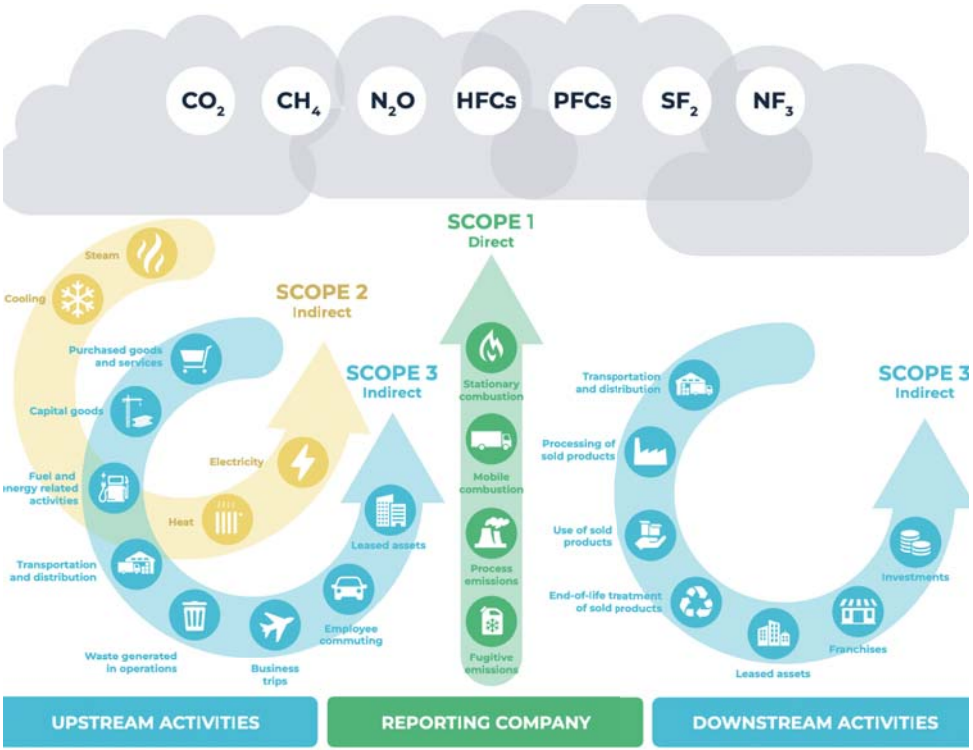
Smart city objectives	*Dimensions*	*Indicators*
Sustainability	Energy	Energy consumption per capita (kgoe per person)
		Electricity production from renewable sources (%)
	Climate	CO_2 emissions per electricity production (in tons of CO_2 equivalent per gigawatt hours)
		People satisfied with efforts to preserve the environment (%)
	Biodiversity	Change in tree cover (percentage points)
	Material footprint	Municipal waste rate (kilos per capita)
		Municipal waste that is recycled (%)
		Number of motor road vehicles per 100 people
		Change in land consumption per capita (squared metre per capita)
Resilience	Health and social	Active physicians rate (active physicians per 1.000 people)
		People with jobs that can be performed remotely (%)
	Institutions	Population without access to health care (%)
		People with confidence in the national government (%)
		People with confidence in judicial system and courts (%)
		People with confidence in the local police force (%)
		People that believe corruption is spread throughout the government in the country (%)

KPIs for special applications based on real data analytics

Beside the general methodology for measuring smart city performance, several detailed key performance indicators can be proposed for vertical applications e.g. like climate change impact based on European Green Deal Policies related to net zero target of EU 2050 Agenda.

The EU's Mission defines the net-zero target as the abolition of greenhouse gas emissions as a result of human activities, which can be converted or absorbed through (natural) storage. The 'net' in net zero is very central to this, as cities need to achieve a balance between emitting GHG gases by scaling up removal technologies and carbon sinks. As outlined in the JRC Info Kit for Cities (EC, 2021) the GHG gases that should be covered by the NZC framework are the following: Carbon Dioxide (CO_2), Methane (CH4), Nitrous Oxide (N2O), F-gases (Hydrofluorocarbons and Perfluorocarbons), Sulphur Hexafluoride (SF6), and Nitrogen Trifluoride (NF3).

Fig. 26 – Overview of Greenhouse Gas Protocol Categories



Source: World Resources Institute, & World Business Council for Sustainable Development. (n.d.). Corporate standard: Greenhouse gas protocol. Corporate Standard | Greenhouse Gas Protocol. Retrieved January 5, 2023, from *https://ghgprotocol.org/corporate-standard*.

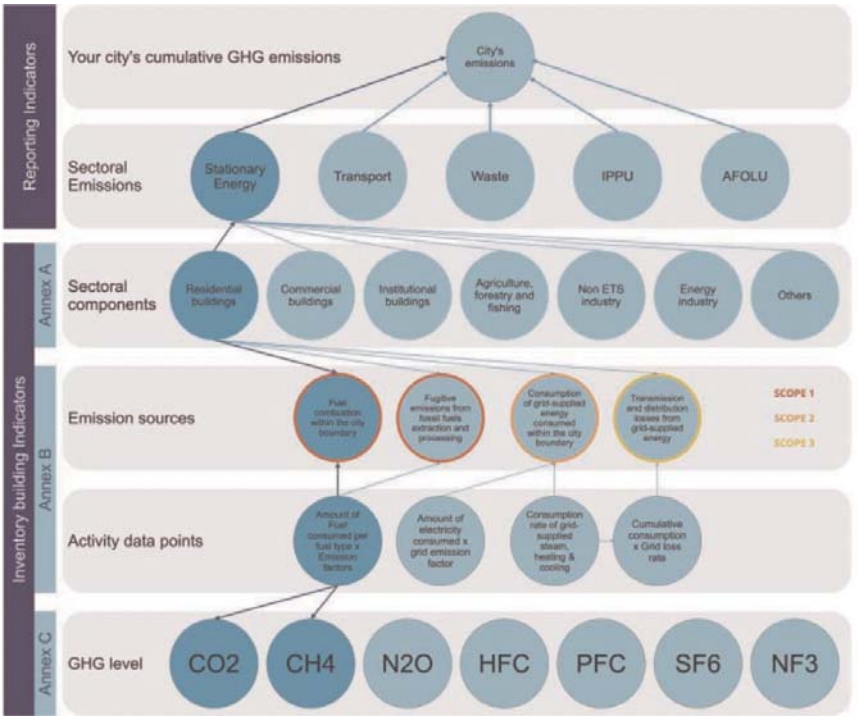
In a 2020 study covering 79 C40 cities, Weidmann et al. found that cities under-report their yearly GHG emissions by 4% if they only account for their territorial emissions. The GHG emissions that occur outside of the city boundaries as a result of activities that happen within the city are still largely left out of the equation. These unaccounted emissions come from crucial resources generated outside of the city such as food, water, goods, energy and transport (73%) and from service-related sectors (27%).

In contrast, 41% of the total emissions were noted to have been generated by producing goods and services for the consumption outside of the city. In other words, using consumption-based accounts alongside existing city-wide inventories is vital for a realistic depiction of the city's impacts. It arguably encourages more holistic GHGs assessments, greater disclosure, and more meaningful benchmarking.

Such inventories can enable decision makers in identifying lever of change which may lead to greater GHG reduction than current standard practices. Given that many sources of consumption-based emissions lie outside the

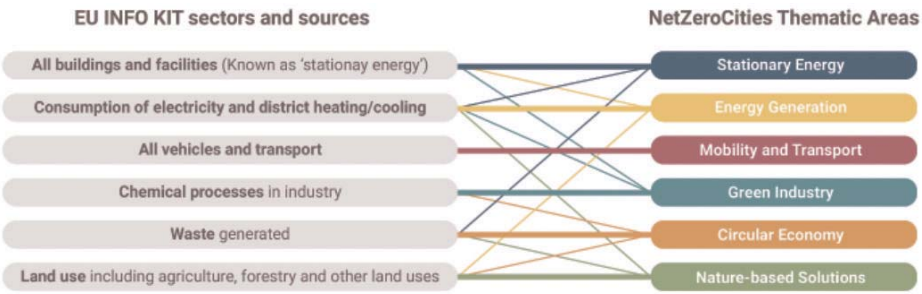
sphere of influence of cities, mitigation strategies can predominantly remain focused on the reduction of producing goods and services within the city boundaries and still be able to address a sizable share of territorial emissions.

Fig. 27 – Net Zero Cities project: Overview for GHG indicators system and relationships



Source: World Resources Institute, & World Business Council for Sustainable Development. (n.d.). Corporate standard: Greenhouse gas protocol. Corporate Standard | Greenhouse Gas Protocol. Retrieved January 5, 2023, from *https://ghgprotocol.org/corporate-standard*.

Fig. 28 – Digital connectivity in cities is also a key cross-cutting priority to improve and support moving forward



Source: NetZeroCities Pilot Cities Programme Guidebook Version N° 0.1 – NZC Consortium coordinated by EIT Climate-KIC – June 2022.

13.3. Relations between Sources and Sectors in EU INFO KIT and NetZeroCities Thematic Areas

The cities should report on cumulative emission in metric tonnes of CO_2 equivalent for the recommended scopes: Direct emissions (Scope 1) in Metric tonne CO_2 equivalent, Indirect emissions from the use of grid-supplied electricity, heat, steam and/or cooling (Scope2), Emissions occurring outside the jurisdiction boundary as a result of in-jurisdiction activities (Scope 3).

The accuracy and reliability of the indicators will highly depend on the available data sources and the collection process in each city for each source and sector. It is recommended to use primarily data that is collected via a bottom-up approach, as its granularity and accuracy will enable a detailed evaluation.

However, in practice, this data may not always be available. Therefore, we recommend combining bottom-up data collection with top-down data to fill known gaps. This is to ensure the number of indicators that can be evaluated is optimized. This is particularly relevant for scope 3 emissions which most cities do not or only in a limited way report on. Many European cities are net consumers, but notable industrial cities may also be net producers and exporting consumptions goods, which makes the weightage of territorial emissions (Scope 1 + 2) and consumption-based emissions (Scope 3) dependent on the typology of the city. Only when all emission sources are covered with either bottom up and top-down data collection that a 'fair' picture of the city's emissions will emerge. Another factor that impacts the reliability of the indicators, is how the system boundaries are selected and thus how the collected data is attributed.

The detailed and vertical indicator framework about climate change actions, like DOCK-BI project, is suitable for applications related to modern City 4.0 Climate related Actions, Services and Platforms and is still under review from the research community and the Smart Cities Alliances worldwide. City-level indicator sets which have been developed under EUfunded projects such as the CITYkeys project city indicator framework, Smart Cities Marketplace, MakingCity, REFLOW, REPLICATE project city level monitoring, CIVIS, Eurbanlab, Carbocount-CITY, and the ICOS Cities project.

13.4. Memorandum of Understanding for Future Cooperation on Maritime Sector Realized in the Frame of DOCK-BI Project

During the implementation of DOCK-BI project, partners prepared and signed a Memorandum of Understanding for continuing cooperation in the next 2021/2027 EU Programme. The aim of this MoU is to foster

a cross-border and unitary vision in order to support the development and enhancement of the maritime transport sector in the frame of future funding opportunities at European Level. The Partners intend to undertake cooperation and collaboration on the basis of equality, reciprocity, and mutual benefit. The Partners foster joint development and implementation of Programmes and Projects related to the maritime transport sector or any other sector of common interest, particularly in the frame of the Interreg Greece-Italy Programme. With regard to the cooperative activities under this MoU, the Partners could also encourage the participation of associated partners and/or may allow, as appropriate, the participation other relevant governmental institutions, public enterprises, other organizations and the private sector.

The memorandum established within the DOCK-BI project serves as a fundamental tool for policy makers to reinforce cross-border cooperation and strategic alignment in the maritime transport sector. Its role in guiding policy decisions is crucial, as it encourages the joint development of projects, promotes sustainable maritime transport solutions, and facilitates access to European funding opportunities, particularly within the Interreg Greece-Italy Programme.

Furthermore, the MoU ensures flexibility and inclusivity by allowing the participation of associated partners, governmental institutions, public enterprises, and private sector stakeholders. This broad engagement strengthens the governance of maritime policies and supports the implementation of innovative and sustainable transport strategies. By leveraging this agreement, policy makers can drive impactful changes, enhance regional connectivity, and ensure long-term cooperation in the evolving landscape of European maritime transport.

14.
Identification of Possible Future Solutions/Programs

14.1. Sustainable Mobility and Territorial Regeneration: From Policy to Local Implementation

The paradigm of sustainability applied to the processes of use of spaces cannot be limited exclusively to the improvement of connectivity aimed at strengthening flows and reducing their impact on society and the environment, but refers significantly to the role played by territorial identity and capacity of the communities settled in the places to define new links with them.

Among the different ways of rediscovering identity to achieve sustainability there is certainly the reinterpretation of territorial heritages that can favor new configurations of mobility characterized by the adjective 'slow' and/or 'gentle'. The latter not only allow original ways of using spaces, but have the power to define new forms of rooting which "above all concern the future of local societies and, more generally, the reproduction of cultural diversity on a geographical basis"[1]. In fact, they also give rise to processes of territorial regeneration which, through the recovery of intended itineraries and paths, activate both new forms of gentle mobility and new forms of slow tourism.

At a national and supranational level, the programmatic directions of public institutions place the recovery of slow itineraries as a key variable to give new centrality to heritage elements that are not qualified or not recognized as such by the community. The latter can acquire the role not only of new tourist attractors, but also of strategic variables to activate local development paths capable of generating relationships at a supra-local level.

This orientation can be seen in a series of planning results that have taken place in our country in which tourism and transport have proceeded

[1] G. Dematteis, "Note sul concetto di radicamento riferito allo sviluppo locale", *Rivista Geografica Italiana*, 125, 2017, pp. 159-161.

in a convergent and synergistic manner. Among these, we can certainly mention[2]:

1) The Atlas of the Paths of Italy[3] which proposes an overall vision of the vast national heritage of cultural, historical, naturalistic and religious paths resulting from work conducted since 2016 by the Paths Committee, an expression of extensive inter-institutional coordination between MIBACT, Regions and Provinces, the latter responsible to indicate itineraries to be included in the atlas. 44 of the 113 itineraries proposed by Regions and Provinces have been included in the Atlas and 137 junctions have been identified where at least two paths meet.
2) The Tourist Cycle Route System, a project born through joint work between MIBACT and the Ministry of Transport starting from 2016 which, following the layout of the European cycling corridors of the Eurovelo project, identifies 6,000 km of cycle routes enclosed in 10 itineraries.
3) The Strategic Plan for Tourism Development 2017-2022. which aims to provide Italy with intermodal infrastructures of greenways within which to enhance railway routes, historical paths, cycle paths and cultural itineraries.
4) The Framework Law on cycling mobility (Law 2/2018) which promotes the development of cycling mobility and the parallel creation of the national cycling network. The Law aims to promote the use of the bicycle as a means of transport not only oriented towards tourism development and recreational activities, but also as a daily means of transport. The text introduces the first regulatory definition of Cycle Route and Cycle Network and proposes a classification. The areas of intervention indicated by the law are both the development of pedal mobility in urban and metropolitan areas, and the development of pedal mobility on regional, national and European itineraries. The Law, thus, initiates a planning activity aimed at identifying the cycle routes of national interest to be included in the National Cycle Network and at establishing the interconnections between this and the European network and between this and other transport systems.
5) The Extraordinary Tourist Mobility Plan (2017) which starts from the vision that "the mobility and accessibility of cities of art and tourist places, in addition to enhancing the image and cultural and landscape heritage of the country, can have a decisive role for the relaunch of the national

[2] L. Spagnoli, *Premessa*, in L. Spagnoli (a cura di), *Itinerari per la rigenerazione territoriale tra sviluppi reticolari e sostenibili*, FrancoAngeli, Milano, 2022, pp.

[3] The Atlas can be consulted online on the website of the Ministry of Culture in *https://camminiditalia.cultura.gov.it/home-cammini-ditalia/atlante-dei-cammini/*.

economy; hence the strategic role of tourism and the importance of a plan dedicated to tourist mobility"[4]. In essence "There is no tourism without mobility: transport constitutes a fundamental prerequisite and plays a key role in the quality of the national tourist offer. Furthermore, moving to reach tourist destinations can in turn become a tourist experience, allowing the traveler to visit the places crossed and get to know the country in an authentic way". From this perspective, cycle-pedestrian mobility is an essential strategic medium.

6) In Puglia, the Regional Authority has structured a series of initiatives to attribute a different meaning to sustainable mobility, seen not only as the compatibility of transport with the natural and anthropic environment and as a process to reduce traffic and its negative effects on spaces, but also as an opportunity to enhance in a conservative way certain cultural, environmental and social resources present in the area. By operating in this direction, starting from 2005, the organization acts as an initiator and pivot in the promotion of strategies that attribute a decisive value above all to pedal mobility on an urban and supra-urban scale, considered a medium in the construction of new functional relationships between mobility and daily space and between mobility and recreational and tourist use of spaces. This commitment is attested by planning and programming work begun in the period 2006-2010 aimed at creating the Integrated Cycling Mobility Network. In this first five-year period, a significant push towards the recognition of the potential regional cycle network came with the creation of the cross-border cooperation project Cy.Ro.N.Med (Cycle Route Network of the Mediterranean), financed by the PIC INTERREG III B 2000-2006 ArchiMed of which Puglia is the promoting and leading body for the Mediterranean area. Cy.Ro.N.Med, in fact, is committed to structuring a feasibility study of a cycle network that crosses the countries of the south-eastern Mediterranean. This is an analytical census of existing and potential cycling resources whose itineraries will have to integrate with those of the Eurovelo European cycling network and with those of the national Bicitalia network (Puglia Region, 2007). The Puglia feasibility study was approved in 2008. The document proposes for Puglia a precise reading of the local resources (environmental, cultural, landscape, historical and architectural) that intersect, from time to time, the itineraries and then addresses the issue of tourist accommodation along the routes, remembering that Puglia is a crossroads in the South and in the Euro-Mediterranean space. Furthermore, it identifies 5 itineraries

[4] Ministero delle Infrastrutture e dei Trasporti, VIAGGIARE in Italia. Piano straordinario per la mobilità turistica, 2017, p. 10, in *https://www.mit.gov.it/sites/default/files/media/normativa/2018-01/piano%20straordinario%20mobilit%C3%A0%20turistica%202017-2022%20v0.pdf*.

that touch 126 municipalities, attributing a strategic role to certain cities, nodes of travel in the history of Puglia from the 12th to the 15th century, on which the routes converge and intertwine. Furthermore, it intercepts internal areas of Puglia lacking or poorly endowed with a "vigorous image" (imageabillity) (Lynch, 1969) on a local and supra-local scale. Thanks to Cy.Ro.N.Med, the foundations of the Memorandum of Understanding between the Puglia Region and AQP S.p.A. are laid. aimed at studying a sample route belonging to the service routes of the Aqueduct (CGR 963 of 06/09/2009).

7) In 2010, the Region adopted its own program for sustainable mobility 'Create-Activate-Mind', in which it attributes a key role to pedal mobility, recognized as a privileged area within which to promote and plan multi-level transversal interventions and in the 2007-2013 POR it launches a reflection on the poor interconnection between the different forms of mobility; in the POR 2014-2020, it encourages the use of the bicycle for habitual and short-distance travel and soft mobility as a basis for local development processes and defines the construction of velostations near railway stations to increase sustainable mobility in urban and sub-areas –urban. 2013, Regional Law n. 1 "Interventions to promote cycling mobility" marks the step towards a significant turning point by introducing a new tool, the Regional Cycling Mobility Plan (PRMC) (drawn up by ASSET – Strategic Regional Agency for the Eco-sustainable Development of the Territory), whose general objective is to build a regional cycle network "continuous and uniformly spread across the territory" by defining long-distance itineraries that enhance those already consolidated or planned and favor low-traffic roads (p. 10). In the document, it clearly emerges that the regional cycle network must develop in coherence with the identity of the territory, respecting both the morphological and hydrographic characteristics of the places, and the anthropic values through the reuse and conversion into cycle paths of infrastructures and artefacts already present in the landscape. Seven years later, in 2020, the PRMC is approved and the main backbones of the regional cycle network are defined within it; it is not only "a planning document for the regional cycle network but also a tool for landscape enhancement and tourism promotion"[5].

At the same time, albeit starting from 2018, the Regional Authority is also working on the paths. In 2018 he created the Regional Committee of Paths and Cultural Itineraries which draws up the candidacy dossier of the Southern Via Francigena at the Council of Europe (recognition occurred in 2019). One year later, it identifies the technical requirements to attribute the

[5] ASSET, *Piano regionale delle ciclovie di Puglia*,Adda Editore, Bari, 2020, p. 9.

quality of 'Way' and cultural itinerary to regional routes. In 2020, through the Interreg Italy-Greece project, it finances the recovery of 10 public properties to be allocated to Puglia Public Hostels. In 2021 the Atlas of paths will be drawn up which, together with that of the cycle paths of Puglia, systematises the infrastructural network connected to slow mobility.

The work carried out in the area acquires visibility through the publication in 2020 of two pocket guides drawn up by the Puglia Regional Tourism Agency and also available in digital form on the website www.viaggiareinpuglia.it edited by the same body: 1) 'Puglia by bike' which offers 12 regional itineraries. 2) 'Cammini di Puglia' which features 7 itineraries that wind along the Via Francigena and Cammino Materano, together with eight work in progress paths.

Acting in harmony with the orientation of the Puglia Region, Brindisi could consider pedal mobility, also expressed in the form of slow and/or gentle use of urban and extra-urban spaces, an opportunity to give a new face to the city in the imagination collective and to capitalize on its environmental and cultural assets overshadowed by its identity as an industrial, energy and port centre. The city, in fact, could become a hub for direct connections with cycle routes in its territory, in the province and in Salento.

In the Puglia guide, this vocation manifests itself in a nutshell since the city is included in itinerary 6 which, starting from Bari reaches Brindi along the coastal selvage and a part of the Murgia dei Trulli while it could become a connecting city for those who want to follow itineraries 7 and 8 which extend throughout their province for those who arrive in the city and land at the port or airport.

To operate in this direction and particularly evaluate the process of recovering certain itineraries to be used for daily slow/soft mobility in a tourist-recreational way, we could start from an interpretative path inspired by the paradigm of local territorial systems[6], used in a procedural and dynamic manner and aimed:

1) identify the elements of the cultural and environmental heritage of territorial identity, both urban and extra-urban, to which value has been given and/or can be attributed through slow mobility. To this end, a series of planning tools already developed can be used (e.g. Documents from the Area Vasta Brindisina area, PPTR);
2) Identify the tourist and cycling routes that cross the city of Brindisi and which could cross it to evaluate whether they are integrated with the European Eurovelo cycle network and with those of the national Bicitalia network;

[6] G. Dematteis, "Per una geografia della territorialità attiva e dei valori territoriali", in P. Bonora (a cura di), *S.Lo.T. Quaderno 1*, cit., pp. 11-30.

3) Identify elements of the territorial heritage to arrive at an analytical census of existing and used cycling resources and potential ones to be allocated to daily and tourist itineraries and verify integration with existing ones;
4) research the institutional and non-institutional actors, with particular attention to the self-organised aggregations born from civil society, which have structured cycle itineraries and understand the motivations that pushed them to create such itineraries, giving value to the processes of self- organization and participation which are at the basis of the birth of local and supra-local networks. Define everyone's role in the construction of vertical and horizontal relationships both with respect to the use of the itinerary and with respect to the material and immaterial, qualitative and quantitative sediments of the milieu chosen for regeneration and reuse;
5) Work on the development of an urban and nodal Biciplan, to be included in the SUMP and in a public summary cartography, to define an integrated and integrable cycle network extended to the city and the countryside of the municipality and projected as a hub towards the province and the Salento, with particular attention to the development of the cycle tourism network. The Biciplan, therefore, will have to contain both the existing and potential network of the municipal area, and the network that connects the capital with the provincial territory as a basis for the development of cycling connections and will be able to model the structure of the Biciplan of the city of Bologna which harmonizes the daily mobility network with the cycle tourism network (in *https://pumsbologna.it/Biciplan_metropolitano*).

Points of reference for the operational work aimed at evaluating the existing equipment in the city of Brindisi and its province are certainly the Regional Cycling Mobility Plan, the documents of the Puglia region on greenways, the PPTR and the strategic project for the regional landscape on the soft mobility system. However, to develop a cognitive analysis of potential routes and to aim for reconnaissance, organization and adaptation interventions, third sector associations and entities involved in the field of pedal mobility can be involved (e.g. FIAB, Cicloamici and /or proceed with a reconnaissance in the city) valorising the work already carried out in the area and their skills and knowledge for the benefit of the common good.

In the project work, also aimed at territorial regeneration, reference can be made to informal routes structured within platforms dedicated to cycling such as Komoot, a planning and navigation platform born in Germany, which offers 20 routes that have the city as their fulcrum of Brindisi.

A useful document for the capitalization of identity elements but, above all, for designing Brindisi as a hub for the slow use of spaces in a systemic integration process is the Atlas of Soft Mobility in Italy, edited

by the Alliance for Soft Mobility[7] (A.MO.DO, 29 associations). The atlas, created in collaboration with the Italian Railway Network, currently being published, was developed using big data that systematizes railway stations with cycle paths, paths, greenways, paths, cycle/pedestrian paths, villages with the artistic and naturalistic heritage of the Italy. Born from the A.MO.DO cooperation. and RFI, the atlas proposes a complete collaborative mapping aimed at creating an integrated sustainable mobility model that involves not only the tourist dimension but the entire local economic system[8]. The aim of the work is precisely to identify intermodal hubs for soft mobility connected with interchange services with attention to the attractive nodes of the territories and the network of stations.

14.2. Strategic Opportunities and Funding for Future Mobility Solutions

At the basis of the drafting and implementation of the SUMP in the city of Brindisi there must be a real desire to change the current structure, improving it, from a sustainable perspective. This implies having to act not only on mobility, which is the heart of the SUMP, but also on the quality of life and well-being of the resident population, as well as those in transit and tourists. In general terms therefore it will be necessary to:

- improve accessibility for all, regardless of income and social status;
- improve the quality of life and the attractiveness of the urban environment;
- improve road safety and public health;
- reduce air and noise pollution, greenhouse gases, emissions and energy consumption by limiting individual motorized mobility;
- guarantee social equity.

As for Igoumenitsa, the Strategic Plan of interventions includes the following Axes of Intervention:

- smart energy management solutions under the Sustainable Energy Action Plan including individual policies and projects for the management of public lighting, common areas, energy footprint measurement and energy saving interventions;

[7] Cfr. *https://www.mobilitadolce.net/*.

[8] For further information on the methodology of construction of the Atlas which could be applied on a local scale, focusing on Brindisi and its province, see *https://www.rfi.it/it/stazioni/pagine-stazioni/stazioni-per-il-futuro-delle-citta/L-Atlante-della-Mobilita-Dolce-in-Italia.html*.

- integrated green and combined transport solutions on a local and interregional scale under the Sustainable Mobility Plan;
- smart city systems and information solutions for citizens and visitors inside and outside port facilities.

Needless to say, European funds available through the *Interreg Programmes 2021-2027* represent a crucial opportunity to further enhance and implement sustainable mobility solutions. These funds provide essential resources to promote green, innovative, and integrated transport systems, supporting actions aimed at reducing carbon emissions, improving public transport networks, and fostering the development of smart and eco-friendly urban mobility solutions. By leveraging Interreg funding, Brindisi and Igoumenitsa territories can accelerate the transition toward a more efficient and environmentally sustainable mobility framework, in line with European climate and transport policies.

The results of these interventions bring upgrading port areas and cross-border ferry connectivity between ports of Brindisi and Igoumenitsa. This improvement will be obtained by implementing strategic infrastructural actions which are necessary to:

- boost maritime transport, and
- improve accessibility and integration with the adjacent areas.

By aligning these efforts with European funding mechanisms such as Interreg 2021-2027, both Brindisi and Igoumenitsa can effectively implement forward-thinking solutions that prioritize sustainability, innovation, and enhanced connectivity within the region.

Conclusions

Transportation infrastructure is often considered a key factor in facilitating economic development and growth. Improving transport connectivity has become increasingly significant to international trade research and transport policy agendas. Little has been done so far to investigate the direct association between maritime connectivity and economic growth, let alone the exact effect magnitude. As the connection between ports, local economies, and global logistics networks becomes ever closer, the economic role of port connectivity deserves closer attention[1].

The connectivity of transport infrastructure within the sphere of shipping thus has extremely significant practical effects on global trade and deserves greater attention. Port connectivity refers to the accessibility of ports within the global shipping network, and represents a port's access to the world market. As such, measures of port connectivity have been accorded great importance both by ports and local governments. Subject to factors such as hub-and-spoke network structures, international trade patterns, and geographical proximity, the spatial distribution of port connectivity is highly heterogeneous, which in turn shapes the connectivity pattern of the current shipping network. Ports have undergone several development phases: from merely interface locations for moving cargo between land and sea transport, to transportation, industrial, and commercial service centers, to dynamic nodes in a complex international production and distribution network. As ports and international maritime trade continue to develop, the connection between ports, local economies, and global logistics networks becomes

[1] Weijun Li, Xiwen Bai, Dong Yang, Yao Hou, *Maritime connectivity, transport Infrastructure expansion and economic growth: A global perspective*, Transportation Research Part A: Policy and Practice, Volume 170, 2023, 103609, ISSN 0965-8564, *https://doi.org/10.1016/j.tra.2023.103609*.

increasingly close, throwing the economic role of port connectivity into sharp relief[2].

The results of the analysis reported in this volume, the result of the collaboration between the two ports of Brindisi and Igoumenitsa through the DOCK-BI project, highlight the need for implementing strategic infrastructural actions which are necessary to:

1) boost maritime transport;
2) improve accessibility and integration with the adjacent urban and industrial areas.

These infrastructural interventions will make the maritime based intermodal routes more attractive both for commercial business and passenger traffic.

In summary, the planned interventions essentially go in the direction of:

- upgrading the connection between the ports of Brindisi and Igoumenitsa and to guarantee a better and safer access to the port areas by improving internal and external accessibility to port infrastructure areas;
- optimizing port infrastructures interfaces and operations in order to make the port areas more comfortable for tourists and economic operators involved in export/import activity.

[2] Weijun Li, Xiwen Bai, Dong Yang, Yao Hou, *Maritime connectivity, transport Infrastructure expansion and economic growth: A global perspective*, Transportation Research Part A: Policy and Practice, Volume 170, 2023, 103609, ISSN 0965-8564, *https://doi.org/10.1016/j.tra.2023.103609*.

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DOCK-BI "Development Of Connections between the Key ports of Brindisi and Igoumenitsa" is an infrastructural project financed by Interreg V-A Greece-Italy Programme 2014/2020 aimed at upgrading port areas and cross-border ferry connectivity between the key ports of Brindisi and Igoumenitsa.
The Consortium of Industrial Development Area of Brindisi (ASI Brindisi Consortium) is the lead beneficiary of this project while partners are: the Southern Adriatic Sea Ports Authority (IT), the Municipality of Brindisi (IT), the Igoumenitsa Port Authority (GR) and the Municipality of Igoumenitsa (GR).
Since maritime transport plays a key role in the local economies of the two countries, DOCK-BI faces a common cross-border challenge: to improve the unsatisfactory multimodal accessibility and fill in the lack of integration and interconnection of transport modes between the two ports. This is through implementing strategic infrastructural interventions able to boost maritime transport and improve accessibility and integration with ports' adjacent areas. To fulfill this objective, the project foresees some infrastructural strategic interventions aimed at fostering maritime transport and improving accessibility and integration with the areas adjacent to the two ports.
Not only passengers, tourists and economic operators, but also inhabitants, transport stakeholders and port authorities will directly and indirectly benefit from a modern and enhanced cross-border mobility between Italy and Greece thanks to the infrastructural interventions foreseen by DOCK-BI.

Project duration: 20.12.2018 – 31.10.2023 | **Total budget:** €3.562.315,67 | **EU co-financing (ERDF):** €3.027.968,15

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