SCUOLA DI DOTTORATO
UNIVERSITÀ DEGLI STUDI *MEDITERRANEA* DI REGGIO CALABRIA

DIPARTIMENTO PAU
DOTTORATO DI RICERCA IN
URBAN REGENERATION AND ECONOMIC DEVELOPMENT
S.S.D. ICAR/05
XXXIII CICLO

INTEGRATED POLICIES OF URBAN REGENERATION AND MOBILITY FOR SMART CITIES

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REGGIO CALABRIA, GENNAIO 2021

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ABSTRACT

The new generation of plans (Urban development plans, Sustainable Urban Transport Plans) in Italy, as well as in Europe and in other international contexts, tends to combine different actions such as urban regeneration, enhancement of areas of particular value, containing of negative traffic impacts, also through innovative technologies and measures, in particular in the ITS field (Intelligent Transportation Systems), soft mobility (pedestrian and cycle mobility, zero emission vehicles, shared mobility, green and clean public transport, etc.). The main goal of the research project is to develop an integration between urban regeneration policies and development policies for mobility (infrastructural components and transport services).

Ensuring high levels of accessibility and ensuring sustainable mobility are key goals of the city government policies in order to minimize negative impacts on the environment. The achievement of these goals must be pursued together with the reconfiguration and redevelopment of spaces that need to adapt to the needs of different needs and the reconfiguration of many urban activities. This raises the need to re-elaborate cognitive, methodological and operational approaches to the governance of urban transformations, primarily through the integration of scientific sectors that have so far seemed distant, such as the governance of urban transformations and that of mobility.

Currently the policies are not focused on the growth of cities, a considerable attention has been developed towards the recovery of the "old" rather than the reconstruction of the "new".

Cities are not expanding like in the 1950s and 1960s, because their development was then favoured by enormous economic growth; in those years, transport and its planning were considered as accessories. Today we are witnessing an inverse phenomenon, it is much more important to focus attention on updating (to modify the structures or their use to make them respond to actual needs) or on improvement (to raise to a higher quality standard and / or to quantitatively improve the supply of facilities) of the resources that the territory (city or region)

has to offer. In this particular context, the debate on the interaction between Land Use, Mobility and Transportation Planning leads to interest in how urban regeneration can be aided (or even guided) by infrastructure transport planning.

A careful observation of the urban phenomenon reveals that its evolutionary process and the organization of spaces depend both on the demand for new activities and on the demand for mobility, generated, in turn, by many and different social factors.

This new vision of the mode of evolution of the city makes it necessary to use a new integrated approach that overcomes the differences between the management of the transformations of urban spaces and mobility both in the cognitive phase of the problems in the preliminary study and in the methodological-operational phase of resolution.

INTRODUCTION

The goals of the contemporary city are today mainly linked to the demand for urban regeneration. These needs have led to a renewed interest in issues relating to the reconfiguration and reuse of the existing city, requiring integrated approaches suitable for intervening in the various settlement forms: historic and consolidated cities, urban suburbs, metropolitan fringes, widespread settlements. In an attempt to overcome the long years in which attention had been paid almost exclusively to the quantitative growth of new settlements, research and experimentation in the field of urban planning have brought back interest in defining those aspects of planning capable of guarantee, through new strategies, tools and implementation mechanisms, the characteristics that define urban and environmental quality in Europe: public space and collective facilities as a reference structure for sociality and cultural integration, the enhancement and use of natural environment, the preservation of historical identity as a civil value of one's territory and a privileged field of design innovation.

For several years, in conjunction with the explosion of the environmental issue and social unrest in the metropolitan suburbs, an innovative meaning of redevelopment has emerged, urban regeneration, which directs experimentation towards the integration of physical actions on the building and urban heritage and actions of a social, cultural, economic and environmental nature, in compliance with the principles of sustainability, participation and subsidiarity, supported by a solid and structured public government and forms of public-private partnership. Sustainability and urban regeneration therefore represent an inseparable combination that is based on a series of measures for the protection of the urban environment (reduction of greenhouse gas emissions, increase of renewable energy sources, eco-efficiency of new urban developments, promotion of a more sustainable mobility, reuse of land) but which also considers the social dimension (inclusion and cohesion, integration of immigrants, employment) and the economic dimension (optimization of the human, social, cultural and economic capital of cities to increase their

level of competitiveness). These are integrated urban development strategies which, look at the city in its systemic complexity, to better consider the role of each part of it with respect to the dimensions of economic, social and environmental sustainability and to give the actions undertaken a univocal purpose to avoid that contradict each other or have a mutual negative effect.

The research examines the relationship and potential integration between urban regeneration policies and development policies for mobility (infrastructural components and transport services). In particular, the most recent methods and experiments relating to urban regeneration, ITC innovation for smart cities, actions to improve the conditions of mobility, accessibility, tourism in urban contexts are investigated.

The thesis consists of 4 chapters.

The first chapter is an introductory chapter to the research topic. The goals and the assumptions assumed, the methodological orientations, the prefigured research phases and, finally, the expected results are illustrated.

The second chapter proposes a state of the art on the theme of urban regeneration, and on the issues of interest related to it, such as innovative policies for urban regeneration, smart cities, tourism, innovative policies for sustainable mobility and territorial accessibility.

The third chapter describes the methodological approach proposed for the pursuit of the research goals. For urban planning, do not find simulations of the territory evolution as is the case for the analysis of the transport system. The mobility analysis is carried out through the use of transport models: some address the analysis in terms of land use, others focus attention on the movements and the dimensions that characterize them (origin, destination, modal choice, paths). The link between these two areas would suggest a necessary integration, which nevertheless occurs rarely and not infrequently there are differences with respect to the expected outcomes. In the policies of city government and their development, extensive use is now made of planning tools. However, the sectoral instruments are not always coordinated and coherent, while a synergy of actions would be desirable.

A proposal for an approach based on the integration of urban planning and transport tools is advanced into the chapter. Transport planning and management as well as the development of urbanized areas have posed and still pose problems from various points of view, including the quality of life and the environment, particularly in relation to problematic phenomena such as congestion and pollution, as well as the saturation of road networks, with negative effects on the general economy of the cities. A comparative framework of planning tools relating to the fields of urban planning and mobility in Italian context

is proposed, suggesting a direction of action aimed at the integration or coordination of the various components. Specific attention is paid to the areas of the plan relating to urban regeneration that has an impact on social inclusion, mobility of people and new technologies.
The results of some application contexts with respect to the proposed analysis methodology are reported in the fourth chapter. The various case studies are divided according to the different thematic areas investigated and described in the previous chapters. It starts with some thoughts based on the analysis of emblematic case studies and specialised literature, aimed at bringing out goals and opportunities related to urban regeneration actions and coordinated transport policies, also drawing on the wide range of new Information and Communication Technologies (ITC) and Intelligent Transportation Systems (IST). The main assumption is that appropriate actions aimed at improving the mobility conditions within the neighbourhoods (or of the whole city) and of the conditions of accessibility to the neighbourhood (or the city) from outside, contribute to increase their economic potential and to induce regeneration and recovery actions.

CHAPTER I
RESEARCH GOALS AND GENERAL METHODOLOGICAL APPROACH

CHAPTER I
Research goals and general methodological approach

Goals and hypotheses

The needs of the contemporary city are mainly linked to the demand for urban requalification, as a result of the transition from the culture of expansion to the culture of transformation, as well as the affirmation of the phase of metropolisation of the territory (Oliva, 2000; Font, 2002, 2007). These needs have led to a renewed interest in issues relating to the reconfiguration and reuse of the existing city, requiring integrated approaches suitable for intervening in the various forms of settlement: historic city, consolidated city, urban suburbs, metropolitan fringes, widespread settlements. In an attempt to overcome the long years, in which the focus was almost exclusively on the quantitative growth of new settlements, research and experimentation in the field of urban planning have brought back the interest in defining those aspects of planning capable of to ensure, through new strategies, tools and implementation mechanisms, the characteristics that connoted urban and environmental quality in Europe: public space and collective facilities as a reference structure for sociality and cultural integration (Borja, 2001), the enhancement and use of the natural environment as a specificity and resource of cities (Fallanca, 2010), the conservation of historical identity as a civil value of one's own territory and a privileged field of design innovation (Gambino, 2010).

The redevelopment of the existing city, center of the contemporary urban project (Bonfantini, 2002), despite being one of the priority themes of debate and experimentation in Europe since the nineties (ANCSA 1990, Macchi and Cassia 1990; Falini 1997, 2002; Gasparrini 2015), continues today to constitute an open question placed at the center of the political agenda of individual countries, at all institutional levels, in line with the guidelines traced, and reaffirmed, at the European level (EU, 2007). For several years, in fact, in conjunction with the explosion of the environmental issue and social unease in the metropolitan suburbs, a new meaning of redevelopment has emerged, urban regeneration, which directs experimentation towards the integration of physical actions on the

building and urban heritage, actions of a social, cultural, economic and environmental nature, in compliance with the principles of sustainability, participation and subsidiarity, supported by a solid and structured public government and forms of public-private partnership (EESC, 2010; Sbetti et al, 2013). This new meaning has therefore prompted the implementation of new inter-scalar and integrated design strategies, new partnership and participatory instruments and new multilevel financing methods, which necessarily involve the different scales of intervention: the large scale, to understand the new territories metropolized; the municipal scale, the privileged level for the definition of regulatory and operational instruments, and the sub-municipal scale, a flexible framework for experimenting with intervention programs.

The integrated approach presupposes the resolution of conflicts, overcoming the divergences or interference between the effects that each of these dimensions has on the others, through the creation of appropriate coordination platforms and frameworks for policies and actions. A coordination that is transversal, for the convergence of sectoral approaches; vertical across all administrative levels, from the European to the national, regional, intermediate and local scale, through new multilevel governance formulas; and horizontal among all the actors involved in the construction of the city: from public authorities to the financial and real estate sector.

A planned and integrated urban project, therefore, must overcome isolated actions, by integrating the individual components of the city and between the city and the territory, to promote cohesion, according to a well-balanced polycentric model between the different territorial identities. Among the plans and programs envisaged by EU ministers, who met in Toledo in 2010, is the combination of a set of organized actions, aimed at the physical recovery of buildings and urban spaces with other sectoral actions, for the promotion eco-efficiency, access to social housing, with incentives for entrepreneurial activities and trade and with infrastructures, plants, training and employment policies. The guidelines for urban development thus establish the criteria for physical regeneration interventions, for the management of consumption, the improvement of public spaces and the urban context, the protection of the landscape and heritage. Particular attention is paid to the effects of gentrification - the transformation of popular neighborhoods into luxury residential neighborhoods - such as the social exclusion that sometimes derives from it and which tends to alienate certain groups of the population or those essential functions for a correct urban balance that they are unable to compete with other, more profitable businesses in the short term. On the one hand, therefore, the goal is to stimulate innovation and economic efficiency, on the other hand to protect or encourage residential use, to regulate the mechanisms that stimulate the growth of real estate values, to

extend the quality of life and habitability to all buildings in the city, especially the central ones. Cities and suburbs are therefore considered as a single and efficient complex, where the buildings of the city become spaces in which different social groups can live in full harmony and cohesion, in a wide variety of housing types. Integrated urban regeneration plans and programs are therefore entrusted to a type of management and governance suited to the local context, which stimulates and channels public participation and confers new financial and tax incentives for private companies. A governance that also deals with the inclusion of appropriate ex-ante, medium-term and ex-post monitoring and evaluation tools and indicators in plans and programs, to verify the effective achievement of the goals and, if necessary, take into account consideration of appropriate changes or corrections. From an architectural point of view, the physical recovery and adaptation of buildings allows to overcome many of the shortcomings of the existing real estate assets, in particular those of many houses that were built with low quality standards in the second half of the twentieth century, improving them functionality, promoting diversity and adapting types of residences to new family and demographic models, stimulating the eco-efficiency of buildings and structures, solving accessibility problems and structural deficiencies that some of them still present.

The goal of the thesis is to analyse the relationship between the development of the urban system and the development of the mobility system, aiming at the construction of a methodological plan approach that simultaneously contemplates the two components. Particular emphasis will be given to the notion of accessibility, which is interesting both for the theoretical approach to its definition and for its application in planning practice, but above all as a criterion on which to base a correct integration between transport and land use policies. In fact, the conventional approach to transport planning foresees as its main goal the guarantee of mobility, and consequently the speeding up of vehicle flows and the minimization of travel time. On the contrary, the alternative approach aims, in the context of integrated transport-territorial planning, to favour accessibility rather than mobility.

Too often in the past planning tools have been treated in a distinctly separate way for different reasons, including historical ones. It was in 1942 that the first Italian general law of territorial planning coordination was enacted, which provides for the establishment of a General Town Planning Plan through which urban development can be controlled and managed, while the year in which Italy dates back to 1986 approved its first General Transport Plan. For the first time in the history of the country, the mobility system is designed as a unitary, integrated, functional complex connected to Europe. Over the years, the problems related to mobility become pressing as a result of mass motorization that particularly affects historic cities or the historic

centres of large cities. The planning tools therefore evolve over time in both fields, for example in the field of urban planning before the goal was aimed at building management, then it was extended by integrating urban standards up to a latest generation planning aimed at recovery of the areas hence the term urban regeneration. In the field of transport, the first plans concern traffic regulation (PUT, PUM), aimed at strengthening networks, to move to urban plans for sustainable mobility with new indicators such as social inclusion, pollution reduction, accident reduction (PUTS, PUMS). In their evolutionary path the piano instruments are rarely intertwined. Today we are witnessing the development of plans in an independent and uncoordinated way, which generates obvious limits in the management of the urban organism as a whole. Especially in recent years where smart cities are emerging rapidly, introducing new practices and services that have a strong impact on decision-making and planning, while coexisting with urban structures, the planning approach must become synergistic. In particular, it is necessary to consider smart cities in regional and urban planning frameworks, with the help of ICT and ITS tools, a potential that is often underestimated in urban planning for information retrieval and analysis for the processing of urban policies.

Methodology and research phases

For the construction of an adequate research framework during the first phase, corresponding to the first year, a critical analysis of the literature of the sector was advanced through the study of books, research on specialized websites, participation in conferences in which they were held debates on current national and international urban scenarios regarding sustainable mobility and urban regeneration. The study made it possible to understand and deepen the issues that are at the basis of the current debate on sustainable development that is involving cities on the international scene. Bibliographic surveys and reviews of public strategies were carried out at different planning levels for the contextualization and analysis of European good practices in order to set the basic guidelines for research development. The research carried out was thematised according to the keywords:

- Sustainable mobility;
- Tourism and transport;
- Smart cities;
- Territorial accessibility.

The first phase therefore made it possible to identify the reasons for the current orientation towards regeneration, as well as articulating some variables to read it, both urban and environmental. Finally, the need to identify the relationship between urban regeneration and new development policies for mobility emerged.

The second part of the research explored the issues concerning the variables of urban planning and transport on urban regeneration. In a

redevelopment of the existing city without further consumption of land, for many local administrations as well as for the national legislator, the development of cities takes the form of the regeneration of existing works and interventions as a matter of priority compared to the further extension on the areas now used for agricultural production. Alongside urban planning, however, it is necessary to combine adequate transport planning, here the usefulness of creating a methodological approach that brings together the two fields of application. Transport and land use are part of a retroactive system in which the components influence each other. The business system influences the demand for transport and, in turn, is influenced by the structure of the transport system, through accessibility. The interactions between transport and land use are also part of a complex picture that includes economic, political, demographic and technological changes. Transport planning decisions affect land use directly through the amount of land used and indirectly through the location and design of the development.

The third and final phase concerns the application of the proposed methodology to various case studies. The goal is to evaluate the urban regeneration effects of a given territory starting from the impacts that transport planning can give in terms of accessibility, land use, tourism development, social integration, interventions on networks aimed at regenerating networks. same. Most of the case studies concerned the Calabrian area with particular focus on Reggio Calabria city.

Expected results

It is clear that the transformative goals and urban policies pursued in the various realities are not questioned, but the process to be followed, the role of the actors involved and to be involved and the tools with which to operate. The goal is therefore to outline an integrated transport-territory planning path.

CHAPTER II
GENERAL ISSUES RELATED TO THE INTEREST FIELD

CHAPTER II

General issues related to the interest field

Over time, cities have faced social and economic changes, always seeing a growing need to redesign or regenerate the existing, so that the environment could be current and adequate to today's needs. Thinking that cities are immobile is impossible, what was perfect yesterday becomes unusable tomorrow.

URBAN REGENERATION

The first term that leads back to the definition of urban regeneration is urban renewal, in many dictionaries defined as the physical redevelopment process of an urban area. It has particular resonance as a description of urban politics in many North American cities in the mid-twentieth century decades. The term was also used to refer to similar processes in British and European cities during the same period.

A series of studies and reports, between the late 1960s and early 1970s, drew attention to the plight of Britain's inner urban areas and those who lived in them. The post-1974 recession and the economic restructuring that followed provided a further catalyst for change; a political reconceptualization of the inner city as a spatial coincidence of more fundamental social, economic and environmental problems began to occur in the 1970s (Ward, 1994). It became clear that the increasing levels of deprivation afflicting those areas had their causes far beyond the local scale, in the functioning of the larger national and international economy. There was a need for a new form of political intervention in inner urban areas, which went beyond the traditional and rather limited approach of customs clearance and physical redevelopment but also addressed broader social and economic issues.

One of the first policy documents where the term regeneration appears was a report prepared for the Merseyside County Council in 1975: in times of decline or even low growth, market forces weaken and areas less attractive (in terms of appearance, accessibility and other attributes) become under-populated and abandoned. In such a situation there could be a point where market forces would initiate the "regeneration" of abandoned areas. Experience in some of America's oldest industrial cities suggests that even assuming this to happen, the

process would be extremely lengthy and would involve a multitude of environmental, economic and social problems that would be unacceptable (Merseyside County Council, 1975).
Within the same document, the Merseyside County Council continued to outline a strategy for the regeneration of urban areas. This strategy aimed to concentrate investment and development within the urban area and in particular in those parts with the most acute problems, improving the environment and encouraging housing and economic expansion on abandoned and dilapidated sites; and it was also aimed at minimizing development on the edges of built-up areas (Merseyside County Council, 1975). It is with this political approach that the first urban regeneration intervention is outlined.
The White Paper Policy for the Inner Cities (Department of the Environment, 1977) was the first attempt by a government in the post-war era to understand the nature and causes of Britain's urban problems. It was a splitting event in urban policy development (Atkinson and Moon, 1994), recognizing that a particular component of the urban fabric - the inner urban areas - required its own specific policies. The subsequent Urban Areas Law of 1978, along with a number of other related policy changes, gave local authorities the powers and resources needed for this new approach: urban regeneration.
Since then, many definitions of urban regeneration have emerged; one of the most recent definitions is provided by Chris Brown, CEO of the Igloo Regeneration Fund in Building magazine: Urban regeneration is a concerted social, economic and physical action to help people in multiple deprived neighborhoods to decline and create communities sustainable (Brown, 2006). In the same issue of Building, Jon Ladd, chief executive of the British Urban Regeneration Association, suggested that urban regeneration is a comprehensive and integrated vision and action leading to the resolution of urban problems and seeking to achieve lasting improvement in conditions. economic, physical, social and environmental aspects of an area (Ladd, 2006).

Urban regeneration in Italy

The theme of sustainable urban regeneration is a priority of development policies in the coming years in all countries. In Italy, the disciplinary and political debate is characterized by a continuous advancement of the research and experimentation fronts on the regeneration of the existing city (Oliva, 2014; Gasparrini, 2015) with the aim of refining the strategies and tools for increasingly targeted actions to intervene on the different physical and social fabrics of the contemporary city, within the framework of the growing awareness of environmental issues and economic constraints, with the aim of responding to the needs of the population. Above all following the emergence of the financial crisis in mature economically mature countries and aggressiveness, as well as the frequency, of extreme

climatic phenomena and manifestations of social unease, which have significantly involved the cities of Mediterranean Europe, the new significant references for experimentation concern not so much and not only issues endogenous to disciplinary approaches, but also new responsibilities linked to the inexorable global change of the environmental, socio-economic and cultural context. The challenge of climate change and the growing need to tackle emergency issues in an ordinary way, also through the promotion of new lifestyles and new forms of eco-compatible space design; the relaunch of welfare, to be addressed as a stimulus to identify new operators and funding for the strengthening of the public city and also as an opportunity to achieve greater social cohesion through the involvement of all citizens in the design, implementation and management of common freights; the setting up of a new green and smart economic and cultural model, supported by community-level initiatives and declined at the level of cities, understood as real engines of development (Leipzig Charter, 2007).

Cities, therefore, are at risk due to the depletion of energy and the poor state of the post-war building fund; in this regard, the National Council of Architects, Planners and Landscape Architects (CNAPPC), believes that this is a true urban dehumanization (CNAPPC, 2011), represented by the absence of public spaces, by the land consumption achieved at the level of alert, from the uncontrolled increase in the number of vehicles in circulation, from excessive consumption and the high price of energy, waste and recyclable materials. In general, urban regeneration programs aim to improve the city effect by improving the quality of life. Through these programs, strategic directions are identified and the aim is to create the conditions for strengthening and strengthening social capital, attracting financial resources to transform public and private spaces for the regeneration of historic centers, residential districts, private homes and the landscape. The suburbs must not be neglected, their rehabilitation should represent the starting point for solving difficult situations such as the urban and environmental level, both in terms of construction and environmental impact.

Through urban regeneration plans, the authorities must ensure the improvement of the quality of life and safety of citizens. In Italy the development of a National Plan for Sustainable Urban Regeneration (PNRUS, 2012) was proposed by the Government, the Parliament, the National Council of Architects (CNAPPC) and the National Association of Builders (ANCE), with the following targets:

- safety, maintenance and regeneration of public and private urban heritage;
- drastic reduction in the consumption of energy and water by the population;

- evaluation of public spaces, urban green areas and housing district services;
- rationalization of urban mobility and waste production;
- protection and revitalization of historic centers (Regions and Environment, 2012).

The redevelopment of public spaces, affecting the quality of life of the inhabitants and their sense of belonging to the places, can be a decisive factor in reducing disparities between rich and poor neighbourhoods, helping to promote greater social cohesion. In addition to the aspects relating to the house, urban regeneration interventions must aim at the requalification of infrastructures and the treatment of social, economic, environmental and energy sustainability issues. In the following paragraphs some of these aspects will be analysed.

The phase of the great urban expansion of the second post-war period, shaped and addressed according to the principles of modern urban planning, left two heavy legacies, which the design of the contemporary city now has to face. The first is represented by the disruption of the environmental balance within the city and between the city and the agricultural and natural space; the second concerns the new challenges in terms of environmental sustainability and energy consumption. The change in construction techniques, with the abandonment of the traditional masonry structure, the growing demand for living space, the explosion of the car and the impressive diffusion of individual housing, joining and intertwining with the modernist idea of an open city in the territory, in fact, have generated an unprecedented colonization of natural resources, putting the ecosystem at risk. This has led to a great demand for energy to satisfy an ever-increasing demand that needs to be met; therefore, the design of the city of the new century has focused around the idea of a compact city, that is the recomposition of the city to save energy and soils. The concentration of the population, in fact, in addition to allowing greater possibilities for interaction and exchange (urban life) is also an indispensable condition for reducing transport distances and times, minimizing energy costs, reducing the costs of infrastructures and public services. The idea of a compact, dense city therefore implies the idea of a dynamic city, socially more lively but also durable, more efficient in the use of natural resources, in the consumption of energy, in the disposal of waste, in the reduction of environmental risk.

Dense cities need air and green spaces; density loses its role, as an engine of development, as a crucible of social life, as a factor in recomposing spatial balances, without these two elements. The promotion of nature in the city, of green spaces, is today an indispensable requirement to favour a better distribution of functions in space, to recompose the urban form, to create a sustainable city. On

the other hand, a dense city also means improvement of the individual's lifestyle; it has been shown, in fact, that in dense cities the population is forced to move on foot to reach services, shops and meeting places; the good endowment of public transport encourages this activity.
The model of uncontrolled urban expansion that has characterized the growth of our cities, in recent decades, has produced the formation of urban spaces destined to green in empty, degraded spaces lacking functionality and identity. Today the urgent need to recover and above all enhance these areas is increasingly felt, also in the light of numerous addresses of the European Community, inherent to the preciousness and importance they cover, not only in relation to the climate changes of the planet on which debates, but also in relation to the role they play in improving living conditions, climate mitigation, social aggregation and economic revitalization.

The new urban suburbs of the big cities

From the linguistic definition, the set of neighborhoods arranged on the outer edges of an urban agglomeration can be considered periphery, but also the outermost and marginal area, as opposed to the center, of a space or territory. It is precisely this last interpretation that draws attention to a phenomenon that has been occurring in recent decades. In large cities, while on the one hand there is an expansion in the direction of the widespread metropolis, with a slow but inexorable erosion of agricultural territories and not only that surround them, on the other hand it is not unusual to be faced with peripheral areas that are today included in urban and metropolitan development.
The outskirts of contemporary cities offer themselves to the exercise of the urban plan and urban project as active components of a city in transformation. From critical issues and bearers of marginality, they evolve into significant components of the transformations in the context of urban polycentrism (Carta, 2009).
The observation of the suburbs, today, produces descriptions that are partly different from those of the last twenty years, complex aggregations of places where society leaves its imprint (Martinotti, 2007). Today the periphery is the city: the city of the majority of the inhabitants, in which the signs of new kinds of spaces overlap (public or private, exclusive or popular, heterogeneous, commodified). But it is also the place where the progressive growth of inequalities is represented, where the differences between the city of the rich and the city of the poor materialize (Secchi, 2013).
In the South, the periphery is seen with a negative meaning, characterized by various problems including:

- poor accessibility to higher level services, administrative, health, university, sports, cultural and entertainment;
- the lack of urban and building quality;

- the presence, often, of a heavily criminalized territory, especially in suburban areas;
- the almost total absence of public spaces designed, integrated into the urban context and livable.

Bernardo Secchi in this regard highlights that "the main figure of the city, perhaps of contemporary culture, is not continuity and its articulation in the social and spatial division of work and in the hierarchies and connections of the center and periphery within the social and productive processes as within urban space. What is represented at every scale and in contemporary culture is (…) the fragment. Often interpreted as a chaotic dispersion of things and subjects, of practices and economies, the contemporary city is a fractal city".

The characteristics of the southern periphery are therefore traceable in some considerations on the problems that characterize the periphery itself, and in others that highlight its strategic opportunities. The resources for the development of a peripheral area are to be understood:

- the presence, at times, of a greater quantity of permeable surfaces;
- less congestion of infrastructures compared to central areas;
- the lower generalized cost of land and less building speculation;
- the lack, or less presence, of constraints for urban design.

The commitment in addressing the issue of redevelopment of the peripheries - spatial, social or economic - today finds a new impulse in not limiting itself to their physical recovery or environmental rehabilitation or improvement of road accessibility, acting instead on their more overall regeneration. The interventions could involve three dimensions:

- redevelopment, both understood as an intervention on physical and environmental degradation and as an intervention to combat exclusion and social marginality, strengthening the social capital of the suburbs; a redevelopment intervention requires attention to the micro dimension, a marked sensitivity to design and care of public spaces, social and economic fragility, minorities and cultural identities;
- reconnection, understood as an overall action to improve accessibility to and from the suburbs, within the more general redesign of sustainable mobility in the city;
- metropolitan functions in the peripheral areas, capable of acting as attractors that relocate them in the development of the city (sports facilities, commercial, recreational, directional structures, etc.).

Only through actions that are capable of intervening also on the social and relational capital, as well as on the architectural and urbanistic one, activating processes of revitalization of the economic base, repositioning the suburbs in the overall urban framework, could it be possible to act effectively, increasingly lightening the heaviness - emergency, social, environmental - of the suburbs and thus returning to talk of the city.

Relevant documents

Twenty-five years have passed since the Aalborg Conference in Denmark in 1994, during which European cities defined some important guidelines for urban sustainability and the development of new spatial planning models capable of contributing through the direct involvement of local communities in the struggle. against the climate changes in progress, the protection of the environment, human health and biodiversity, the development of new economic and productive activities with reduced consumption of raw materials and low carbon emissions, inclusion and social equity. In more recent years, the theme of sustainable development of cities and metropolitan areas has been addressed and deepened with new attention in European and national policies for the role of the city considered as the central place from which to start again for the economic revival of the territories the development of innovation.

Leipzig Charter was followed by the Marseille Declaration of November 2008 and the Toledo Declaration of 3 June 2010. Finally, the Brussels Conference of October 2013 led to the definition of a Reference Framework for Sustainable Cities (Reference Framework for European Sustainable Cities) of support for local administrations and the networking of good practices activated on this front. All this in the awareness that the large and medium-sized cities, being the places where the majority of the population is concentrated and where the consumption of material and energy resources and the production of waste, pollutants and climate-altering emissions are greater, must today become the main protagonists of some fundamental structural and behavioural transformations essential to face the challenge of the deep economic, social and ecological crisis that characterizes our age. In the documents of the European Union, particular emphasis is placed on the need for urban regeneration programs to be articulated in the three different dimensions of sustainable development, which are closely related to each other: economic, social, environmental. Government bodies and local administrations are therefore asked to promote and implement integrated programs that are able to coordinate, with a strategic vision of the future of the cities and territories involved, sectoral policies and projects and that are able to intervene on all components, physical, economic and social, etc. characterizing the life of an urban community, identifying its strengths and weaknesses, enhancing and enhancing its historical, cultural and

social heritage, creating the conditions for the emergence of new local economies based on knowledge, innovation and excellence.
The Leipzig Charter also emphasizes the strong link between urban quality that can derive from a rigorous and shared urban planning and building culture (inspired by what Alois Riegl defined as the Kunstwollen or the desire to give an aesthetic form to one's work) and economic prosperity of cities: the quality of the landscape and urban spaces are in fact decisive for promoting tourism and for attracting talents, qualified and creative human resources and industrial investments with a high content of know-how.
From reading the Toledo Declaration, some fundamental principles and action strategies can be derived to start urban regeneration projects:

- Planning and management of the territory must consider cities as unitary bodies, characterized by a complexity of functions, in which any sectoral intervention or on individual territorial areas must be thought and implemented by evaluating the close connections and possible effects on the overall organization of urban life. Positive results and synergistic effects can only be ensured with a multidisciplinary methodological approach and with the activation of a plurality of converging interventions.
- Urban regeneration policies cannot disregard an integrated city-metropolitan hinterland-rural territory vision, adopting a polycentric model aimed at stemming the unlimited growth of urbanized areas, settlement dispersion (sprawl) and land consumption. Essential to this end appears to be the creation of an efficient collective transport network, in which nodes to concentrate residences, services and jobs, and the formation of extensive peri-urban green belts aimed at safeguarding agricultural areas, naturalistic areas and biodiversity. New polarities distributed throughout the territory, equipped with a sufficient degree of functional autonomy (in order to reduce the transport needs induced by the concentration of jobs in specialized areas), but also able to express their own identity deriving from the specific activities established, from the urban and architectural shape and image.
- The integration of urban and rural spaces constitutes the condition for dealing more effectively with the problems connected to the closure of ecological cycles (circular urban metabolism, rather than linear) and those relating to climate change: at this scale the urban region can, in fact, be analyzed and designed as a real ecosystem, in which it is increasingly possible to regulate the anthropic processes of withdrawal, transformation and consumption of primary resources, promoting renewable energy, proximity agriculture and short

supply chains between producers and consumers , reducing energy consumption and polluting emissions, favoring the recycling of water and urban solid waste. Measures aimed at reducing the ecological footprint of the inhabitants and the production of greenhouse gases, but also at adopting measures to mitigate the foreseeable negative effects of climate change itself (urban resilience).

- For a sustainable regeneration of cities, both widespread actions on an urban and territorial scale and territorialized actions are necessary, such as the construction of infrastructures for collective transport and the training - preferably in abandoned areas - of eco-neighbourhoods. These are interventions in labour-intensive sectors, but which at the same time require new specializations and technological innovation, with positive repercussions in terms of new employment and competitiveness on international markets.
- The theme of eco-neighbourhoods is central to the ecological regeneration strategies of cities. The creation of an eco-neighbourhood can in fact allow an effective integration of the many aspects that characterize urban life. At this scale, excellent results can be obtained both from an environmental point of view and from an economic and social point of view. An eco-district can also become, if its relations with the context are studied, a catalyst element of more extensive regeneration processes of significant parts of the consolidated city and in particular of its suburbs and a pole of urban attraction, where to find innovative services intended for the entire community and a widespread quality of public spaces.
- The launch of an urban regeneration process requires new forms of territorial governance: new and more effective forms of vertical coordination between all administrative levels (national, regional and local) and horizontal coordination between all the actors involved in the construction of the city. It is emphasized that the city is primarily a social construction. The transparency of decisions must therefore be ensured in all phases of the urban planning and transformation process and the participation of citizens must be promoted with diversified methods in relation to the scale of the intervention (from a simple information assembly to focus groups coordinated by technicians and specialists in different sectors of intervention, to participatory planning laboratories).
- The implementation of the projects also requires, if only for financial reasons, new forms of public-private partnership and therefore the definition of clear and transparent codes for

the selection of private subjects and for the regulation of reciprocal relations. For the involvement of individuals, specific financial and tax incentives may be provided, but it is also specified that one of the purposes of the public intervention programs must be to regulate the mechanisms that generate the growth of real estate values or to transfer these values to the community.

From European Community documents, an aspect generally highlighted is that concerning the opportunity for a shared set of urban sustainability indicators to be developed, to verify with monitoring activities downstream of the implementation processes the actual achievement of the set goals and possibly to introduce, during construction or in subsequent intervention programs, the appropriate changes and corrections. A set of indicators that also allows a comparison between the different experiences launched by the European cities and a sharing of good practices that have produced positive results, in a spirit of cooperation and not cooperation. In recent years there has been a new focus on European and national policies due to the role of the city considered as a central place from which to restart for the economic revitalization of the territories and for the development of innovation. In a national context, on March 15, 2013, the proposed law Rules for the containment of land use and urban regeneration was presented. In this text, urban regeneration means an organic set of interventions that concern public and private buildings and public spaces, through demolition and reconstruction, renovation and new construction initiatives, with the aim of achieving a significant reduction in water and energy consumption. , acting on the performance of buildings, on the saving and production of energy from renewable sources, on the safety of buildings from a static point of view, on the reclamation of areas and on the naturalistic qualification of public spaces, on the reduction of impermeable areas, on the improvement of waste management and separate collection, as well as sustainable mobility based on pedestrian and bicycle travel and public transport. In this bill, therefore, urban regeneration deals with the recovery of existing heritage as a strategy to contain land consumption and make the urban fabric energy efficient. On a local scale, the tools made available to municipalities are the 2014-2020 Urban Axis Structural Funds Programming, PON (National Operational Plan for Metropolitan Cities 2014-2020) and the Urban Agenda.

Urban economic, social and environmental development occupies a central place in the regional policy of the European Union. An integrated approach that guarantees the city to stand out in these three areas should help implement the Europe 2020 strategy of smart, sustainable and inclusive growth. Cities are the engine of smart, sustainable and inclusive growth, a privileged place to live, work,

relate and, consequently, invest, considering their increasingly central role in defining any strategy for the future.

SMART CITIES

Cities, in recent years, have faced, and will still have to face, many challenges mainly related to climate change and social processes caused by the increase in population in built-up areas and increased competitiveness. Innovation and technological change, based on creativity and knowledge, are the essential factors for promoting the development of cities. European policy-makers have set themselves the goal of making cities more efficient and more liveable, or transforming cities into smart cities (Mundula and Auci, 2017). In this context, urban planners must take into consideration the dynamics linked to both global and local competitiveness, necessary to achieve a better level of well-being. As highlighted by Papa et al (2014), there is in fact a relationship between the concept of smart city and that of competitive city. Even if there are differences, the similarities are prevalent so that a city, to become smarter, must be more attractive and competitive, and vice versa.

This basically resides in the absence of a commonly accepted definition of smart city, which indeed sees different positions of open criticism on the ability of this notion to represent current urban dynamics (Vanolo 2014; Carvalho 2015; Glasmeier and Christopherson 2015; McFarlane and Söderström 2017; Haarstad, 2016).

The concept of smart cities has been shaped in literature spanning over 30 years, from the earliest writings on the subject in the late 1980s to the current explosion of smart city publications. An early stage in the use of the term and in the formation of the concept can be traced back to the period 1985-1995, as it began to be systematically used in urban development, planning, computer science and engineering publications after 2000.

The first reference to the term smart city is found in the period 1988-1990 and has been used to capture the innovations in urban mobility supported by information technologies, the use of ICT for the provision of urban services and the best performance of target cities. environmental, economic and social (Hall, 1988; Raynal, 1988). Shortly before, the term appeared in the context of the innovation-driven urban development literature and the Japanese Technopolis program. Publications such as Lipman (1986), Newstead (1989), Batty (1990) and Masser (1990) have outlined how the use of information technology and internet networks could support the technological development and competitive advantages of cities.

The following decade (2000-2010) marked the academic and technological institution of the smart city paradigm. The literature of this period reflects how a technological base (telecommunications, Internet, software, data) enriched with various forms of networking

and social intelligence could produce an innovative and effective functionality for cities.

Since the earliest writings on smart cities, multiple definitions have been proposed about what a smart city is, showing the diversity in the conception of the smart city and in the building blocks.

However, an analysis of the ontology of many formal definitions reveals that three blocks of entities characterize this concept: city, citizen, user, activity and infrastructure and flows in cities; institutions and information, knowledge, intelligence and innovation processes within cities; and smart systems, urban technologies, the Internet, broadband networks and electronic services in cities (Komninos, 2014).

Tab. 1 shows a synoptic table of the key factors that characterize a Smart City in different sector studies (fig. 1).

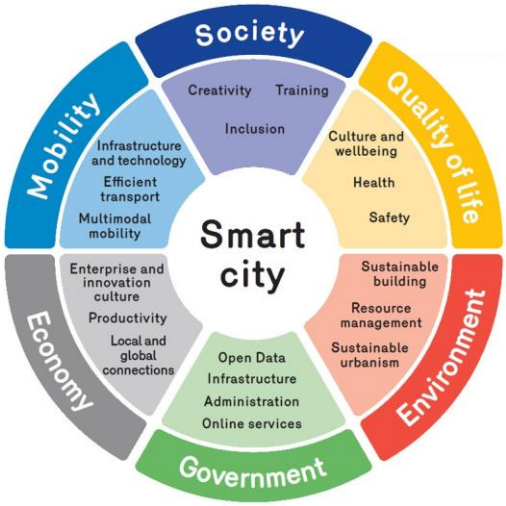


fig. 1. Smart City planning / Mission.
Source: EDEN IAS

Furthermore, many studies have examined the definitions and dimensions of the literature of a smart city, characterizing and identifying variables and elements to group them. Among the authors of these studies are Giffinger et al. (2007), Albino et al. (2015), Chourabi et al. (2008). According to Caragliu et al. (2009) a city can be defined as “Smart" when investments in human and social capital and traditional (mobility and transport) and modern (ICT) infrastructures feed sustainable economic development and a high quality of life, with wise management of natural resources, through a participatory governance method.

The Smart City, therefore, is a multidisciplinary concept that embodies not only the IT infrastructure but also its ability to manage information and resources to improve the quality of life of its people. The use of information technology is considered as a key factor in the development of a city since it can perceive, monitor, control and communicate most of the urban services such as transport, electricity,

environmental control, crime control, social, emergencies, etc. [Murgante et al. (2015), Debnath et al. (2014), Akhras (2000)].

Wishing to stimulate the development of smart technologies in urban areas, in particular through the pooling of research resources in the energy, transport and ICT sectors, the European Commission launched in 2011 a European Innovation Partnership for cities. and smart communities (Smart Cities and Communities European Innovation Partnerhip).

Source	**Key factor**
Giffinger et al. (2007)	• mobility • quality of the environment • governance of the urban system • economic context • participation in social life • viability
Chourabi et al. (2008)	• management and organization • technology • governance • policy • people and communities • economy • infrastructure built • natural environment
Caragliu et al. (2011)	• use of network infrastructures to improve economic and political efficiency and enable social, cultural and urban development • business-driven urban development • attention to the crucial role of high-tech industries in long-term urban growth. • achieving the social inclusion of various urban residents in public services • development of social and relational capital in the urban area • development of social and environmental sustainability
Albino et al. (2015)	• network infrastructure enabling political efficiency and social and cultural development, • focus on business-driven urban development • creative activities for the promotion of urban growth • social inclusion of residents • social capital in urban development • natural environment as a strategic component for the future

tab. 1. Key factors that characterize a Smart City

The word Smart is therefore adopted to highlight the main goals of the Smart City:

- governance: promotion of citizen involvement processes on issues of public interest, data sharing, transparency of decision-making processes;
- economy: public / private cooperation, development of incubators and small and medium-sized enterprises; integration of ICT;
- mobility: promotion of technologies useful for improving the mobility of cities (non-polluting vehicles, ITS, dynamic traffic control, etc.) and limiting negative impacts on the environment;
- environment: reduction of CO_2 emissions; use of renewable energy sources and control of pollution and energy consumption;
- community: sharing of data, security and protection of sources, network and communication; training and research;
- social life: shared work sites, cultural initiatives, public health, living laboratories, cooperative crowdsourcing.

The sustainable development model is based on the interaction of three different interrelated aspects: the economic, social and environmental aspects (fig.2).

fig. 2. Sustainable development model

For the achievement of sustainable development, the Smart City model must include three important factors: the technological factor, the human factor and the institutional factor. These three factors, through interaction and cooperation, allow the evolution of the sustainable development model towards an intelligent development model (fig. 3).

Technological factor and ICT systems are fundamental elements for the development of a smart city. The institutional factor implies

government support for the project and implementation of the various initiatives. Finally, the human factor refers to the active involvement of citizens, without which the initiatives could not be successful.

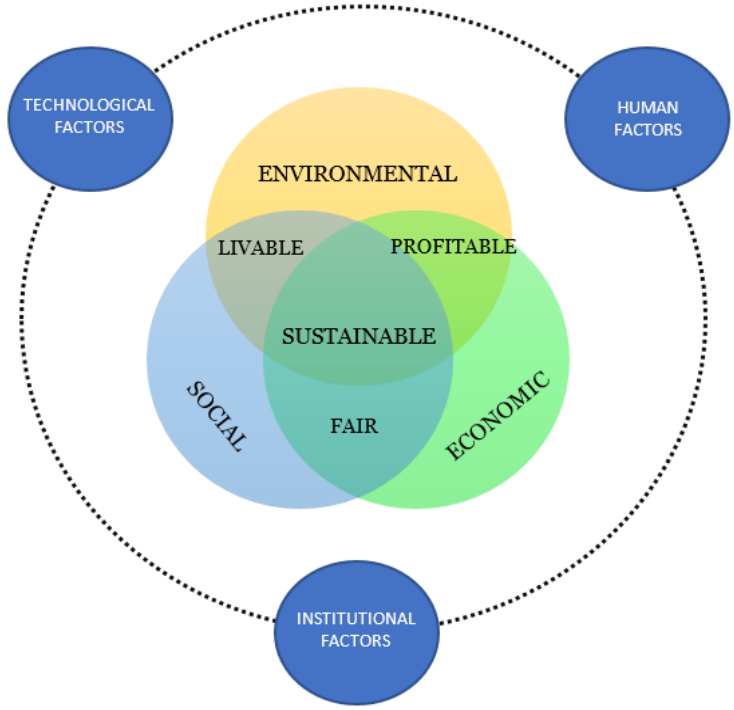


fig. 3. Smart development model

Tab. 2 summarizes the areas of action and sectors of a smart city in relation to the aspects related to sustainable development. A smart city offers efficient and effective solutions for its inhabitants. At the same time, it is a healthy and energy efficient city that uses renewable energy sources, including biomass and waste and requires advanced smart technologies.

Sustainability aspects	**Urban Components**	**Action fields**	**Sectors**
Economic	Institutions	Government	Participation Transparency Public and social services
		Economy	Innovation Entrepreneurship
Environmental	Habitat	Mobility	Traffic Public transport ICT infrastructures Logistics
		Environment	Network and environmental monitoring Energy efficiency
Social	Inhabitants	People	Digital education Creativity
		Social life	Tourism and culture Health & Safety Accessibility technology

tab. 2. Action areas and sectors of a smart city (ASCIMER project, 2015)

Some emblematic cases of sustainable development and transport

Smart City is also an inclusive place, where technological and innovative solutions are used to increase integration, social assistance and fight poverty and deprivation. In general, a Smart City must be a good place to live, offering the best possible quality of life, with the least possible consumption of resources.
Several cities around the world have pioneered policies that prioritize public transport and active mobility; among others we can mention three symbol cities of different origins: Curitiba (Brazil) 2 million inhabitants, Nantes (France) 300,000 inhabitants, Pontevedra (Spain) 80,000 inhabitants, Grenoble (France) 160,000 inhabitants

Curitiba, is the first successful model of Smart City; it was born in the 1970s, based on a vision centered on three aspects: mobility, sustainability and tolerance. A global land use program has led to the development of public transport lines with similar performance to the metro, but much cheaper: buses with high commercial speeds, high frequencies (45-60 buses / h) and therefore large transport capacities on primary urban corridors. A concept of BRT, Bus Rapid Transit, which here takes on particular connotations (fig. 4). But Curitiba is also famous for having created the first pedestrian district, for its vast endowment of green areas (55 m^2 / inhabitant), for waste management focused on recycling and collaboration with citizens, for its vast network of cycle paths (about 150 km).

fig. 4. Curitiba's BRT

Curitiba's master plan, promoted by its mayor Jaime Lerner, integrated urban and transport planning, aiming at a cultural, social and economic transformation of the city. It focuses on the individual rather than the self. In a move that symbolizes the spirit of the whole plan, the planners as a first step decided to close a main street in the city and turn it into a pedestrian street, thus limiting traffic. Other policies have contributed to the success of the public transport system: residential density inversely proportional to the distance of the BRT lines, discouraging the use of the car, public parking limited to the city center, public transport subsidies offered to the poorest citizens.
The popularity of the BRT has brought about a significant change in the modal choice of the city's inhabitants; 28% of BRT users abandoned the machine. Compared to other Brazilian cities of its size,

Curitiba consumes around 30% less fuel per capita, resulting in one of the lowest levels of air pollution. Today around 1,100 buses offer 12,500 journeys per day, serving over 1.3 million passengers, 50 times more than 20 years earlier. A citizen's expenditure on transport is about 10% of his income, well below the national average.
The city of Nantes has been sensitive to sustainable mobility for a long time (fig. 5). Currently active mobility and public transport represent about 45% of trips (25% TP), but the goal is to reach 58% in 2030 (Allen H., 2013). The main points are:

- a broad vision and a long-term strategy of the city;
- the local administration has the competence in all fields necessary to allow integration (for example, parking and availability rates, integrated ticketing, infrastructure, etc.);
- the authorities were able to draft an agreement with neighbouring municipalities, obtaining political support to implement integrated solutions and plans;
- smart choices and the integration of different modalities, including more opportunities for sharing cars and bicycles, carpooling and walking (including pedestrian zones) have been fundamental for the success of the public;
- investments made in infrastructure and quality vehicles, an interesting offer of alternatives to the use of private cars;
- high quality public transport service at an affordable price.

Copyright: Patrick Garçon, Nantes Métropole.

fig. 5. Nantes. Integration of public transport services, near an exchange car park

Many of these points can be adapted and replicated in other cities for the benefit of their citizens. The success of Nantes also highlights the potential for medium-sized cities to implement strong and effective transport policies while limiting the use of cars.

Pontevedra is a small city that has chosen a special sustainable mobility strategy. Since 1999 the city has been almost completely

closed to cars and motorcycles except for an area where their transit is allowed but with a speed limit of 30 km / h (zone 30). There is only one car park in the suburbs, free of charge, not too far from the centre (fig. 6). The results are remarkable: most of the cars that travelled the streets of the centre have disappeared, pollution has been reduced by 65%, the number of accidents has gone from 1203 in 2000 to 484 in 2014, 70% of journeys are made by bike or on foot. To help tourists and citizens in their mobility choices, two Apps have been activated: *Metrominuto*, a pedestrian network map similar to that of public transport that offers information on distances and travel times between the main nodes of the city and *Pasominuto*, which offers 20 routes for which distances travelled and calories burned are calculated.

fig. 6. Metrominuto plan of Pontevedra

The effect of this change was also positive for the local trade and there was an extension of green spaces and children's play areas. The quality of life has improved, healthier and less stressful, to the point that the city has attracted new residents. Public transport (120 buses) is available and taxis are plentiful. Fares are generally low because the distances are not great. The bus and train stations function as a single communication hub and the public transport lines entering the city (19 lines) have stops at the main points of their urban routes. The connection between the city centre and the train stations can be made on classic roads or through the Gafos River Park.

Grenoble has implemented effective measures to support public transport, walking and cycling. Grenoble leads by example, as it encourages its staff to use alternative modes of transport by providing incentives such as, reimbursement of 50% of bike rental costs, reimbursement of 50% of public transport subscriptions and

reimbursement of 100% of car-sharing service subscriptions. The city has an impressively high modal share of cycling, which stems from the actions that the City has taken to facilitate and promote cycling. In addition, has a well-developed car-sharing scheme and prescribed pedestrian areas to encourage walking. Moreover, the City is actively trying to reduce vehicle dependency through a number of parking rules.

A feasibility study in 2010 illustrated that 42% of daily journeys are made on foot, 21% by public transport and 5% by cycling. The proportion of low emission and alternatively fuelled buses operating in the city is impressive with 57% of buses being low emission (at least Euro VI) and 74% alternatively fuelled (e.g. electric, hydrogen and liquefied natural gas (LNG)). Current measures to reduce and renew the fleet of municipal vehicles include the replacement of personal staff cars with a subscription to the 'Citiz' car-sharing service, the acquisition of 152 electrics, 99 natural gas vehicles (NGV) and 1 hydrogen car and a fleet of 700 bikes available to municipal staff.

Grenoble has adopted a 16-point action plan for sustainable urban logistics, which was co-produced with public and private stakeholders. The 2018 SUMP sets out future mobility guidelines for 2030 with the main guidelines being:

- A fossil-fuel and pollution-free urban area
- Support to change mobility behaviours;
- Promoting active and shared modes of transport
- Improving interconnections within the entire mobility area.

The application illustrates a number of measures to expand the public transport network, develop gas, electricity and hydrogen infrastructure supporting the renewal of vehicle fleets, and encourage integrated and sustainable mobility.

The application provides a good description of future plans, however information on how they would be financed is minimal. The City's targets, with respect to sustainable transport (e.g. reducing vehicle use, increasing public transport and cycling), for 2030 are unclear. In addition, it would be interesting to understand more about the City's plans to provide timely and multi-modal travel information.

An interesting picture of virtuous experiences of good practices in the field of green mobility emerges from the experience of the European Green Capital Award program promoted by the European Commission. Every year since 2010, a European city is awarded that has achieved important results in terms of improving the quality of life and mobility from a sustainable perspective. Candidate cities must meet the three requirements to win the award:

- high environmental standards;
- ambitious goals for further environmental improvements;

- ability to serve as a model to inspire other cities by providing "best practices".

To date, eleven European cities have received the award for successfully pursuing environmentally friendly urban development; Table 3 proposes some elements relating to these experiences such as motivation and the reduction of CO_2 per capita

Year	City	Inhab.	Motivation	CO_2 reduction per capita (%)
2010	Stockholm	912.000	Long historical tradition of integrated urban transport management and ambitious plans for the future	26
2011	Hamburg	1.800.000	High environmental standards and ambitious plans for the future	25
2012	Vitoria-Gasteiz	242.000	Environmental results obtained in public green areas, biodiversity and management of water resources	25
2013	Nantes	292.000	Sustainable transport policy	20
2014	Copenhagen	580.000	Success model, especially for the green economy, and because it has an efficient communication strategy	25
2015	Bristol	430.000	Investment plans for energy and transport, decreasing emissions despite the growing economy, development of cycling, intensive involvement of citizens	19
2016	Ljubljana	278.000	Significant changes brought about sustainability with promotion of environmentally friendly modes of transport and protection and conservation of green and recreational areas	20
2017	Essen	581.000	Transformation from an industrial area into a cleaner and greener city	23
2018	Nijmegen	171.000	Mobility planning with significant investments in infrastructure	15
2019	Oslo	658.000	Ambitious urban mobility plans, careful transport planning, densification at public transport hubs with the aim of enabling a car-free life	8
2020	Lisbon	548.000	Demonstration of how sustainability and economic growth can go hand in hand despite facing an economic crisis	42
2021	Lahti	119.068	The City of Lahti displayed strong performance across the majority of the indicator areas and demonstrated great proficiency in Nature & Biodiversity, Noise and Water. It received top ranking in the areas of Air Quality, Waste, Green Growth & Eco - innovation and Governance.	47

tab. 3. Europe Green Capital Award

The Horizon Europe program is pushing municipalities to take an innovative approach to provide cities with a "widespread and synergistic digital infrastructure", thus favoring interaction between urban services.

M. Annunziato, Director of the Smart Energy Division of ENEA, in *Smart City Platform: A programmatic proposal for the transformation of the country system into a smart key [..]* writes: “today mobility, tourism, energy, public lighting and electrification are deeply connected and only with a systemic and integrated approach is it possible to manage and face the new evolutionary challenges. It is therefore necessary to initiate and guide the transition of the Municipalities in the adoption of a digitized system for the management of urban data, favouring the urban reorganization - with a view to digital integration - of the management processes of the infrastructures and services that, respectively, govern and animate cities and territories with a view to digital integration”.

ENEA, the National Agency for New Technologies, Energy and Sustainable Economic Development, has explored a model of the city of the future with high-tech solutions and tools for homes and the urban environment while maintaining reference concepts such as energy and water saving, safety, health, circular economy and environmental monitoring.

The Agency, collaborating with the main national university institutes, as part of the project "Development of an integrated model of Urban Smart District" of the Program Agreement with the Ministry of Economic Development, has tested these solutions in some Roman districts, in Italian municipalities and in the Smart Village of the ENEA Casaccia Center.

An integration ICT platform was developed, a Smart City Platform, capable of connecting all urban services to the platform and integrating the prototypes and innovative solutions created.

The integrated technologies of the replicable model of the city of the future, reported in *Innovation: from ENEA a model for the Smart City of the future*, are: smart home, smart building, smart street, smart street lamps, software for risk forecasting of energy infrastructures and water systems, a system based on drones for energy monitoring of buildings, management of water and organic waste, a national platform for monitoring and assessing the consumption of energy-intensive public infrastructures and Social Urban Network. All these technologies send data to the SCP simulating a city and this makes the model effectively replicable in an urban context.

ENEA has created a prototype of an open, standardized and replicable platform in different urban contexts.

The ICT platform is a “data collector software” which is used to monitor and manage the application contexts of the city more

efficiently. Based on a common methodology, which allows the integration of urban services on a district, city or national scale, the Smart City Platform uses interoperable management systems, which, while remaining autonomous, are able to exchange useful information among themselves effectively. All this is possible thanks to the adherence of the systems to technical specifications, or the Smart City Platform Specification (SCPS).
In particular, the ENEA Smart City Platform was designed to be used by the city administration and aims at two important goals: to provide a tool to the municipality, to observe and manage the application contexts of the city, freeing itself from closed proprietary solutions and thus creating a bridge to communicate the different platforms already used at urban level.
The model was first tested at the ENEA research centres and later in some urban realities such as Livorno, Reggio Emilia and it is planned to extend the experimentation of the project to Umbria and the Municipality of Bologna. ENEA, along the way, supports cities, supporting them in the definition of the general approach and in the transfer of smart culture, helping to connect local urban platforms to the national platform of the Agency.

To resume the above, in the last decade there has been attention and expectations on the role that information and communication technology (ICT) solutions play in increasing responsibility, participation and transparency in the Public Administration. Furthermore, attention to citizen participation is increasingly at the centre of the debate on Intelligent Cities. However, technological solutions have often been proposed without considering the needs of the mayor and the socio-technical misalignment within the city and concentrated in the peripheral area. This increases the digital divide between those who have access to technologies and those who are partially or totally excluded.
To create an IT solution for a Smart City and facilitate interaction between citizens and the administration in urban suburbs, the MiraMap project, a government IT tool, is mentioned, demonstrating how much the process structure, the methodological system and the support new technologies 2.0 have played an essential role in addressing the complexity and dynamics of urban development in an inclusive way.
This is a social innovation project, which uses a collaborative digital platform to promote communication, participation and interaction between citizens and administrators. MiraMap combines online and offline modes and consists of a geo-referenced interactive map, used by citizens to report problems and proposals regarding public space, and a back-office system available to technical-administrative staff to manage user reports. In this way, the role of active participation of

citizens and governance of the Public Administration territory is strengthened, which becomes a subject capable of managing contributions of a different nature, with a view to co-planning and co-production of services.

The novelty of the approach lies in connecting a new local social network based on an interactive map, called First Life, with an open source business process management (BPM) system. Therefore, the MiraMap architecture provides:

- an interactive map, which is used by citizens to report complaints and proposals located in the neighbourhood and make them visible to all;
- a BPM used by administrative staff to manage complaints and proposals. The map automatically shows the progress of administrative processes as the workflow progresses in the BPM and provides citizens and policymakers with a comprehensive view of neighbourhood problems and opportunities;
- an interactive website functional for monitoring the process, consultation and dissemination.

The interaction with the participants was put first and the workflow and the interface of the BPM were developed in close collaboration with the administration. Citizens can create and share geo-referenced reports on the web-based map. The reports sent individually are shown on the public map and everyone who is connected can learn about the progress of the management of the reports through graphic markers and finally comment and share. Each stage of the administrative process is communicated to the citizen via email and, at the same time, can be seen as a change of state on the map.

The medium-long term goals that the project identifies are to propose an administrative sustainability model that can be replicated through:

- the simplification and transparency of the reporting data management process;
- the creation of a low cost, accessible and inclusive “smart” system;
- the conception and improvement through application experimentation of a working methodology that can involve representatives of civil society, the Public Administration and local associations from the earliest stages;
- the construction of interest and capacity on the territory for the use of new technologies for the identification, mapping and monitoring of elements (punctual and systematic) connected or influencing existing or potential problems;
- the ability of all the actors involved to promptly consult data and intervene with solutions, offering an accessible and rapid response to the reports received;
- the availability of a tool to support decisions.

In conclusion, the MiraMap project was conceived to encourage bottom-up involvement and at the same time make the PA more aware of the needs of citizens and more transparent towards citizens in investment decisions, thus facilitating the activation of inclusive and micro -projects on the territory.

TERRITORIAL ACCESSIBILITY

The problems of transport / urban territory interaction have been the subject of reflection for several decades, especially since mass motorization has spread. The availability of new transport technologies, the gradual increase in the economic conditions of large groups of the population, the growing needs of individual mobility, and other factors, have determined situations that have become unsustainable in environmental, social and economic terms over time. Phenomena of environmental pollution, social disintegration, accidents and diseases due to vehicular traffic, significant energy consumption, ineffective management of the logistics of freights in the city, have resulted in unsustainable economic costs for many communities. The search for new solutions useful for making urban life more sustainable and recovering adequate quality standards, has prompted us to review the classic paradigms of the expansion of the urban fabric and also to exploit the opportunities offered by technological advances. If innovative solutions for the reorganization of the land / transport system have been experimented since the early 1970s, it is especially in the new century that interesting solutions of smart cities are emerging and spreading, i.e. cities capable of ensuring at the same time values of environmental eco-sustainability, high opportunities for social communication, significant reductions in costs and material consumption. The attractiveness and effective use of the city are strongly linked to the structure of mobility; in urban regeneration actions there is the problem of ensuring accessibility from the outside and inside. The question therefore arises of combining urban regeneration and mobility policies to make the city more accessible.

Mobility analysis can be addressed by adopting transport models. Some approaches consider the issue at the level of land use / transport, others focus only on the normal dimensions of the journey (origin, destination, modal choice, route). Transport planning decisions affect land use directly through the amount of land used and indirectly through the location and design of the development (Litman, 2019). Transport and land use are part of a retroactive system in which the components influence each other.

Fig. 7 shows a simplified scheme useful for framing the problem. Given a territory, it is possible to distinguish a transport system and a system of (socio-economic) activities that interact mutually. Within the transport system it is still possible to distinguish two macro-components, supply and demand; the interaction between these two

components translates into traffic flows on the transport network and network performance (service levels, transport quality, external impacts). The interactions between transport and land use are also part of a complex picture that includes economic, political, demographic and technological changes. The business system influences the demand for transport and, in turn, is influenced by the structure of the transport system, through accessibility. Indeed, a good transport system improves accessibility to the area.

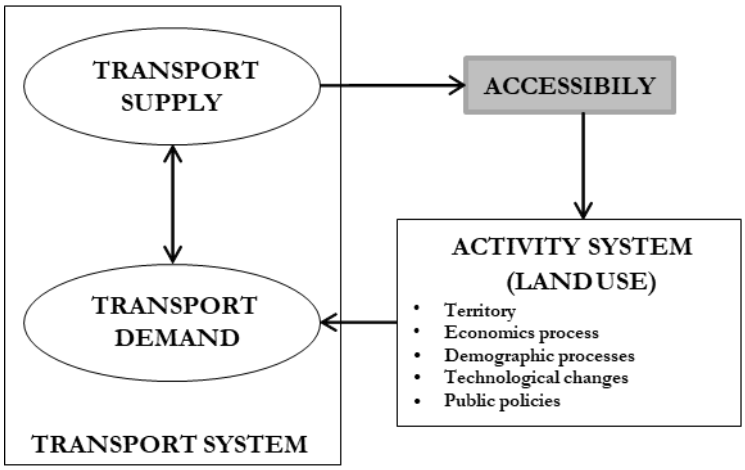


fig. 7. Accessibility in the context of t Transport / Territory interaction

Transport and tourism

The accessibility analyzes highlighted a close correlation between tourism development and the transport system, which is worth investigating. There are many studies concerning the transport/land use dimension; states of the art have been proposed by different authors (Wilson, 1997; Wegener and Fürst, 1999; Russo and Musolino, 2007; Acheampongand and Silva, 2015); but related to the tourism/transport sector they are rarer. The interactions between tourism and transport have been studied by some scholars (Prideaux, 1993; Page, 2005); there are also specific researches related to the estimation of the demand for touristic mobility (Lim, 1997; Page, 1999; Li et al., 2004) and the demand/supply interaction in the tourism sector. The majority focuses on forecasting models and econometric approaches. Matching supply and demand in tourism has been analysed from different perspectives (Lubbe et al., 2013), such as tourists' motivations and destination choice (Andreu et al.2005), tourist perceptions of destinations (Ibrahim et al., 2005), destination attractiveness (Formica and Uysal, 2006).

The typical transportation model subdivides a territory into relatively homogenous land-use zones, and express the demand for couples of zones in a specific interval of time (hour, day, year). For the tourism industry, it is possible to distinguish two different land context:

- an interregional or international context, where trip-generating zones are states or regions and the destinations consist of a range of potential attractive regions, land or

cities; in this case the touristic flows occur between specific points as airports, train/bus stations, ports, or origin/destination sites using car as mode of transport;

- a local context; trip generating zones tend to be highly concentrated areas of hotels and resorts, as well as more dispersed second homes and those of friends and relatives; like workday commuters, the overall flow of tourists will occur out from these points of origin in the morning, and return to them at the end of the day (similar to a hub-and-spoke pattern).

An important element in touristic mobility modelling is the transportation network, which includes the alternative routes from the different origin/destination couples. The network depends of type and distance of travel and of the modal opportunities available; transportation modelling is useful to predict the distribution of trips among different transportation modes. The choice of transport mode considers two factors: a practical one relating to forms of transport available and a perceptual one relating to the perceived related costs and benefits. Basic modes are available: car, airplane, train, bus, ship; and, at local context public means (buses, trams, trains, ferries, taxis), bike, walking. The two most important modes of travel serving tourism are today air travel and the private motor car.

A specific field of research concerns territorial accessibility measures. Some studies focus the attention only on the transport supply, considering the role of transportation in tourism essentially to provide accessibility (Van Truong and Shimizu, 2016). Without accessibility, tourism simply cannot take place (Prideaux, 2000). Accessibility is not only defined as providing opportunity to tourists to reach destinations, but also by the use of transportation services at destinations once they arrive (Page and Connell, 2014; Hall and Le-Klähn, 2015). Della Corte et al. (2010) assess the attractiveness of tourist destinations through "Six A's", as follows: "(i) Accessibility of the destination; (ii) Attractions, defined as the local sights that attract demand; (iii) Accommodation structures; (iv) Amenities, or the services available at the destination (restaurants, theatres, etc.); (v) Assemblage, or the activity of tour operators/local actors to generate complex offers; (vi) Ancillary services, which include the activities of incoming agencies, local institutes, and supporting organizations. Among these factors, accessibility is stressed as the fundamental element that determines the destination's position in the market".

In general, a tourist destination's accessibility can also be improved by developing the transportation infrastructure network or by improving connectivity between the network and tourist facilities. In some exceptions, improving transportation infrastructure may reduce accessibility (Sheffi, 1985). Cost is a major consideration determining

the demand for a destination. It generally includes two components: travel cost (monetary and temporal) and living cost at the destination.

INNOVATIVE POLICIES FOR SUSTAINABLE URBAN MOBILITY

If the city in its various territorial dimensions represents today the model of maximum concentration of critical impact factors on human well-being and health, the transport system is the main protagonist in the search for effective and dynamic solutions.

The European debate is offering important contributions in terms of innovation in the design and implementation of interventions aimed at combining the urban development needs of cities and the indispensable policies for sustainability. Eco-neighborhoods, ecological housing, smart cities, are concepts that can be interpreted as different declinations of a single line of innovative approach that characterizes the strategies of urban regeneration and the construction of new parts of the city, involving the fields of digital innovation and construction technologies and their synergy within invisible technology processes.

The infrastructure project, and with it the urban landscape project that underlies it, builds a system of relationships and multi-scalar dynamics, inherent in the definition of collective space. Public transport, active mobility or private non-motorized transport (cycle-pedestrian), intermodality, door-to-door mobility, security, urban logistics, mobility management and Intelligent Transport Systems (ITS) represent the themes on which the Action Plan on Urban Mobility (2009) and the Transport White Paper (2011) have been oriented in order to achieve the long-term climate and energy goals (2050) promoted by the European Commission.

Traffic, pollution, energy consumption are all problems related to urban mobility. The enhancement of public transport and research on technological innovation of vehicles are tools with which administrations can improve the management of resources and the quality of life of citizens.

In response to the need for more appropriate legislation with urban development, many administrations have opened the legislative process for the adoption of Sustainable Urban Mobility Plans (PUMS) which should allow the spread of innovative technological applications in the field of transport. We are therefore witnessing the relaunch and diffusion of trams and underground lines or public transport systems in their own or private offices and of ICT for mobility.

The term sustainable development dates back to the 1970s, but only in the 1990s was it used in the context of urban renewal policies (Bromley et al., 2005). Sustainable development is a complex concept (Weingaertner and Barber, 2010) made even more important by the fact that there is no common definition of sustainability. There is a growing line of research that attempts to conceptualize the

sustainability of urban renewal in different contexts. Lorr (2012) examined three of the most common theoretical approaches to sustainability: the perspective of intergenerational and intra-generational equality and justice, the global perspective of environmental, economic and equitable change, the greening perspective of the free market.

Regardless of the conceptualization of sustainability, common sense seems to be that sustainable development is founded on three pillars: social, economic and environmental. This has therefore become the most popular approach to achieving a more sustainable society in most contexts, and urban renewal is closely linked to it.

Urban renewal aims to address a number of problems, including the deterioration of urban functions, social exclusion and environmental pollution. It is considered a valid approach to promote land values and improve environmental quality (Adams and Hastings, 2001), address the problem of degradation and achieve various socio-economic goals (Lee and Chan, 2008), improve existing social networks, the inclusion of vulnerable groups and change the negative impacts on the living environment (Chan and Yung, 2004). Specifically, urban renewal projects aim to ensure good quality housing and reduce the risks to community health (Krieger and Higgins, 2002), promoting the repair of dilapidated buildings and improving the effective use of housing stock and resources. territorial areas of the city (Ho et al., 2012). In these respects, urban renewal can contribute significantly to sustainable urban development if it follows a sustainable path. However, most urban renewal policies tend to focus on economic regeneration rather than environmental or social regeneration (Couch and Dennemann, 2000). Although the relationship between sustainability and urban renewal is complex, it provides direction for a sustainable urban future.

On the other hand, the insufficient use of energy produced from renewable sources, the dilapidated building stock in terms of energy performance, the often convulsive urbanization that characterizes the territories, the wicked use of the land, have led over the years to the creation of situations of unlivability of places and cities. Hence the need to promote interventions aimed at restoring the expected environmental quality to places, limiting the impact that the existing urban fabric has on the environment to a minimum, focusing on new technologies, home automation, quality and excellence.

It is in this perspective that the theme of the smart city, energy saving, limiting emissions, that is, new and possible solutions to make the urban environment more sustainable and livable. Carefully analyzing the territory, grasping the real needs, exploiting its inherent vocations and enhancing its strengths, are the cornerstones of a careful planning-design of interventions, not exclusively plant-structural but understood in a broad sense, including the economic-cultural sphere.

The use of ITS

The so-called Intelligent Trasportation Systems (ITS) respond to the containment of the environmental and social impacts of urban mobility by offering a new range of technical solutions based on integration with digital and information technologies. Examples are hydrogen vehicles and mobility control through smartphone applications.

Sustainability is the main goal behind strategic planning and solutions for urban mobility. The city of the future must be able to exploit all the resources that are within it. In terms of urban mobility, this means knowing how to exploit the flows of commuters, tourists and the rest of traffic according to a logic of effectiveness and efficiency. All the actors of city transport must be included in a mutual enhancement plan: car pooling that becomes real time ridesharing, car sharing, bike sharing and public transport can jointly succeed, in a synergistic way, in providing citizens with a high value service, flexible and capillary at the same time.

Among the approaches to innovative services for mobility it should be noted the MAAS (Mobility As A Service), a new business model for the provision of transport services. Like all "as a service", it provides for a monthly flat-rate subscription that guarantees the personalized use of a bundle of public and private transport: trains, buses, taxis, car and bike sharing that can be used indefinitely. The development of an integrated sustainable mobility offer that is increasingly door-to-door and in line with the needs of citizens, also thanks to the support of new information technologies, constitutes a strategy aimed at optimizing existing resources without decreasing accessibility. of the territory and the related freedom of mobility of individuals.

The goals of improving the competitiveness of the transport and mobility sector, and its extension to the main economic sectors connected to it, require an integrated approach that takes into account many factors including the dynamics of vehicle fleet turnover, infrastructure, sustainable planning. Added to these is the need for a strong and effective strategy, focused on promoting research programs that improve the strategic positioning of production companies and favor the development and industrialization of efficient and competitive mobility products and services capable of generating development. socio-economic sustainable.

Integration of public transport and urban planning

The integration of urban planning and public transport can lead to:

- revitalization of an urban area and better accessibility to public transport;
- creation of new multifunctional and compact urban areas oriented to public transport;
- redevelopment of stations/stops and surrounding areas, ensuring greater public safety.

Compact urban transport oriented structures (Transit Oriented Development, TOD) can help reduce the use of cars, compared to dispersed structures. It is about acting through Transit Oriented Development Design projects, rethinking the development of urban spaces. For example, their provision to facilitate the mobility of pedestrians around stations could encourage the use of more sustainable modes of transport. Roads could also be remodeled as green infrastructures through extensive and careful use of vegetation that could provide a better microclimate, lower pollution levels, and generally greater sustainability of urban areas (Barcelona City Council, 2013). TOD can be thought of as:

- urban design principle (Calthorpe, 1993) oriented towards pedestrian accessibility, a great density around the stations, a functional mix, an urban 4D: Distance, Density, Diversity, Design;
- tool to increase the use of the public transport system and improve urban quality in all stations / stops, influence mobility behaviors, limiting urban expansion and car-dominated development logics.

Some American studies claim that Transit Oriented Development (TDO) offers a range of benefits ranging from lifestyle, to the environment to the economy. A higher density development offers ecological advantages such as more efficient use of land, greater energy efficiency, reduced pollution, health benefits. For the urban economy as a whole, the transport costs of a compact development model that revolves around stations and public transport are generally lower than those of a dispersed development model that depends on the car. Public transport is preferred over the car especially in well-designed areas that prioritize sustainable transport. San Diego (California) was the first city in the United States to adopt a TDO ordinance for public transit-oriented urban development in 1992.

The International Union of Public Transport (UITP, 2009) states that, with a view to public transport designed to improve the quality of the surrounding urban fabric, particular attention must be paid to the design of stations and accessibility for pedestrians. Multimodal access is another essential element to consider. Not necessarily for each station, but at least at the network level, favoring access to bicycles, improving accessibility for pedestrians and maximizing the integration between buses, trams and trains, aiming to expand the range of accessible destinations with initiatives that improve the competitiveness of public transport compared to private cars.

CHAPTER III

PLANNING APPROACHES AND LIMITS. AN INTEGRATED URBAN / TRANSPORT PLANNING APPROACH

CHAPTER III

Planning approaches and limits. An integrated urban / transport planning approach

Ensuring high levels of accessibility and sustainable mobility are now the main goals of the city government policies in order to minimize negative impacts on the environment. The achievement of these goals must be pursued together with the requalification of the spaces that must adapt to the needs of different needs and the reconfiguration of many urban activities. This raises the need to re-elaborate cognitive, methodological and operational approaches to governing urban transformations through the integration of scientific sectors that until now have seemed distant, such as urban planning and transport. Over the last twenty years, we have gone from considering the city as a space whose shape and organization was the result of the transformation of its places, to conceiving it as a space mainly dedicated to supporting the flows of mobility deriving from the activities located in it. Both conceptions are based on the conceptual separation between urban spaces and displacement flows, while one must aim at achieving a model based on their integration.

A careful observation of the urban phenomenon therefore reveals that its evolutionary process and the organization of spaces depend both on the demand for new activities and on the demand for mobility, generated, in turn, by many and different social factors. As some authors point out, what was previously the project load of the plan, i.e. the demand for housing and anthropogenic activities in general, now seems to be largely replaced by the demand for mobility of people.

If in the literature it is now agreed that, to ensure greater chances of success in environmental challenges, it is necessary to adopt an integrated approach; in planning practices the integration between urban planning and mobility management plans is not put into practice. This circumstance is, in part, due to the fact that the development of a synergy between plans, programs, urban planning and mobility management tools and the use of environmental and energy indicators with which to monitor the actions undertaken or to

be undertaken requires a great deal of effort of cooperation and resources, both human and economic.
The results in terms of air quality and urban environments, greater accessibility to places and the sustainability of transport systems cannot be entrusted to the sensitivity of technicians and administrators towards environmental issues; planning initiatives should be codified on the basis of complete integration between the urban and transport systems. These initiatives should also pay particular attention to the sharing of decision-making processes with stakeholders and the entire community: the creation of consensus and extensive participation are, in fact, elements that can no longer be ignored in order to achieve any goal. transformative that begins first of all with a radical diffusion of the culture of participation.
The integration between the governance of urban transformations and the governance of mobility is, therefore, only the first qualitative leap on which to base the preparation of planning tools open to the integration of all the components that make up the urban system in its complexity.
It is evident that the transformative goals and urban policies pursued in the different realities are not questioned, but the process to be followed, the role of the actors involved and to be involved and the tools with which to operate.

URBAN PLANNING TOOLS

In the evolution of urban planning tools in Italy, three different models can be distinguished, based on the legislation that produced them: the nineteenth-century one of the law of 25.06.1865, n. 2359, that due to the town planning law of 08.17.1942, n. 1150 still in force and the contemporary one, due to regional laws.
The nineteenth-century model develops in the second half of the nineteenth century with the l. 2359/1865, the first Italian town planning law. Municipalities with more than 10,000 inhabitants can draw up a Building Master Plan for the rehabilitation of the existing city and / or an Expansion Master Plan for the new expansion. Expropriation for public utility is introduced, with compensation commensurate with the market value of the properties to be acquired. These are Regulatory Plans concerning the city alone, often some parts of it and not the entire municipal area, essentially based on the identification of a new road network to be expropriated, which cuts out new urban blocks, within which private individuals its interventions in compliance with specific building regulations, while the Municipality must create the roads and services provided. In the blocks, functional destinations are not indicated, except for some rare public services and some new parks. Over the years, the original nineteenth-century building typologies cantered on the closed block of the block or on isolated buildings, more or less large, surrounded by fences aligned on the edge of the block, have been replaced by the

new types of rationalism, with buildings oriented according to the specific criteria, or, maintaining the alignment of the block, but with taller and more consistent buildings. The same demolition interventions carried out during Fascism were managed in the same way, except for some interventions managed by special rules.
Territorial planning is introduced in Italy (Ministry of Public Works) as a competence of the State by the law 1150/1942 (fig. 8) for special interventions in some areas that require supra-municipal authority.

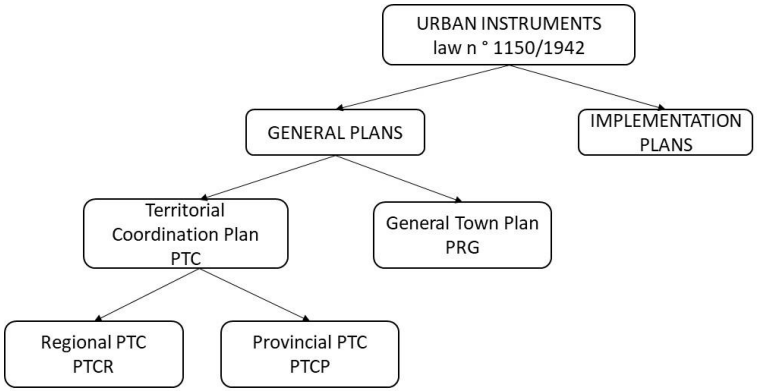


fig. 8. Urban planning process

Therefore, the instrument of the Territorial Coordination Plan (PTC) is envisaged, with indefinite validity and with binding legal effects on municipal planning. Until the transfer of urban planning powers to the Regions (1972), however, no noteworthy activation of territorial planning was recorded, except for the use of this tool to define the structure of national and regional parks, a solution that is still used today. From then on, on the other hand, regional legislation defines an important space for territorial planning, both at the regional level and at the sub-regional level, especially the district. The structure of this provides a cascade territorial planning system articulated on three levels connected by hierarchical ways: supra-municipal planning, which traces the general lines of land use, municipal planning that regulates the organization of the municipal territory and implementation planning that allows you to intervene on individual building uses.
At the regional level, the reference plans are the Coordination Plans and the Landscape Plan. With the law of 08.08.1985, no. 431 also assumes great importance the landscape planning, a form of territorial planning, usually at the regional level, which takes up and develops the protection legislation introduced by the law of 29.06.1939, n. 1497, which however related to particular assets specifically identified. With the Landscape Plan, variously referred to by the Regions, the cultural heritage bound by the law of 1.06.1939, n. 1089, thus arranging an organic plan for the protection of cultural and landscape heritage. The *Code of cultural heritage and landscape* (Legislative Decree of 22.01.2004, n. 42) has been in force since

2004, unifying and coordinating all the relevant legislation and defining the formation of Landscape Plans with joint responsibility of the State (Ministry of Cultural Heritage and Activities) in relation to the constraints of competence and of the Regions, which can also sub-delegate Provinces and Municipalities both for in-depth planning, landscape and management.

Territorial Coordination Plans are, in general, great reference frameworks for local planning and for connection with regional planning, especially as regards infrastructural and environmental policies, while the district level tends to replace the disappointing experience of Intercommunal PRG. However, it is with the law of 08.06.1990, no. 142 that territorial planning, henceforth also referred to as "large area" assumes great importance, we distinguish the Regional PTC (PTCR) and the Provincial PTC (PTCP). The first defines the general and specific goals of the regional policies for the territory, of the sector programs and plans having territorial relevance, as well as of the interventions of regional interest. These goals constitute a programmatic reference for the territorial policies of the Provinces, the Metropolitan City, the Municipalities and other local bodies and for the respective sector programs and plans. It also provides directives (in the form of precise indications) and guidelines (in the form of general indications) that must be implemented by the urban planning instruments of the local and regional sectoral bodies, as well as by other regional bodies and finally in the formulation of own opinions on plans and projects under the competence of the State and other entities affecting the territorial structure. The PTCP assumes a fundamental role of strategic direction for those areas of exclusive provincial relevance, respecting the guidelines and guidelines of the regional territorial planning tools, allows the sustainable development of the territory and the protection of supra-municipal interests according to a model of dialogue and loyal cooperation with local authorities. The plan has the function of programming and planning guidance, and establishes the directives to be followed in lower-level planning in relation to the location and enhancement of the main communication lines (road, rail, sea), of the plants of particular importance, interventions relating to water regulation and hydrogeological and hydraulic-forestry arrangement.

A parallel reasoning should be made for mountain communities, local authorities established between mountain and partially mountain municipalities, not necessarily of the same Province, with the aim of promoting the enhancement of mountain areas, the exercise of their own functions and assigned functions associated exercise of municipal functions. The mountain community development plan is a special urban plan because it has as its goal the development of the mountain. The drafting of this plan by the mountain community is optional. The plan which has an indefinite temporal validity must be in harmony

with the regional urban planning lines and in turn conditions the municipal general regulatory plans. It can therefore be considered a territorial coordination plan limited to mountain areas only. The works envisaged in the development plans of mountain communities are considered of public utility, urgency and cannot be deferred and therefore the areas concerned are subject to expropriation constraints.

PRG has an indefinite validity, is prescriptive and conforming to building rights: it is therefore a legally binding, rigid instrument, which can only be modified with a variant with complex approval procedures of the same PRG and can only be replaced by a general variant or a new PRG. These characteristics have made its application problematic in many municipalities without an adequate technical management structure, while the long approval times have discouraged the necessary adaptation.
During its long life and very wide application, the contents of the PRG change with the changes in the socio-economic and therefore territorial situation. The most important change occurs with the passage from the phase of urban expansion (1950-1980) to the subsequent phase of the urban transformation still in progress: in the face of this new scenario, the limits of a tool designed for expansion appear evident and contribute to its decline.
The limitation of the duration of urban planning constraints, the expropriation crisis, but also the extreme rigidity of the instrument make the application of the PRG increasingly difficult, questioned in the nineties both by deregulation and by the use of the Integrated Program of Intervention (PII), a negotiating tool based on the systematic use of variants, envisaged by the law of 27.01.1977, n. 179 and similar to the PP in terms of urban planning, but absolutely different, being always a variant of the PRG.

The contemporary urban planning model is based on a 1995 reform proposal from the National Institute of Urban Planning. The PRG is replaced (fig.9) by three components: the Structural Plan (PS), the Operational Plan (OP), the Urban Planning Regulations (RU).
The PS has only a programmatic character, non-conforming of building rights and not binding, thus overcoming the difficulties related to the rigidity of the previous model, the duration and the forfeiture of the restrictions; while not excluding an expropriation approach, it suggests the use of urban equalization, as an alternative implementation method to expropriation; it contains all the essential (structural) indications for the infrastructural, environmental and settlement systems, defining the future structure of the territory and identifying the strategic functions that will have to be confirmed or implemented over the period of its duration of ten to fifteen years; finally, it is subjected to the Strategic Environmental Assessment, an

assessment and participation procedure originating from a directive of the European Community, which involves all those who have responsibilities in the governance of the territory.

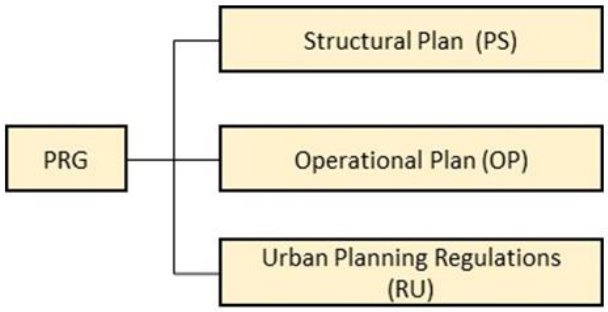


fig. 9. PRG's component

The PO relates to urban transformation interventions, has a prescriptive, binding and conforming nature of building rights and an indicative duration of five years, to allow the equalization of urban planning constraints to the building rights assigned. It is not an implementation tool of the PS, but translates its indications by design, thus guaranteeing the flexibility that proved necessary during the application of the previous PRG. Its implementation is therefore entrusted to direct interventions to the implementation tools governed by regional laws, often framed by a masterplan, an indicative and illustrative tool, widely used in Europe and the USA for the definition of urban projects and, in general, large projects of transformation.
The strategic-structural component is represented by the PS and is the one that shapes the territory (landscape constraints, ecological network,…). The operational component of the PO conforms the ownership, that is the jus aedificandi. In relation to this, the interlocutors of the planning administration are diversified and the evaluation methodologies are different.

The PS is therefore an urban planning tool of a strategic nature that includes urban planning forecasts. It is used by the municipal administration for:

- plan strategies for the government of the municipal area;
- implement urban policies, such as those for saving agricultural land.

The OP establishes the necessary elements for the operational interventions of protection and transformation of the municipal territory. It is used for:

- carry out administrative actions aimed at transforming policies into "detailed programs";
- decide where and when to intervene to implement the PS.

Finally, there is the RU, a tool with which it is established which are the processes of transformation of the territory that deserve to be

supported and strengthened and which, instead, are those that must be stopped. The urban planning regulation makes it possible to implement the design choices and guidelines contained in the structural plan; furthermore, it indicates which areas and which artifacts must be transformed, completed or protected.
The new model has found wide application in the regional laws approved at the turn of the constitutional reform of 2001 (constitutional law of 18.10.2001, n. 3). In some Regions, this application, albeit with different definitions, is fully compliant with the original indications of the INU (Tuscany, Basilicata, Emilia Romagna, Veneto, Umbria, Abruzzo), in others it experiments with similar roads, but with significant differences (Calabria, Puglia, Lombardy). The Regions that have not followed this path and have revisited the old model are therefore a minority, while very few have not yet changed the first regional legislation.
In the drafting of plans at a strategic level, an important role is represented by the Strategic Environmental Assessment (VAS) which pursues the general purpose of ensuring that human activity is compatible with the conditions for sustainable development, and therefore, in compliance with the regenerative capacity of ecosystems and resources, the safeguarding of biodiversity and an equitable distribution of the benefits associated with economic activity.
VAS is a process of integrated and participatory evaluation of the possible significant impacts on the environment and cultural heritage of plans or programs. It pursues the specific purpose of ensuring a high level of environmental protection and of contributing to the integration of environmental considerations when drawing up, adopting and approving such plans and programs by ensuring that they are consistent and contribute to the sustainable development.

The following public initiative operational plans are implementation tools of the PRG:

- Detailed Executive Plan (PPE - *Piano Particolareggiato Esecutivo*);
- Housing Development Plan (PL – *Piano di Lottizzazione*);
- Economic and Popular Building Plan (PEEP - *Piano per l'Edilizia Economica e Popolare*);
- Plan for Productive Settlements (PIP - *Piano per gli Insediamenti Produttivi*);
- Recovery Plan of the Existing Building Assets (PdR – *Piano di Recupero del patrimonio edilizio Esistente*).

PPE must be accompanied by a rough forecast report of the necessary expenses and a detailed plan volumetric representation of the surrounding environment. It must contain information regarding the road network; altimetry data; heights of buildings, spaces reserved for public works and indication of the buildings to be demolished and

rebuilt. The validity of an EPP is set at 10 years so it has the same validity as a strategic plan.

PL is an urban planning implementation tool through which it is possible to intervene for urbanization purposes on areas of the municipal territory intended by the PRG for residential or productive settlements. Using this tool, private initiative is integrated into the urban planning process by intervening on already urbanized or poorly urbanized areas. The main goal of the PL is the rationalization of interventions on the territory and integration with the urban context, within it we find information on the area subject to subdivision, on the road network, parking areas, green areas and the existing, planned and proposals for the improvement of the area.

PIP draws the structure and characteristics of the areas that the regulator plan has identified as a settlement of productive activities. The goal of the PIP is to guarantee the availability of areas at (originally) low prices, to promote an organic and coordinated planning, and to guarantee the availability of areas in regional development processes.

PIP project must indicate the road network and the delimitation of spaces to be allocated to works or systems of public interest, the subdivision into lots and their use, the location, type and construction methods of the various buildings and the expense as well as the cadastral lists of properties included in the plan

The goal of the PPEP is to form an area plan to be used for the construction of economic or popular housing, as well as for complementary urban and social works and services, including public green areas. It must be accompanied by information regarding the main road network and distribution, works and systems of public interest, subdivision and building typology in respect areas.

The drafting of a PdR presupposes the existence of a "will to recover" the existing assets already expressed in the drafting of the general plan. In fact, the degraded areas to be subjected to conservation, rehabilitation, reconstruction or better use of the urban and building heritage must be indicated and bounded. For the types of intervention allowed, the Recovery Plan plays a double role: on the one hand, it specifies the recovery interventions applicable to individual buildings or groups of buildings; on the other hand, it defines the urban restructuring interventions that can change the design of entire urban areas, therefore, it affects the urban layout of the areas in which it works. It must therefore contain the plan of the project on a cadastral map with identification of the minimum units of intervention and any areas of urban restructuring, supplementary implementation rules, regulatory profiles along the main squares and streets, graphic drawings of the main architectural types.

Fig. 10 summarizes in schematic form the breakdown of activities in urban planning, with functions, plan components, technical functions.

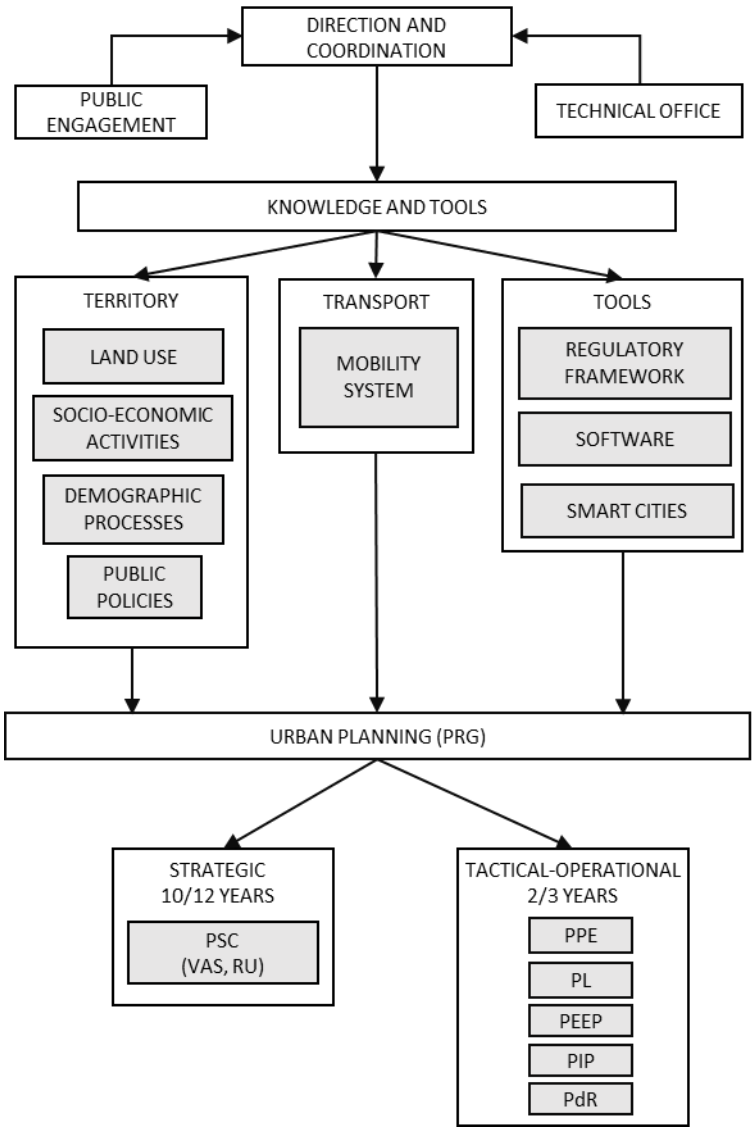


fig. 10. Activities in urban planning

- **PSC - Piano Strutturale Comunale** (Urban Master Plan)
- **VAS –Valutazione Ambientale Strategica** (Strategic Environmental Assessment
- **RU – Regolamento Urbanistico** (Urban Planning Regulation)
- **PPE - Piano Particolareggiato Esecutivo** (Detailed Executive Plan)
- **PL – Piano di Lottizzazione** (Housing Development Plan)
- **PEEP - Piano per l'Edilizia Economica e Popolare** (Economic and Building Plan)
- **PIP - Piano per gli Insediamenti Produttivi** (Plan for Productive Settlements)
- **PdR -Piano di Recupero del patrimonio edilizio Esistente** (Recovery Plan of the Existing Building Assets)

TRANSPORTATION PLANNING TOOLS

In this chapter, a reading of the current policies and sustainable mobility initiatives implemented at national level is proposed, with the aim of contributing to the definition of a new approach that arises from the integration between cities and mobility in compliance with the principle of sustainability.

Traffic has long been considered a major problem in the city. Attention to the issue of mobility in urban areas, i.e. to the mobility system understood as the set of movements made in a given territory and the physical structures that allow such movements (Cascetta, 1998), has developed in Italy second half of the 1980s, following a greater awareness of the issues of environmental quality and sustainable development. The great attention to these issues is certainly due to the increase in emissions of dust and polluting gases into the atmosphere, to which the greenhouse effect is linked. Among

the main causes of the increase in greenhouse gas emissions is undoubtedly the increase in vehicles in circulation, which in turn is determined by various factors, including sprawl and metropolitan diffusion phenomena. The increase in vehicles circulating on urban and extra-urban roads has in turn led to problems of saturation of the existing road network, as the number of vehicles in circulation exceeds capacity. According to Paolini (2004), the factors that have determined, over time, the onset of congestion due to urban traffic are essentially three: the emergence of the automobile as the preferred means of transport to public transport for comfort, personal prestige and savings. of time, the lack of adequate legislative instruments (of the municipal administrations) and the insufficient technical preparation of the staff and the disorderly urban development of the post-war period.

The tools of the Plan aim to provide a set of information, organizational and management tools that meet the goals of improving the quality of circulation, favouring the growth of environmental quality, social life and the urban landscape.

In general, a transportation system can be defined as the set of those components and their interactions that determine movements between different points of a certain territory. It can be broken down into two main strongly interacting components: the supply system and the demand system. The first is made up of the physical components (road infrastructures) and organizational components (traffic structure) that allow for travel; the second is given by the set of users who, driven by the need to carry out activities in different places, use different modes of transport.

The characteristics and the relevant aspects of a transport system can be reproduced in a synthetic and simplified way through the construction of a simulation model. In general, it is composed of an offer model capable of representing the main characteristics of the supply system, a demand model capable of reproducing the demand system and a supply / demand interaction model (or assignment model) capable of simulate traffic flows on the network. Decisions relating to transport planning affect land use. Given a territory, it is possible to distinguish a transport system and a system of (socio-economic) activities that interact mutually.

The business system influences the demand for transport and, in turn, is influenced by the structure of the transport system, through accessibility. Indeed, a good transport system improves accessibility to the area. The interactions between transport and land use are also part of a complex picture that includes economic, political, demographic and technological changes.

In Italy, the strategic planning process is divided on a national, regional and local scales. The apparently distinct processes influence each other (fig. 11).

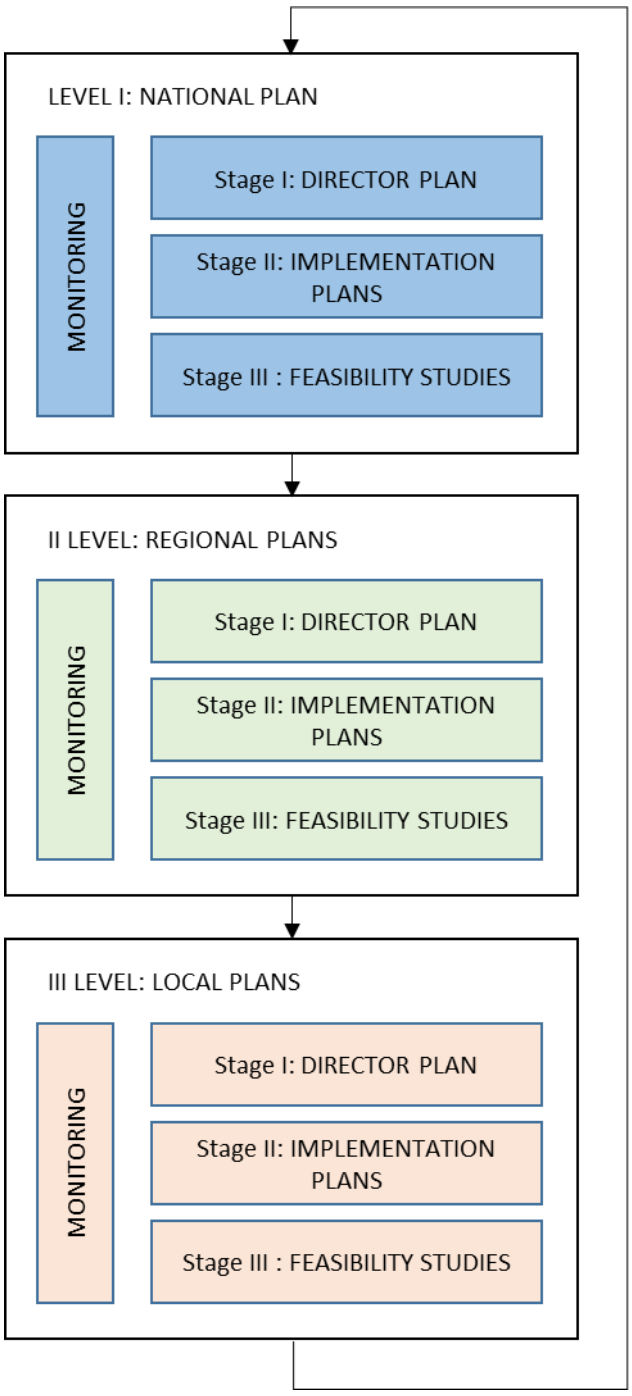


fig. 11. Articulation of the strategic planning process

On a local scale in particular, there are various plans and programs that have, over time, tried to regulate both vehicular and non-vehicular mobility. Until the 90s, there were no rules that regulated traffic circulation and it was entrusted to the ordinances of the traffic police; with the exception of the Urban Traffic Plan (PUT), introduced in 1986 by the Ministry of Public Works as a non-legal and therefore non-mandatory instrument. It became a legal instrument in 1992 with

the approval of the New Highway Code (*Codice della Strada*) which made it mandatory for certain municipalities with a resident population:

- over 30,000 inhabitants;
- less than 30,000 inhabitants who registered, even only at certain times of the year, a particular tourist influx;
- less than 30,000 inhabitants who are affected by high commuting phenomena or congestion of road traffic.

The declared goal of this instrument was to obtain the improvement of traffic conditions and road safety, the reduction of noise and atmospheric pollution and energy saving, in accordance with the urban planning instruments in force and with the transport plans in compliance with environmental values. Furthermore, the instrument should have established the priorities and the timing of implementation of the interventions. This plan should have been supplemented by a transport plan which was never established. It should have been responsible for structural intervention programs that would have involved modifications to the infrastructure and urban planning fabric and to the management of transport.

In 2000 a new instrument appeared on the national scene, the PUM. Urban Mobility Plan was made mandatory for municipalities or aggregations of municipalities with a population greater than 100,000 inhabitants for polycentric and widespread metropolitan areas.

PUM was in fact supposed to have replaced the previous transport plan envisaged by the 1986 circular which, however, was never created. The duration of the new Plan was established as ten years, providing for a systematic review every 5 years. Urban Mobility Plans are to be understood as projects of the mobility system, which include both material and immaterial interventions aimed at the specific achievement of certain goals:

- meet the mobility needs of the population;
- ensure the abatement of atmospheric and acoustic pollution levels;
- ensure the reduction of energy consumption;
- ensure an increase in the safety levels of transport and road traffic;
- ensure the minimization of the individual use of the private car and the moderation of traffic;
- ensure the increase in transport capacity;
- ensure an increase in the percentage of citizens transported by collective systems, also with car pooling and car sharing solutions;
- ensure the reduction of congestion phenomena in urban areas.

In the same year in which the PUM was produced, the Triennial Program of Services (PTS) of urban public transport and the Urban Road Safety Plan (PSSU) appeared on the national panorama with the

aim of achieving goals in terms of quality, efficiency, respectively. and effectiveness, and to reduce accidents. If on the one hand the new tools introduced have brought about improvements, on the other hand the overlap of the same, with sometimes similar goals, has done nothing but create confusion. In particular, the plans that came to life were born as a response to particular problems, or emergencies (pollution, accident reduction) therefore they were numerous and often poorly integrated with each other. Another tool was the General Transport Plan, established by law no. 245 of 15 June 1984, adopted in 2001 by a Ministerial Decree. It underlined how "the diagnosis of the transport sector in Italy highlights serious deficiencies of an infrastructural, managerial and organizational type and, in general, an inadequate quality of the service offered". It also highlighted some critical issues such as the increase in pollution, the decrease in safety, congestion and traffic in urban and metropolitan areas, or almost absent organizational systems and lack of coordination.
The General Plan of Transport and Logistics underlines how the PUM is the fundamental tool for regulating urban mobility (PGT, 2001).

At the European level, the first document introduced in the field of transport was the *White Paper of 1992* which placed at the center the goal of opening the market in the sector, which has now been fully achieved. This was followed by the *2001 White Paper* focused more on environmental, economic and social impacts, up to *the 2006 interim review document.* The goal that the European Union set itself through the creation of these tools was to obtain an effective and efficient transport system capable of:

- ensure a high level of accessibility to all citizens throughout the Union;
- promote rules to protect passengers, citizens and the industry itself, ensure safety and protect the environment;
- make the transport system more sustainable and efficient;
- establish international connections.

They were followed by strategies, programs that gave rise to other strategic documents, in 2004 the *Green Book - Towards a thematic strategy on the urban environment.* The overall goal was to improve the quality and environmental performance of urban areas and ensure a healthy living environment for the inhabitants of European cities, strengthening the environmental contribution to sustainable urban development while taking into account the related economic and social aspects.
The strategy for implementing the established goals was realized through the drafting of a document on sustainable urban transport: the Expert Working Group on Sustainable Urban Transport Plans.
The European Commission thus wanted to guarantee a sustainable urban transport plan to all cities with populations over 100,000

inhabitants. The plans would have enabled the 500 major cities in the EU to fulfill the obligations under the directives on air quality and noise assessment and management, and would have contributed to the achievement of the Kyoto Protocol goals.

The goal of these plans was to create a transport system that was accessible to all citizens, consistent with the choices of land use planning, with the economic and environmental development of the city, as well as efficient from an environmental point of view.

In particular, urban areas were identified as a laboratory where "new sustainable development policies could be tested: The challenge posed by sustainable development in urban areas is immense: it is a question of reconciling, on the one hand, the economic development of cities and accessibility of their territory and, on the other hand, the quality of life and environmental protection*"* (Green Book/*Libro Verde*, 2007).

With the 2009 *Action Plan on Urban Mobility*, the European Commission presented a global program for urban mobility; program to which local, regional and national authorities could refer. The action plan in particular provided for:

- to promote integrated policies to address the complexity of urban transport systems;
- to focus on citizens' needs by promoting reliable travel information;
- to support non-polluting urban transport by introducing new clean technologies and alternative fuels;
- to respond to requests for funding by carefully evaluating existing opportunities;
- to respond to requests for funding by carefully evaluating existing opportunities;
- to encourage the sharing of experiences and knowledge;
- to optimize urban mobility;
- to improve road safety.

The plan included 20 specific actions, some starting in 2009, others in 2010 and 2011 on issues such as improving information on mobility issues, passenger rights, better planning and the possibility of making transport greener.

In 2011, a strategic document was born with the intention of defining an agenda of interventions for the following decade, the *White Paper on transport*. The document aimed to reduce greenhouse gas emissions by 60% by creating a balanced, sustainable and efficient transport system. To do this, it equipped itself with 10 precise goals to be implemented which can be divided into 3 strategies:

- use innovative and sustainable fuels and propulsion systems;
- optimize the effectiveness of multimodal logistics chains by increasing, among other things, the use of more energy-efficient transport;

- improve the efficiency of transport and the use of infrastructures through information systems and market incentives.

According to the document, a mixed strategy is needed in urban areas to reduce congestion and emissions based on the following elements: spatial planning, charging systems, infrastructures and efficient public transport services for non-motorized transport modes and for refuelling of clean vehicles.

In 2013, a new document was drawn up by the European Commission (COM, 2013) with the aim of supporting the concept and development of sustainable urban mobility plans.

With this *mobility package* the Union undertook to establish a European platform on sustainable mobility plans to develop concepts, implementation tools and provide support to national, regional and local authorities for development and implementation.

It is precisely through this document that the main characteristics of a Sustainable Urban Mobility Plan were described and clarified how it included eight main elements:

- a long-term vision and a clear implementation plan;
- an evaluation of current and future performance;
- the balanced and integrated development of all modes;
- horizontal and vertical integration;
- participatory approach;
- monitoring and evaluation;
- quality assurance.

Forms of targeted financing, involvement of member states and research and innovation were guaranteed to solve new challenges of urban mobility.

Thanks to the documents published by the European Union, the concept of the Urban Sustainable Mobility Plan (PUMS – *Piano Urbano Mobilità Sostenibile*) has emerged more and more over the years, identified as the main tool for achieving an efficient and effective transport system.

PUMS is a strategic planning tool which, over a medium-long term time horizon (10 years), develops a system vision of urban mobility (preferably referring to the metropolitan city area, where defined), proposing the achievement of environmental, social and economic sustainability goals through the definition of actions aimed at improving the effectiveness and efficiency of the mobility system and its integration with urban and territorial structure and developments The new approach to strategic planning of urban mobility takes the document *Guidelines. Developing and Implementing a Sustainable Urban Mobility Plan* (ELTIS Guidelines), approved in 2014 by the Directorate General for Mobility and Transport of the European Commission and is in line with what is expressed in the annex

Connecting Italy: infrastructure needs and projects. PUMS integrates PUT and replaces the Urban Mobility Plan (PUM) of law 340/2000 which had never had effective regulation.

The Ministerial Decree of Infrastructure and Transport of 4 August 2017 (Official Gazette No. 233) highlights that the PUMS is clearly differentiated from the PUT, but is interacting with it. With the PUMS mobility problems are faced whose solution requires “investments” and therefore financial resources and technical implementation times, as well as the implementation of complex and intersector urban / metropolitan policies. The PUT, on the other hand, assumes "unaltered infrastructural resources" and organizes the existing ones in the best possible way, effectively representing a management plan.

From this perspective, it is clear that from the analysis of the unsolvable criticalities with the PUT, the works envisaged by the PUMS can be identified and that the PUT, once the PUMS works have been completed, will have to be revised since the set of available infrastructures will have changed.

The plan action will be divided into two levels. A strategic planning (10-12 years long horizon) which will be expressed through the Urban Sustainable Mobility Plan (PUMS); a tactical-operational planning (short horizon and limited resources) corresponding to the Implementation Plans identified in the PUMS.

PUMS assumes the role of Framework Master Plan and the implementation plans will be subordinate. The managers of the different components and phases of the Plan will have to interact directly or through the Plan Office (technical coordination) and under the supervision of the General Management.

PUMS is to be understood as a Framework Plan with a time horizon of at least ten years which should guide and include internally a series of implementation plans. First of all, the following are envisaged as Implementation Plans:

- Urban Traffic Plan (PUT – *Piano Urbano del Traffico*), including Road Safety Plan (PSS) and Urban Parking Plan (PSU);
- Soft Mobility Plan (PSM – *Piano Soft Mobility*), for the development of pedestrian and cycling mobility (pedestrian areas, accessibility for people with reduced mobility, BiciPlan);
- Local Public Transport Plan (PTPL - *Piano del Trasporto Pubblico Locale*);
- Shared Mobility Plan and low-impact vehicle dissemination (PMC - *Piano della Mobilità Condivisa*) relating to actions such as car sharing, car pooling, bike sharing, services on demand;
- Urban Logistics and Waste Management System (PLU - *Piano della Logistica Urbana*);

- Plan of the network of road infrastructures (PRI - *Piano della Rete Infrastrutturale*), parking, street furniture, etc.;
- Transport Systems Integration Plan (PIST - *Piano di integrazione tra i Sistemi di Trasporto*).

In transport planning process, particular attention should be given to the role of the Road Regulations (RV – *Regolamento Viario*), an operational tool, provided for in the Directives for the drafting and implementation of urban traffic plans.
It is a tool not yet exploited, which, in the ordinary drafting of the PUTs, is often reduced to a few pages or even just to a synoptic table which merely lists in a compiling manner the main geometric and functional indications of the road classification.
In reality, the tool of the Road Regulations, also for the tasks that the legislator assigns to it, can become a repertoire of guidelines for the classification, design, management and redevelopment of road space, the network that in the PUT constitutes the supporting system on to which the transport policies apply.

Below are the main contents of the implementation plans, summarized (fig. 12).
PUT is aimed at the management and rationalization of the transport network over short time horizons, with particular attention to the problems of fluidification of circulation (reduction of congestive phenomena) of the various user components and to the problems of parking, to the implementation of pedestrian areas or with limited traffic; any road pricing measures.
The measures for the diffusion of telematics technologies will also fall within the scope of the PUT, in order to spread modern telematics technologies in the various sectors of mobility capable of increasing the "intelligence" of the system consisting of infrastructure, vehicle, person, traffic; they should concern in particular applications in urban public transport sectors; in the management of private traffic; in urban logistics; in road safety, in information to users. The Parking Plan and the Urban Logistics Plan are also located within the PUT. The Parking Plan is aimed at identifying the demand and supply of parking in the urban centre, at detecting critical issues and outlining organizational and regulatory strategies in relation to the PUT guidelines.

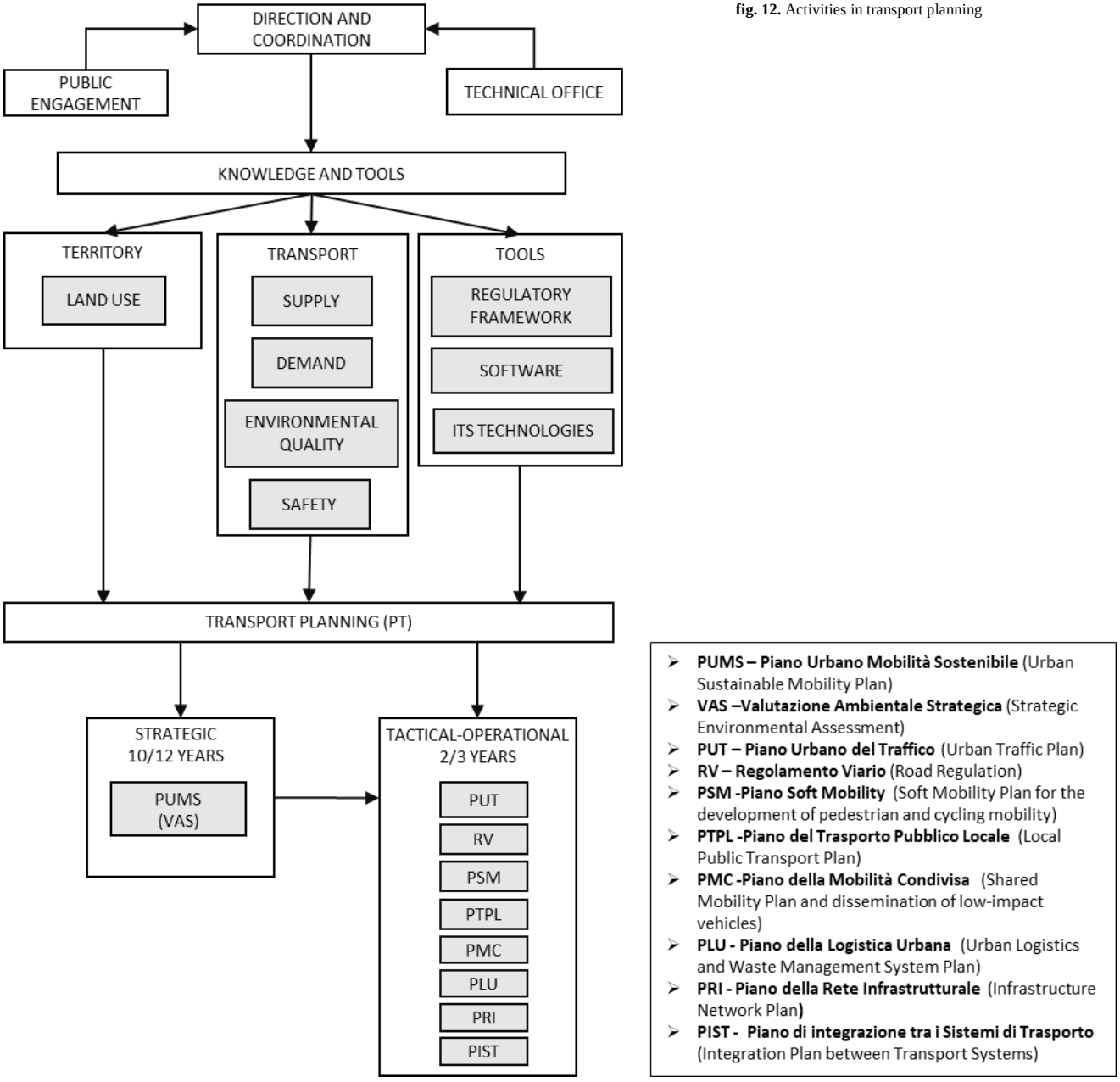


fig. 12. Activities in transport planning

The road safety plan is aimed at reducing accidents by acting on all the components that contribute to determining road safety: the infrastructure, the vehicle, man and traffic management. Therefore, it must implement lines of action which, as far as it is in the power of the municipal administration, contribute to increasing the safety margins dependent on these components. In general, these lines of action should concern in particular: the identification and elimination of black points and critical traits; the securing of the internal network of residential areas through the implementation of the 30 zone plans; the safety of the roads; strengthening the control and sanctioning of

risky driving behaviours; the diffusion of telematics technologies in traffic management in order to maximize safety; the promotion of educational campaigns particularly among young people; the development of educational activities in schools. In order to adequately perform the pre-eminent function that each road element must perform within the urban road network and - therefore - in order to ensure a homogeneous degree of safety and regularity of use of the road infrastructures themselves, the functional classification of the roads it must be supplemented by a specific road regulation that determines the geometric and traffic characteristics and the rules of use of each type of road. The road regulations determine, in particular, specific technical standards for each type of road.

The purpose of PSM is to pursue the maximum possible development of pedestrian mobility and the use of bicycles in the city. It has a very close relationship with the road safety plan and should concern in particular: the construction and maintenance of protected pedestrian paths and areas, cycle paths, service equipment such as social meeting spaces or bike parking; the offer of promotional services such as bike sharing or bike mobility management; promotional campaigns and any forms of incentives to leave motorized vehicles; partnerships and support for grassroots associations. In this context, specific actions must also be outlined for the accessibility of disabled people (PMR), aimed at creating the conditions for full compliance with the right to mobility for people with disabilities; the lines of action should concern in particular full accessibility to public transport and the elimination of architectural barriers from public space.

The aim of PTPL is to make urban public transport more competitive to the point of taking passengers away from private motorized transport. It must concern in particular: lines, intermodality, vehicle fleet, traffic light management, tariff policy and safety.

The primary goal of PMC is the promotion of a varied offer of sharing mobility services, in order to help reduce the use of individual means of transport, and to encourage the spread of ecological vehicles. The Plan provides for incentive measures dedicated to shared vehicles, such as access in restricted traffic areas and / or in the Low Emission Zones, facilitated parking on the blue lines and standard share of parking stalls on the entire road network; other interventions will also have to be implemented such as: the integration of shared mobility services with local public transport, the provision of sustainable mobility hubs to facilitate multi-modality, the definition of economic, management, social and environmental goals to be measured and evaluate periodically.

PLU has particular significance as it aims to reduce and rationalize the impacts caused by the circulation of freights transport vehicles in the city. The goal is to reduce the presence of large vehicles on the city's roads, to provide peripheral interchange structures (logistic platforms,

warehouses), to rationalize timetables, spaces and methods of delivery and collection of goods in order to avoid overlapping traffic at peak times, to encourage the " use of ecological means for distribution, promote intelligent forms of logistic cycle management that also include actions on reverse logistics. In this context, consideration is also given to the logistics relating to the management of waste collection and disposal.
The purpose of the PRI is to improve the performance of the infrastructural network by coordinating all the infrastructural interventions deriving from the other sector plans and from the needs deriving from urban planning or from infrastructure plans and projects of a higher scale. It must concern in particular: the improvement of intermodality and the public transport network; the elimination of bottlenecks; the offer of parking spaces; scheduled maintenance; the coordinated management of the interventions deriving from the other sector plans.
There are clear interdependencies between the sector plans. For example, interventions on private traffic can have effects on public transport and vice versa. The same can be said with reference to the interventions on the cycling system in relation to private traffic and public transport. For this reason, PIST for the various transport components appears important.

In addition to the PUT and the PUMS, another urban mobility planning tool is the PSSU (Urban Road Safety Plan). The regulations attach particular importance to the problem of road safety in urban areas, where in 2017 there were 74.6% of accidents, 43.4% of deaths and 70.8% of injuries. In urban areas, accidents that occurred at intersections accounted for 42.2% of the total, 6.6% on curves and 4.8% near a roundabout. Of the isolated vehicle accidents in urban areas, 14.3% involved pedestrians.
Some research conducted by the General Inspectorate for Road Safety has revealed the opportunity to promote, in the context of urban traffic planning, the drafting of specific road safety sector plans and already about 20 years ago (June 2001 - Circular 3698) the Ministry of the LL.PP. has issued the guidelines for the drafting of the PSSU that are attached and which constitute an act of guidance for the municipal administrations held, pursuant to art. 36 of the New Highway Code, to the drafting, adoption, implementation and updating of the PUT. The same document also represents a useful reference for the Administrations which, although not required to draft the PUT, want to pay due attention to the problems of road safety within their inhabited centers.
Referring to the entire inhabited center of the municipal area as defined by the Highway Code, the Urban Traffic Plan constitutes an

"administrative document" to be approved under Law 142 by the City Council; it is oriented to the following purposes:

- classification of the road network and related regulations of use;
- improvement of pedestrian mobility conditions, with the definition of squares, streets, itineraries or pedestrian areas (ZP) and limited traffic areas (ZTL);
- reorganization of the movements of private motorized vehicles, with the design of both the general scheme of vehicular traffic (for the main road network), and the procedures for assigning precedence between the different types of road;
- improvement of the conditions of mobility of public transport;
- reorganization of car parking on and off the road.

CRITICALITIES IN CURRENT PLANNING APPROACHES

The relationship between transport planning and urban and territorial planning, in Italy, has in the past been treated in infrastructural terms, as Riganti argues, by inserting the design of the transport infrastructure route into the General Regulatory Plan, with reference only to conditions of accessibility to transport networks, i.e. proximity to infrastructural networks; without, however, taking into account the circulation system, traffic flows, mobility and demand (Riganti, 2003). According to the author, it is difficult for the drafting of urban plans to involve a reflection on traffic flows, and on the impact of urban planning choices on the conditions of mobility.

Therefore, the great road system has always been addressed in terms of a work of art, while the minor road system has remained a functional appendage of the built space (Savarese, 2005).

This has pushed, within the drafting of the Regulatory Plan, the assignment of a priority to the building interventions to the detriment of the infrastructural measures, which have therefore turned out to be an appendix of the built space and their role has not been considered, not secondary, in the design or redesign of the urban morphology, of the settlements and portions of the city to be redeveloped.

However, the reason why the design of the route appears in the PRG is perhaps due to the fact that this plan has a forecasting capacity linked to a temporal duration (about ten years). This threshold can often affect the needs, for example those of demand, linked to an infrastructure project, which tend to become obsolete and change before the project is implemented; since the plan does not guarantee the time required for the completion of the work, that is, it does not guarantee that the project will be carried out in a certain period of time, and not beyond the set threshold.

One of the factors, in fact, that affects the decision-making effectiveness of transport policy consists in the ability to respect the

deadlines. If the times are not respected, the costs increase and there is a risk that the initial projects will change.
The same plan is structurally unable to include the dimension of the demand for mobility in the definition of land use rules, except as an analysis of the state of affairs; also because in the evaluation of an urban transformation project particular attention must be paid to infrastructural planning, that is, which infrastructural works can be expected to be carried out within certain time limits, also given a certain financial availability. For this reason, some sectoral instruments for the organization and management of mobility were introduced between the end of the 80s and the 90s, including the PUT. This tool classifies the road network based on its use and physical characteristics and defines the organization of the circulation of collective and individual transport, so it refers to both the transport offer and how it is used by demand. However, it does not deal with the management of the demand that belongs to the PUMS or with the management of the supply of parking due to the PUP (Urban Parking Plan), which also influences the mobility system since as Riganti claims it is "itself the origin and destination of "(Riganti, 2008). However, the tool that intervenes on the localization of demand is the Master Plan, which regulates land use, through the localization of functions in a binding manner, attributing building rights that cannot be easily renegotiated even if changes occur in the mobility system. The rules contained in the plans, which define the settable functions, almost never define the latter by relating them to the actual capacity of the transport supply to satisfy the demand induced for example by new transformations, only in the best cases the building capacities are defined in relation the infrastructural endowment of the territory understood as proximity to the transport networks. Hence a lack of interaction between land use rules and the mobility system, which leads to problems from different points of view. Examining the implementation plans of urban planning, what stands out is that even if the plans are different there is a single common thread, that is, that everyone cannot ignore the knowledge of the road layout. This is where our attention is most concentrated. The road regulation in transport planning is an implementation plan, therefore it assumes less importance than the urban regulation which is instead a strategic plan with a ten-year duration. The two planning processes follow two completely different time scales, the need to align the two plans stands out.

The preparation of urban and transport plans often takes place at different times. For the head of transport, they are generally short times (from a few months to a year), while the elaborations of an urban plan are prolonged (one or more years). Furthermore, in transport planning, extensive use is made of scenario simulation

models, models for estimating the impacts deriving from interventions, something that occurs rather rarely in urban planning.
The forms of involvement of the population are different, but in general the practices of public engagement still struggle to establish themselves.
In the context of urban planning the transport component is often neglected or underestimated as well as in the transport planning process, at a strategic level, land use analyses are often limited, even if we tend to affirm a land use / transport approach with mathematical models.
The planning activities in the urban planning field are entrusted to a single actor; in this way the elaboration of the strategic plan is consistent with the operational one. In the transport field, the drafting of the urban traffic plan (PUT) and other underlying operational plan components is almost always distinct from the drafting of the strategic plan (PUMS) with obvious risks of inconsistency, also due to the different processing and approval times, as well as economic waste (for example the repetition of cognitive investigations).
The approach to approving the planning tools is quite different in the two fields: in the case of urban planning, times are often extended, so it may happen that in the implementation phase the reference conditions have changed from the time of departure. The implementation plans in urban planning generally have longer time horizons than that of transport and are also not bound by the timing rules unlike the other where the rules provide for a periodic biennial update.
This integration process can be pursued not only with respect to the regulatory framework but also with regard to the planning support tools. With a view to smart cities and the use of ITS, the investigation and evaluation tools common to the two sectors are represented by GIS, drones, big data and others.

The problems outlined above suggest the opportunity for a review of the plan processes in a more modern key, ensuring unified process, methodological and temporal consistency, synergy and cooperation among the various components.
In the next paragraph, guidelines for the integration of urban planning and transport will be proposed.

A PROPOSAL FOR INTEGRATED URBAN/TRANSPORT PLANNING APPROACH

In the general context of reference, the identification of the Italian infrastructural landscape cannot ignore the concrete territorial effects that the multiple interactions of the networks induce on the system of services, equipment and intrinsic endowments of the built-up area, as well as on settlement morphologies and housing practices. of the areas involved. In fact, the current physical, social and economic complexity of the infrastructure reveals profound dissonances between urban policies and territorial realities, mirrored by the discrepancy

between new complex configurations of the town and surviving administrative boundaries. The result is a recognizable decline of the consolidated models of interpretation of space, challenged on several fronts by significant changes at the inter-scalar level, such as to question not only the conventional design paradigms of urbanized territories, but also strategies, methodologies and operational tools connected to them. In the many scientific-disciplinary sectors involved, there is therefore an urgent need for a common and integrated vision, capable of elaborating an inter-sectoral 'background', on which the close correlation between city / transport / territory comes to compose a sort of 'intermediate zone' of open, oriented and innovative confrontation between the various skills involved in the processes of settlement transformation. In the fields of transport, energy and mobility, the need appears to be directly connected to the issues of sustainability (environmental, economic and social), urban regeneration, resource management and climate change, in the direction of an irreplaceable rethinking of the future. of the country. Only in this perspective can the mandate of contemporary design be reconfigured, in the various declinations of urban, territorial and landscape design, no longer distinguishable according to functional specificities, but dialectically recomposed within a new integrated vision, capable of bringing back the general theme of 'urban planning 'to a more aware' strategic plan 'of the existing conditions. In fact, in this perspective it is possible to conceive an overcoming of sectorial, ideological and specialist visions, towards a plural, convergent and integrated vision, within which strategic planning can take on an important role as a result of the complex correlation between interacting practices, able at first to select decision-making choices, then to identify common scenarios, and finally to envisage innovative visions, oriented towards specific goals and actions. Called to question the changed socio-cultural, economic-productive and political-institutional dynamics, these practices take on an important role in sharing decision-making policies, especially in contexts heavily involved in conflict situations, environmental problems or social emergencies. Precisely the territories that first signal their state of vulnerability and weakness (the degraded suburbs of the 'widespread city'; the abandoned spaces of post-industrialism; the interstitial spaces and the 'forgotten' places by the most recent planning ...), be they places marginal or fragments of centrality never completed, are able to signal, in their being perpetually in an 'intermediate' state of potential 'contention' between different conditions, new possible opportunities for redemption from a situation of immobility that has been settled for many years. In this context, infrastructures play a fundamental role, as 'relational links' and 'intermediary spaces' par excellence, capable of once again becoming the privileged territories of the country's urban, social and economic transformation. The most evident changes of the last twenty years are reflected not only in the changed forms of spatial organization of the settlements, but also and above all in the new rhythms dictated by the

displacements and the temporal dynamics underlying urban development, increasingly fragile and vulnerable, no longer oriented in a congruent and unidirectional way, but subjected to discontinuities and oscillations so wide as to require advanced levels of prefiguration. This background framework - which can be interpreted as a necessary paradigm shift - is further interfered and conditioned on the one hand by the most recent forms of digitalization and widespread globalization and their influences on social, economic and cultural phenomena, and on the other by growing forms of environmental awareness. which, regardless of the consolidated spatial boundaries, are proposed locally through new bottom-up design models, based on innovative forms of collaboration, participation and social sharing. In particular, environmental issues are increasingly becoming the driver of territorial policies in a logic that goes beyond national borders, building a connected global background. A dimension reflected by the transnationality of the policies themselves, as demonstrated - above all - by the European Green New Deal or the United Nations 2030 Agenda, whose 17 goals directly involve the central role of the transport system and infrastructure in the construction of cities, quality territories and landscapes (fig. 13).

fig. 13. United Nations 2030 Agenda – Sustainable development goals

Below are some proposals aimed at encouraging the rapprochement between the two plan areas, urban and transport planning, and an integrated reference framework that can be taken as a perspective goal in order to overcome the problems already described.

In the first instance, the emphasis is on the opportunity to coordinate the activities of drafting the plan documents; they should be developed simultaneously, both on the strategic and operational dimensions, by a single responsible team or by two specialized teams, but under a single direction. This should ensure both horizontal coherence (between urban planning and transport plans on a strategic scale, between the implementation plans for the reorganization of the territory and the transport system) and vertical, from the strategic to the operational dimension.

The time horizon should be uniquely defined both in terms of processing times (for example 6 months for fact-finding surveys, 1

year for strategic planning, 1 year for operational planning) and in terms of the plan horizon (for example 12 years for strategic planning, 4 years for implementation). The implementation plans could also have different time horizons, but they should in any case be temporally bound and subject to updating at each deadline;

The technical offices of the local authorities should be integrated or subject to a coordination of binding activities; and it would be advisable for the same offices to be equipped with qualified technicians especially in the management of the plan implementation phases.

It is necessary to ensure forms of involvement of the population not limited to the plan elaboration phase, but also in the implementation phase to continuously monitor the impacts and repercussions on urban life; it is a question of providing suitable procedures for contact, interrogation of samples of families, interaction between public government authorities and citizens; there is today a wide range of solutions successfully tested in the international field.

The Transportation Planning component must integrate within the Urban Planning at a strategic level (PUMS / PSC); the land use / transport analyzes should seem integral to the two strands of the plan and be based on the appropriate use of mathematical models; scenario simulation models, aimed at understanding the future structures of the urban system and the transport service components should become ordinary tools in planning practice, in particular models for estimating the impacts deriving from the interventions.

It would be advisable that the regulations (RU-Urban Regulation and RV-Road Regulation) have the same value and are consistent; both RU and RV should be drafted within strategic planning, assuming quantitative parameters and non-contradictory or misaligned constraints.

Fig.14 proposes a synoptic framework of an integrated approach. It results from the merger of the diagrams illustrated in figs. 10 and 12. It can be observed in particular how the activities of investigation and construction of a cognitive framework are unified, thus avoiding waste of time, energy, resources in the research and processing phase, and ensuring information consistency (same statistical sources, same time references of the data, homogeneity, etc.).

Public engagement actions are coordinated and also in this case the dichotomy between two different areas is avoided; the community wishes to have an overall vision of the future structure of the city, both in its urban planning components and in the service components such as those of mobility.

If PUMS and PSC, the two strategic plans, are elaborated in close relationship and hand in hand, it is possible to proceed with a single VAS avoiding possible forms of inconsistency.

Less important is the temporal parallelism on the Implementation Plans of the two disciplinary areas, but it is necessary to guarantee forms of consistency control between them in order to regulate their progress in a balanced way.

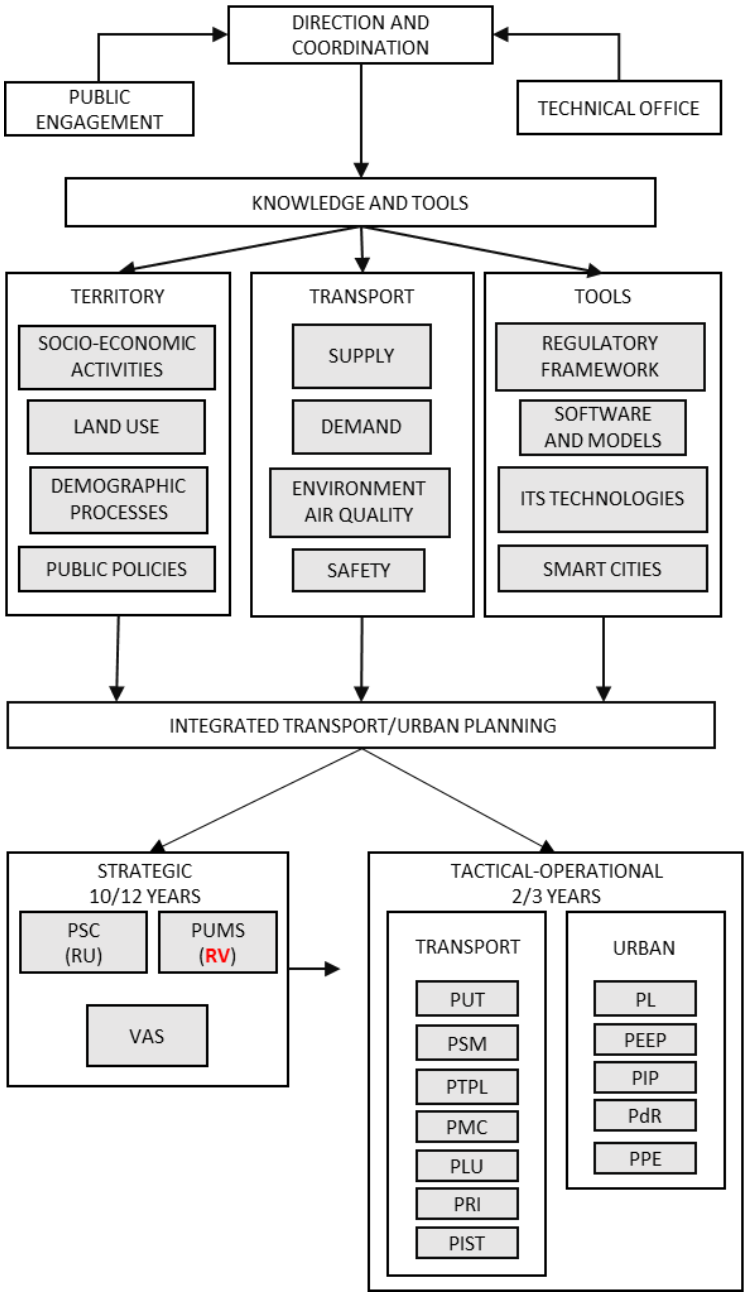


fig. 14. Activities in transport/urban integrated planning

- **PRG - Piano Regolatore Generale** (General Local Plan)
- **RU – Regolamento Urbanistico** (Urban Planning Regulation)
- **PUMS – Piano Urbano Mobilità Sostenibile** (Urban Sustainable Mobility Plan)
- **RV – Regolamento Viario** (Road Regulation)
- **VAS –Valutazione Ambientale Strategica** (Strategic Environmental Assessment)
- **PUT – Piano Urbano del Traffico** (Urban Traffic Plan)
- **PL – Piano di Lottizzazione** (Housing Development Plan)
- **PEEP - Piano per l'Edilizia Economica e Popolare** (Economic and Building Plan)
- **PIP - Piano per gli Insediamenti Produttivi** (Plan for Productive Settlements)
- **PdR -Piano di Recupero del patrimonio edilizio Esistente** (Recovery Plan of the Existing Building Assets)
- **PPE - Piano Particolareggiato Es** ailed Executive Plan)
- **PSM -Piano Soft Mobility** (Soft l for the development of pedestrian and cycling mobility)
- **PTPL -Piano del Trasporto Pubblico Locale** (Local Public Transport Plan)
- **PMC -Piano della Mobilità Condivisa** (Shared Mobility Plan and dissemination of low-impact vehicles)
- **PLU - Piano della Logistica Urbana** (Urban Logistics and Waste Management System Plan)
- **PRI - Piano della Rete Infrastrutturale** (Infrastructure Network Plan)
- **PIST - Piano di integrazione tra i Sistemi di Trasporto** (Integration Plan between Transport Systems)

CHAPTER IV
SOME CASE STUDIES

CHAPTER IV
Some case studies

URBAN REGENERATION POLICIES TO ENHANCE TOURISTIC MOBILITY AND ECONOMY

In many successful Urban Regeneration (UR) experiences, such as those previously proposed, the redevelopment of entire neighbourhoods is accompanied by an improvement in access and movement opportunities within them. There is a wide range of opportunities, which is not limited only to transport infrastructures, but also includes advanced public transport services, intelligent technologies (ITS), apps to inform and guide the use of public interest goods, actions to support mobility active and non-polluting, measures for deterring motorized traffic (ZTL - Limited Traffic Zones; Zone 30 - Traffic Calming; pedestrian areas; parking with particular tariff arrangements; etc.). Significant action on the transport offer in these terms is generally effective in increasing accessibility to neighbourhoods, their liability and social inclusion.

Factors that in turn act as elements of attraction for external visitors, especially if the neighbourhoods also host a heritage of monumental, historical and cultural heritage. One could cite the Hundertwasserhaus (house of Hundertwasser) in Vienna as an example, a complex of public housing built in 1986 by the architect F. Hundertwasser in the district of Landstraße, east of the city centre. The building houses 50 apartments intended for less well-off people, and looks like a structure made of soft lines, with brightly coloured facades and decorated with coloured ceramics from the recovery of waste building materials, hanging gardens. And with some public spaces such as souvenir shops, cafes, restaurant. Hundertwasser's house has become a tourist centre, capable of attracting thousands of tourists every year.

If the actions of Urban Regeneration are in themselves useful to the economics of construction and building-urban restoration, urban accessibility and attraction are two attributes that can generate a demand for tourist mobility which represents a potential resource in relation to practices. territorial. In this view, the transport system and the territorial system (land use) influence each other; the activity system influences the demand for transport (tourism) and, in turn, is influenced by the structure of the transport system, through accessibility. Accessibility represents a tool capable of expressing the

relationship capacity of a site with respect to the outside world; therefore, it can be considered as a synthetic indicator that lends itself to the evaluation of the degree of organization and connection of the territory-transport-tourism system, characterized by the combination of geographical, human and anthropic activities. The regeneration of urban districts, sometimes even of significant size, translates into an increase in their attractive potential and greater traffic flows. Appropriate actions aimed at improving the conditions of mobility within the neighbourhoods (or the entire city) and the conditions of accessibility to the neighbourhood (or the city) from the outside, contribute to increasing their economic potential and to induce regeneration actions and recovery.
However, the circuit could be virtuous, provided that the actions on the urban sector and those on the transport field are coordinated and integrated. Otherwise, counterproductive effects could occur, such as excessive traffic in neighbourhoods that are unable to support them, or redevelopment interventions that are ineffective and excessively onerous in relation to demand.
The starting point of the application phase of the research was based on an analysis of emblematic case studies and specialized literature, aimed at bringing out goals and opportunities linked to urban regeneration actions and coordinated transport policies, also drawing on the wide range of new Information and Communication Technologies (ITC) and Intelligent Transport Systems (IST).

Since the 80s there has been a growing interest in urban tourism and this has highlighted the need to rehabilitate the historic centres of the cities, to increase the cultural activities within them. International statistics reveal a tendency to affirm of shorter holidays than in the past, but more frequent; this has led to a general increase in mobility and urban tourism in Europe.
Tourism is an important part of the city's economy and contributes to the well-being of the whole community; government authorities are increasingly aware of this, to the point that it is considered a key factor for economic development and therefore assumed as such in its electoral programs.
It is no coincidence that over time a process of urban regeneration has emerged in many European cities, aimed at enhancing its building heritage of historical-monumental-cultural value. We went in search of multiple compatible goals: limiting land consumption or forms of expansion in the territory, recovering entire neighbourhoods for residential and social life, promoting economic development through the restoration of buildings and the requalification of public spaces, promoting the setting up of commercial and cultural initiatives to increase tourist attraction. Not infrequently, special measures have been taken to facilitate both access to the redeveloped areas and to

regulate internal mobility, in order to make the visit pleasant to visitors without penalizing the right aspirations of the residents for harmonious economic and social growth, in the compliance with the most advanced environmental standards. The following text is divided into two parts. The first proposes a review of emblematic cases of urban regeneration (fig. 15), mainly European, which have determined reference paradigms for other contexts; the review is divided into twenty-year historical periods (70-80, 80-90, 90-2000 of the last century, the last 20 years of the new century) and aspects relating to the urban transport sector and impacts on tourism sector. In the second part, attention is directed to a proposal for a modelling approach to the joint Transport - Land use - Tourism analysis, which can be validly assumed by urban planners and government authorities, in order to pursue virtuous solutions of cities in the future, in in line with the lessons emerging from experiences and drawing on the opportunities offered by new technologies (as Information and Communication Technologies and Intelligent Transportation Systems) and by new tools and models to support decisions.

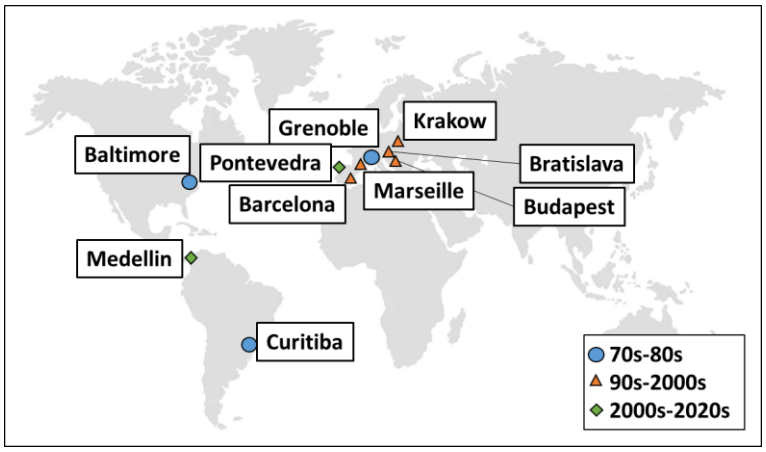


fig. 15. Urban regeneration process in the word

First experiences of Urban Regeneration (70-80s)

UR's first interventions were born in North America. The Federal Housing and Urban Development Act program of 1965 in the USA has the goal of renewing devitalized urban centres, with a series of tools that facilitate the demolition of dilapidated structures and houses within cities. Expropriation for public utility and financial aid in various forms allow to carry out transformative processes of large areas of American cities (Wilson, 1966; Bratt, 1989). Following the Urban renewal waterfront report (1965), the federal government proposes a series of methodological and financial tools to operate on disused port areas. In the late 1970s, in the wake of the first regeneration operations in the cities of Baltimore and Boston, dozens of other cities will carry out regeneration processes.

The Baltimore (USA) urban redevelopment is one of the many urban regeneration models that saw the light in the last 40 years (figg.16). Urban Renewal Plans in Baltimore date back to the late 1960's. They are area plans adopted by the Mayor and City Council to establish and implement redevelopment goals. There are four major categories of plans: downtown, commercial corridors, industrial areas and neighborhood plans. Initially, URPs were based on large scale redevelopment plans, such as Charles Center, Inner Harbor and major residential redevelopment for areas such as the Harlem Park. In the late 1970's and early 1980's Urban Renewal Plans were used to encourage redevelopment of commercial corridors. The plans included authority for property acquisition, made recommendations for land use and zoning changes and established design standards for the corridors. Increasingly the plans included design guidelines and land use restrictions to improve these areas. In many cases the urban renewal plan served to provide desired regulations as the zoning code became increasingly out of date. The Inner Harbor area of Baltimore is considered the first ever tourism-led regeneration project. The regeneration project pushed Baltimore to become the first city in the world to pursue the tourism economic strategy, and the Inner Harbor has been defined as "the model for post-industrial waterfront redevelopment around the world" (Urban Land Institute, 2009).

The pioneering initiative of Baltimore soon became a benchmark for urban tourism development in other cities around the world, with the development of large-scale leisure spaces as in Barcelona, Singapore, Sydney. The Inner Harbor regeneration project comprised five main components (Brambilla and Longo, 1979; Millspaugh, 1980, 2003; Wallace, 2004): high-quality commercial and office buildings on the waterfront; multi-family housing in eastern and western areas; an obligatory alignment of the buildings closes to the waterfront; no tall buildings on the waterfront except for some iconic towers; a promenade characterized by parks, public areas and a wide promenade.

The success factors of the initiative were the long-term planning process and the political commitment involved; the ability to attract investment; the general quality of urban and architectural design; and the synergistic mix of local uses and attractions.

figg. 16. 1970's in Baltimore Inner Harbour
Present day

Curitiba (Brazil) is a city that has been affected by a very particular Urban Regeneration action with significant results in terms of sustainability that can be classified into six areas: integrated urban planning, local environmental awareness, effective public transport system, priority to pedestrian and public mobility, social equity, intelligent management of local waste (Mills, 2006). In 1964, Mayor J. Lerner launched an ambitious development plan, assuming a series of priority goals including severe limitations to urban sprawl, a reduction in vehicular traffic in the centre, the conservation and tourist enhancement of the historic centre, the construction of a convenient and economic public transport system based on buses in a protected location (BRT). The plan was adopted in 1968; In addition to the large-scale planning requirements, numerous small-scale practical solutions have been adopted to improve the quality of urban life.
In Curitiba, the first successful Smart City model was established in the 70s, based on a vision cantered on three aspects: mobility, sustainability and tolerance. The territorial redevelopment plan has led to focus the development on public transport lines with performances similar to the underground, but much cheaper: buses in a protected location, with high commercial speeds, high frequencies (45-60

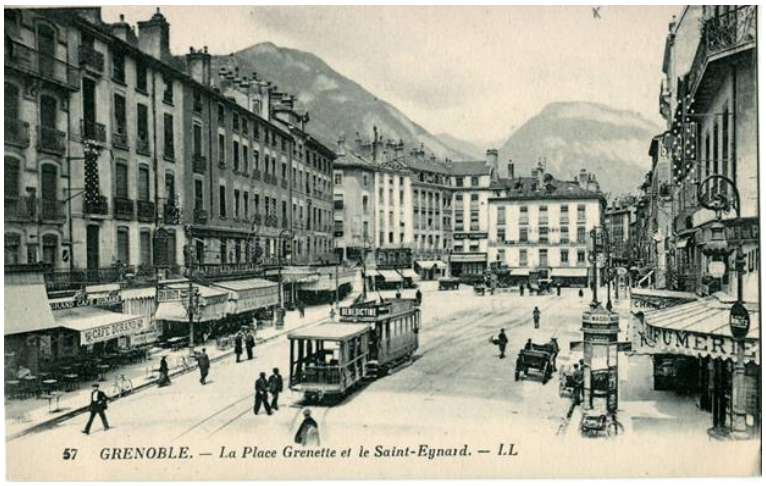
buses/hour) and therefore large transport capacity on primary urban corridors. It is the concept of BRT, Bus Rapid Transit, which has spread to other major cities in the world. But Curitiba is also famous for having built the first pedestrian area, for its vast offer of green areas (55 m^2/inhabitant), for waste management focused on recycling and for the collaboration of citizens, for its vast network of cycle paths (about 150 km). The popularity of the BRT has led to a major change in the modal choice of city dwellers; 28% of BRT users have abandoned the car. Compared to other Brazilian cities of similar size, Curitiba consumes around 30% less fuel per capita, resulting in one of the lowest levels of air pollution. Today around 1,100 buses offer 12,500 journeys every day, serving over 1.3 million passengers, 50 times more than 20 years earlier. A citizen's travel expenses are around 10% of their income, well below the national average.
The general plan of Curitiba is characterized by an integration between transport and urban planning, with an appeal to the cultural, social and economic transformation of the city. It limited building growth in the central area, encouraging commercial initiatives along the main roads that radiate from the city centre. In the latter, car traffic was limited and pedestrian streets were created. Other policies also contributed to the success of the public transport system (residential density inversely proportional to the distance of the BRT lines, discouragement of the use of the car, limited discouraged parking in the city center, transport subsidies offered to the poorest workers).

A unique experience of UR is that which took place in Grenoble (France) in the 60s, in the district of the historic centre Berriat-S.Bruno (figg.17). It was a neighbourhood inhabited mainly by working class families. Affected by an economic crisis and the closure of industries, it presented itself as a degraded housing settlement with a tendency towards a demographic reduction and a gradual reception of Maghreb immigrants.
The deterioration of the neighbourhood pushed the administrative authorities to intervene to avoid its marginalization, giving priority to public housing and the improvement of old houses for the benefit of the most disadvantaged categories (Parent, Schwartzbrod, 1995). More generally, the aim was to revitalize the neighbourhood by keeping the population residing on the spot, preserving the popular identity and cultural diversity, reviving economic activity and attracting young families. The initiative was part of a UR policy that aimed to rehabilitate the old neighbourhoods and that made Grenoble a place of avant-garde experimentation. It is here that an approach to habitat improvement was invented which is still recognized internationally today (Jacquier, 2001).
This policy was organized for the first time, from 1965 to 1976, on the mobilization and encouragement of private owners to restore their

housing, as part of a collective real estate restoration operation, through incentives and technical support, without replacing, but involving the resident population and limiting the risk of large real estate transactions (Parent and Joly, 1988).

In reality, the company proved to be more complex than expected: land fragmentation, the reluctance of some inhabitants, the absence of empty houses, insufficient resources were a strong obstacle. So that the municipality in 1976 adopted a rigorous land use plan, characterized by modest construction indices and strong constraints on industrial land; then he activated a Land Action Program, or the acquisition of land and properties, with the aim of creating new social housing. A second form of intervention consists in "resuming", by introducing legal coherence and territorial and financial planning, the operations undertaken in previous years and at the same time activating actions for the redevelopment of unhealthy housing, the acquisition and rehabilitation of buildings, the improvement of public spaces or roads, remediation. The urban landscape does not experience any brutal qualitative change.

From 1983 to 1994, a new political phase took over. The idea of modernizing the neighbourhood then emerged, favouring the expulsion of destitute populations, and in particular of immigrant populations, to peripheral areas. Strong measures are being taken to relaunch the renovation by reducing the regulatory constraints on construction. Some areas are thus transformed into urban areas, thus becoming buildable, or into mixed areas of habitats and activities. These measures are quickly associated with a more direct and visible intervention to attract new populations and private promoters. In 1987 two main operations were carried out: the development of a tramway network, with a line crossing Berriat Saint-Bruno, and the launch of a shopping centre (Europole). Berriat Saint-Bruno was therefore considered an essential functional complement for the new commercial and service site, capable of providing an attractive residential offer to future managers and researchers in the business district. The construction of the tramway network is accompanied by a development of the road space (new flooring, lighting, street furniture) and the rehabilitation of the surrounding buildings (restoration of the facades). The tram conveys a strong image: it is a collective, ecological, innovative means of transport in the French context and whose design embodies the ideas of modernity and progress.



figg. 17. 1970's in Grenoble. Present day

Experiences of Urban Regeneration at the end of the century (90-2000 years)

Urban Regeneration's practices multiplied in the last part of the twentieth century all over the world. Sometimes these are large-scale interventions that deeply modify large urban areas; sometimes of targeted actions on degraded and socially complex neighbourhoods. The experiences of two major European cities (Barcelona and Marseille) and the historical centres of three cities in Eastern Europe following the fall of the Berlin Wall (Krakow, Budapest, Bratislava) are recalled.

The areas affected by the most recent redevelopment projects in Barcelona (Spain) in the 1990s are different: sports facilities in Montjuic, the Diagonal, the new axis of the central city, the Poble Nou area, where the main Olympic village was built, and brownfield areas recovered, not far from the sea. The city has thus seen its function as a connection node with other coastal cities and regions of the maritime Mediterranean strengthen, also welcoming millions of tourists to its port (Perich and Martinez, 2011).

The construction of the Olympic Village in 1992 gave birth to a real new neighbourhood with the construction of a marina, five large beaches, several green areas, the extension of the Barceloneta seaside

promenade, more than 2000 apartments and 44 blocks of housing, a renovated waterfront, over 4.5 km long. Other important interventions concerned the area of the Forum of Cultures, with the extension of via Diagonal to the sea (2004) and the Diagonal Mar (residential area and park). The Forum event, together with the new residential areas developed in height, led to the redevelopment of a large area with great potential for its strategic position.
The expansion of the city thus began to change its configuration, triggering a process of driven gentrification, with the transition from the lower social class to a more comfortable class of residents who can afford to live in one of the new towers overlooking the sea, in a space in the city that is still being transformed, perhaps among the most complex and full of contrasts. The towers on the Villa Olimpica, conceived as two isolated objects located near the sea, become here a symbolic way of building the city and seem to demonstrate that in Barcelona growing intensely in height is a prerogative that belongs to the suburbs, in particular to the waterfront. The renewal of the accommodation facilities, the strengthening of marketing, the adaptation of the cultural and museum offer, with new offers and integrated tickets, have generated a considerable development in tourism.

The city of Marseille (France) has a strong connection with the sea. The construction of the strategic scenario for the redevelopment of the central areas of the city began in the 1990s. An ambitious redevelopment project for abandoned port areas, as a driving force for the conversion of the urban economic base, was promoted for the first time by the Chamber of Commerce and Industry in 1987. Marseille is characterized by a linear development of about 10 km along the coast with a historical core (Vieux Port, fig. 18). This area, largely closed to the open sea, appears as an integrated part of the city; the pier is a dynamic business center for the fish market (a significant part of the dock hosts fishing vessels that are the protagonists of this space together with sailing boats, yachts, pleasure boats.
The Vieux Port is therefore a hybrid area located between land and water where the city finds its true essence. The aim of regeneration was to re-emerge the compromised relationship between city and sea. For this reason, significant financial resources were used for the Vieux Port and its surroundings. Marseille is a model for understanding how waterfronts are considered public spaces that each citizen owns.
The urban redevelopment project included among the main actions, the expansion of pedestrian areas with functions of rebalancing between public and private spaces. The docks have become a simple pedestrian area near the water, while the historic activities of fishermen have ceased. Another characterizing element is the absence

of benches, green spaces and shaded areas; the design choice interprets the Vieux Port as a transit area.

fig. 18. Vieux Port

The project was accompanied by a careful assessment of the social and economic trend of the city and its positioning internationally. The investments made over the years by real estate companies in the Docks Joliette area (fig. 19) were also influential and pioneering in the construction of this scenario, in which the renovation of the 19th century buildings belonging to the Compagnie des Docks et Entrepôts and their destination for tertiary functions, they marked the entry of the service economy into the city, opening up a new evolutionary perspective.

fig. 19. Docks Joliette

The redevelopment of the urban heritage was also made possible by the large investments made following the designation of Marseille as European Capital of Culture 2013.

Some interesting experiences of Urban Regeneration occurred in Eastern European cities after the fall of the Berlin Wall (1989); there is a multiplication of urban redevelopment initiatives. Some

significant actions concerned the historical centres of large cities, through interesting forms of UR. Three are mentioned here in particular relating to the historical centres of Krakow, Budapest and Bratislava. These were neighbourhoods somewhat degraded both in terms of urban quality and social and economic life; they have been revived and have become very attractive spaces also for tourists.

In Krakow (Poland) the new political situation has favoured the revaluation of the Jewish quarter of Kazimierz. The dynamic development of Kazimierz has been underway since the political transition of 1989. It is known for concentrating the Jewish heritage of Krakow and being the most vibrant cultural district of the city, attracting tourists, university students and expatriates. Near the historical centre of Krakow, directly connected to the Kazimierz district, is the Old Podgórze district. The recent development of the latter is strongly linked to that of Kazimierz: for more than a decade, a rather organic urban regeneration process has been taking place, supported sporadically by public interventions. Since 2010, the two neighbourhoods have been connected directly by a pedestrian bridge (Bernatka bridge), inspiring the "coffee rejuvenation of the streets leading to it in both neighbourhoods" (Murzyn-Kupisz M., 2012).

Old Podgórze is also strongly linked to the Zablocie district, a former industrial area with industrial waste plants, currently in the process of becoming a cultural / tourist district thanks to some new cultural investments, the most important of which is the private University of Krakow (Krakowska Szkoła Wyższa) and Schindler's Factory Museum, inaugurated in 2010.

Since the early 2000s, a slow transformation has taken place in Podgórze, which shows the typical signs of the conversion of an urban area based on the sector inhabited mainly by a working population into a trendy cultural district. The cultural boom has attracted more and more commercial investments in the neighborhood. Podgórze appeared on the tourist map of Krakow, the number of new hotels and catering units has increased - although still to a lesser extent than the two classic tourist districts, the historic center and Kazimierz (fig.20).

In 1990 the administrative reform in Budapest (Hungary) led to the introduction of a two-tier system with forms of strong decentralization. The competence of the neighbourhoods has been significantly strengthened, with high autonomy in the implementation of housing and social policies, in the start of regeneration programs, etc. If on the one hand, the administrative fragmentation of the city has created serious barriers in the elaboration and implementation of global urban development programs, on the other hand it has also offered neighbourhoods the opportunity to implement small territorial interventions. Indeed, the centre of Budapest has become an urban laboratory in which numerous small neighbourhood initiatives have been tested, resulting in various forms of physical improvement and

social change. After 2000, the private sector also began to show growing interest in the redevelopment of some neighbourhoods in the city centre.

fig. 20. Kazimierz, present

Business and services functions considerably expanded in the inner city of Budapest during the 1990s (both quantitatively and geographically), and a growing number of former homes were turned into offices, in order to feed the increasing demand of companies willing to settle there. As a result, by the mid-2000s business function already dominated over residential function in the entire area between the Grand Boulevard and the Danube (Baji, 2012). The initial spatial diffusion of 'city functions' was primarily horizontal: most companies used ground floor or first floor rooms as their offices, and when there was no more space available in the “city”, they started to search for places located farther from the capital's city center.

In the meantime, development cores emerged in the Buda side as well, albeit there is still much more space for such spatial diffusion in Pest, mostly due to topographical reasons. Around the Buda side patches of the 'economic city', mostly hilly terrains are found with upper class residential areas (characterized by the highest land prices of the entire capital city), whereas in the Pest side, residential function is more likely to turn into an economic one (owing to the better overall accessibility and connectivity of the area).

Bratislava (Slovakia) is one of the youngest capitals in Europe and enjoys a singularity; it is located on the border with Austria and Hungary, a short distance from its capitals.

The socialist period left the city centre of Bratislava in a poor state. The physical structure was obsolete, many buildings were devastated, and the service function was underdeveloped. During the last decade of the 20th century, city-centre development focused on the rehabilitation of the existing building stock. The rehabilitation was successfully completed, especially in the historical core called Staré Mesto (Old Town). Projects were usually individual ones, limited in size and costs, construction works often progressed in stages, larger development zones were lacking. This trend has changed since the turn of the new century. A pro-reform central government, the perspective of accession to the EU and a positive macro and local economic development jointly improved the image and investment attractiveness of the city. A series of larger projects emerged, accompanied by numerous individual projects in the centre of Bratislava. The Staré Mesto district covers the central area of the city, with a territory of 9.6 km2 and about 45,000 inhabitants; it is located on the left bank of the Danube and includes the most valuable historical core of the city, as well as the castle area. The western part of the district contains the most elegant and expensive residential area of Bratislava on the slopes of the Little Carpathian Mountains. The rest of the district is of mixed functional use. Large areas of Staré Mesto belong to monument protection areas; the historical core and the castle area are strictly protected as City Monument Reserve, and the wider territory of Staré Mesto is designated as City Centre Monument Zone, with a weaker regime of monument preservation.

The first positive consequences of post-socialist development can be observed above all in the almost complete rehabilitation of the historical core (Bucek, 2006). Large private investments and accompanying public ones have resulted in an urban environment of much higher quality than before. Most of the previously devastated historical buildings were decently and authentically reconstructed and now they serve mostly commercial purposes. Public spaces in the most attractive historical core and the adjacent streets were completely renewed, thanks to the efforts of the local government. The main streets of Staré Mesto close to the historical core attracted investments from the financial sector first (Bucek and Pitonák, 1997), which was followed by other investors converting the previously neglected city centre into a typical representative inner-city of a capital. The most attractive parts of Staré Mesto, especially in the western residential area, has faced an intensive housing development of higher standards since the mid-1990s (Korec and Smatanová, 2000). The Master Plan of 1998 has been has been updated by a new one in 2007. The

character of the physical environment of Bratislava seems balanced today between modernist and conservation-oriented approaches.
The city centre of Bratislava was a source of conflict among proponents of heritage protection, rent maximizing developers and advocates of traditional local life and local interests. The role of participation in planning and managing urban development in Bratislava reflects the situation of societies under democratic transition. Citizens and interest groups are demanding the right to effective objection or appeal if a policy is damaging their individual or group interests. The citizen's participation has been inadequate and undervalued in the first decade. Planning has been managed by a stakeholder's elite (architects, urbanists and local politicians, often linked to commercial actors). In the last decades in Bratislava an increasing interest of citizens on planning practices has emerged, as in many others European cities.

Urban regeneration and Smart Cities (2000-2020)

Smart cities introduce a variety of new practices and services which impact urban policy making and planning as they co-exist with urban facilities. And there are various ways that smart city framework can help city planners to meet the above-mentioned criteria and contribute to an urban life.
The generic architecture of a smart city contains the following layer: User, Service, Infrastructure and Data layer. If looked closely, we can observe how those layers all correlate in one way or another with urban planning criteria.
For example, ideally the infrastructure layer shouldn't charge the local environment or the local protected areas and has to plan to uniformly develop smart cities across the regions for coherent development. When it comes to the Service layer, smart transportation services would align directly to the Quality and to the Viability Timeline planning dimensions.
Or other way around: how the criteria can be met thanks to one or more layers. For example, the environmental data that is collected from the sensors can to contribute to Quality, History and Landscape dimensions. So what we can observe is a bidirectional relation between urban development policy and smart city framework. Smart city aligns easily to urban planning dimensions, while urban development policies should be on the lookout to capitalize what smart city solutions have to offer.
Several cities around the world have experimented with sustainable urban regeneration policies. Among others, some policies have given priority to public transport and active mobility; in the following paragraphs two of these experiences, indeed quite original, are described, those of Pontevedra and Medellin.

Pontevedra (Spain), a millennial city, has become more recently a model of urbanism and urban design reinventing itself with its citizens as protagonists. Pontevedra has become a model for many cities where in just 15 years more than 70% of urban movement is now done on foot or by bicycle.

Pontevedra has been trying to create a lasting and sustainable improvement to the urban environment of the city and has focused on raising the quality of all of its urban components with actions that aimed:

- drastically reduce air, noise and water pollution;
- achieve an inclusive city in which social class, physical or disability barriers, by age, sex or any other diversity are mitigated or eliminated;
- eliminate the dangers of traffic and enhancing non-motorized mobility, reversing priorities and placing foot-travel as a central element of urban mobility;
- convert the city's urban public spaces into social spaces – a city of "integrated plural uses";
- promote the autonomy of children and their integration into urban life.

CO_2 emissions' in the urban centre have been reduced by 88% and traffic related injury has been drastically reduced with no deaths or serious injuries recorded. In addition, public spaces and green areas, as well as pedestrian and bicycle paths have added to the rehabilitation of the city's historic centre. As a result of this Pontevedra received the UN Habitat Award in 2015, which recognises the policies implemented by the city and that these as examples of best practices that can be copied by other cities around the world. The successes of Pontevedra have been recognized in terms of innovation, urban quality and social inclusion and as such it is seen as an example of a model city. Its urban planning model focuses on 7 key points:

- city centre traffic closed thus reducing vehicle pollution in the urban area by 66%;
- reduction of the maximum speed to 30 km/h to achieve a calm and safe circulation;
- realizations of 40 km of footpaths and cycling paths near the rivers;
- eradication of wastewater discharges in rivers;
- recognition of its urban model as a transferable model;
- policies developed to transform the city into an inclusive social city that allows people with physical disability to move smoothly throughout the city;
- increase of green areas, places to practice sport as well as its fluvial beach.

Pontevedra's achievements have been recognized in terms of innovation, urban quality and social inclusion and as such are seen as an example of a model city.

Medellín (Colombia) is located in the Aburrá valley within the Andes mountain range. From the beginning of the twentieth century, the city underwent chaotic development without planning, with an industrialization process on the banks of the Medellín river which induced a migratory movement of inhabitants from the countryside. All this led to a generalized abandonment of the central areas and a massive invasion of the peripheral territory which required new services and infrastructures (fig. 21). The worsening of the problems has repeatedly pushed the government authorities to plan actions since 1950. However, in the 1980s the situation worsened, with the spontaneous and disordered expansion of the building in hilly areas, without spaces free, equipment, infrastructure and basic services. This chaos has led to an increase in marginality and crime. As a result, whole squatters were formed, authentic urban ghettos, socially excluded and with poor living conditions.
The urgent need for urban regeneration has translated into a series of projects at the beginning of the century. Projects integrated into a program of social, political and educational reforms in an attempt to recover degraded areas and contribute to a regeneration of society: global urban projects (PUI). The main goal of the PUI was to reactivate the problem areas of the city, helping to extend and improve the public space, also through the creation of public structures in strategic positions. Through these projects, accessibility, urbanization and social integration of different urban areas have improved. Echeverri and Orsini (2010) defined them as "a tool for planning and material intervention in areas characterized by high rates of marginality, segregation, poverty and violence". The intervention strategies were inspired by the urban regeneration policies of other cities such as the aforementioned Curitiba and Barcelona. Among the projects of an innovative nature, the one of the gondola lift, that is a quality air link, which has allowed to overcome morphological obstacles (strong slopes) and settlements (ghettos without infrastructures), by reconnecting distant parts of the urban fabric and promoting relationships, deserves to be mentioned. social and inclusive mobility.

fig. 21. Medellin Metrocable

If the actions of Urban Regeneration are in themselves useful to the economics of construction and building-urban restoration, urban accessibility and attraction are two attributes that can generate a demand for tourist mobility which represents a potential resource in relation to practices. In this point of view, the transport system and the territorial system (land use) influence each other; the activity system influences the demand for transport (tourism) and, in turn, is influenced by the structure of the transport system, through accessibility. Accessibility represents a tool capable of expressing the relationship capacity of a site with respect to the outside world; therefore, it can be considered as a synthetic indicator that lends itself to the evaluation of the degree of organization and connection of the territory-transport-tourism system, characterized by the combination of geographical, human and anthropic activities.

TRANSPORT-TOURISM INTEGRATED DEVELOPMENT

In tourism activity the concept of travel is implicitly included and, therefore, this imply a relationship with the transport system. The planning of measures in transportation field pushes to analyse the mobility demand, and touristic component, related to the socio-economic variables that characterize a region and to the transport system performances. On the other hand, the tourist policies cannot neglect the related aspects to the management of the individual's movements toward the regions and inside the same regions. The coordinated promotion of investments in the tourist industry and in transport sector may encourage a better access to the sites and the reduction of the travel costs. In this regard, the analysis of the Transport-Tourism system, by specific accessibility models, may represent a decision system tool to orient choices of economic policies. In the case study, a preliminary review of reference models is illustrated, taken back by the specialised literature. The attention is specifically focused on the accessibility models. Therefore, a theoretical approach of accessibility analysis is proposed, able to include both factors of travel cost and touristic attractiveness. This approach is applied to a context of international tourism, useful to put in evidence the role of the different components involved.

Tourism includes the activities of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business or other purposes. Tourism is one of the most important industries, and its impacts on the social and economic life is very relevant.

The tourism sector, at international level, lives a positive dynamic. In the last years a growth the international tourism travels have been registered and the trend is estimated to keep globally positive, around 4% on average, up to 2030. The increasing trend concerns almost all macro-geographical areas, but Europe has the most consistent share of arrivals (over 50 %), equal to 600 million travellers.

Europe remained the largest region in the world in terms of international visitor spending (US$619 billion), accounting for 37% of all global international spending in 2019 (WTTC; 2020).

Whilst the European overall economy grew by just 1.3%, the Travel & Tourism sector showed a stronger growth of 2.4% on the previous year.

The largest European economies in terms of Travel & Tourism contribution to GDP in 2019 were Germany (US$347 billion), Italy (US$260 billion), UK (US$254 billion) France (US$229 billion) and Spain (US$198 billion).

Accurate prediction of foreign tourist numbers has become crucial for governments to be able to set up relevant sustainable tourism development and marketing strategies to promote the tourism industry. National authorities are always more interested to the characteristics and trends of foreign tourists. The variety of

international tourism has raised a challenging task for foreign tourist prediction.

The rapid evolution of COVID-19 and its already palpable impact on the Travel & Tourism sector, has once again highlighted the increasing complexity and interconnectedness of shocks today, the reality of the "panic factor" and the importance of being crisis ready to ensure the sector is able to safeguard its people and its destinations.

While Travel & Tourism has become increasingly resilient, with the average recovery time from crisis decreasing from 26 months to 10 months between 2001 and 2018; the economic impact of shocks has increased. In effect, according to WTTC's scenario analysis from June 2020, which reflects the current uncertainty in the sector's outlook particularly with regards to the scale and duration of travel restrictions; Travel & Tourism job losses for 2020 are projected at 121.1 million for the baseline scenario and 197.5 million for the downside scenario. Meanwhile, Travel & Tourism GDP losses are projected at $3.4 trillion for the baseline and $5.5 trillion for the downside scenario.

It is clear from WTTC's previous research and the current experience with COVID-19, that no one stakeholder group can address today's shocks on their own; requiring both inter-governmental cooperation as well as public-private collaboration.

The extensive impact of COVID-19 has once again illustrated the need to strike a balance between protecting the health of individuals and the health of economies. Managing the fear, panic, stigma – and associated infodemic- is also key. In effect, according to the WHO, 90% of economic losses during any outbreaks arise from the uncoordinated and irrational efforts of the public to avoid infection.

As such, the importance of taking strategic approach, built on facts and experience, and ensuring business continuity, remains central to the successful management and swift recovery of a crisis.

Practices and Geographies of destinations changed massively in the last 30 years. Today we witness a form of global tourism; it has spread since the early 90s to today and now extends to all social classes. The prevalent forms of tourism are holidays; visiting friends and relatives; business related; pilgrimages; health; sport; educational study; etc.; but some new typologies that foresee a more authentic contact with the local reality (rural, environmental, cultural, religious, eno-gastronomic tourism) tend to emerge. For these reasons, the supply is oriented to meet the demand through the enhancement of resources and local identities, integration and shared development (involvement of local actors), differentiation, personalization and specialization, taking into account the demand (consumer interest), fashions, lifestyle changed) and new technological opportunities, especially in terms of information and communication.

Global flows are increasing, although for limited periods of time; the holiday periods are distributed throughout the year, multiplying the opportunities for recreation, organized in short stays, a few days or even just a weekend; parks and nature reserves attract more and more visitors as they satisfy the need for quiet and natural environments; group travels are abandoned; destinations far from the classic, uncrowded, are chosen; rural traditions arouse attention and curiosity; the tourist demand asks for a *global supply*.

Over the years it has been consolidating the awareness that the development of the tourism economy of a territory is not only related to attraction factors and suitable accommodation facilities, but also depends on an adequate transport system; system able to facilitate access to tourist sites, ensuring quality in transport services. The coordinated promotion of investments in the tourism sector and of investments in infrastructure and transport services could facilitate greater access to the sites and the reduction of the general travel cost. In this sense, the analysis of transport-tourism interconnections could be a useful information tool for making general economic and sector policy choices.

The planning and implementation of actions in the transport sector pushes to analyse the mobility demand in general, and touristic mobility demand in particular, in relation to the socio-economic variables that characterize a region and the performance of the transport system. On the other hand, tourist policies cannot neglect the aspects related to the management of travels towards regions of interest (long-haul) and within the same regions (local trips).

It is proposes a brief review of reference models taken from the specialized literature for integrated Transport/Tourism analyses (transport/land use models, demand models, supply models, etc.). Attention is focused especially to accessibility models. A theoretical approach to accessibility analysis is proposed, which tends to include both travel cost factors and tourist attraction factors. An application of the modelling approach is then presented, with reference to two Mediterranean regions, Calabria and Crete, and to the international tourism context, useful to highlight the role of the different components at stake, also in relation to some scenario hypotheses. Finally, some remarks on the analytical approach adopted and on possible future research developments are outlined.

Understanding how tourists move through time and space, and the factors that influence their movements, has important implications for infrastructure and transport development, product development, destination planning, and the planning of new attractions, as well as management of the social, environmental and cultural impacts of tourism. The interaction between tourism and transport has been subject of studies for a long period of time (Hall, 2010).

Quantitative researches able to measure the impacts of transportation on tourism are based on CGE, Computable General Equilibrium (Van Truong and Shimizu, 2016). A CGE model is a system of equations describing an economy as a whole, the interactions among its parts, the motivations and behaviours of all producers and consumers in the economy, and the linkages among them (Burfisher, 2011). CGE models may be used to tourism analysis, and to simulate the inter-relationships among tourism and other sectors of the domestic economy, to different economic scenarios (Konan and Kim, 2003).

The analysis of touristic mobility can be tackled by adopting transport models. Some approaches consider the question at land use/transportation level, others focus just the usual dimensions of trip (origin, destination, modal choice, path) limiting the attention to the touristic motivation.

Fig.22 shows a simplified scheme useful to frame the problem. Given a territory, it is possible to distinguish a transport system and a system of activities (socio-economic) that interact mutually. Within the transport system it is still possible to distinguish two macro-components, supply and demand; the interaction between these two components results in traffic flows on the transport network and in network performance (service levels, transport quality, external impacts). The activity system influences the transport demand and, in turn, undergoes the influence of the transport system structure, through accessibility. Indeed, a good transport system improves accessibility to the territory.

The analyst's attention may be limited to a component of the activity system, i.e. the tourism component; in this case the structure of a regional tourism system generates the tourist mobility demand, but the growth capacity of the tourism system is linked to the transport supply, through accessibility. The latter can be influenced by the tourism system of the region through attractiveness factors. The enhanced quality of related tourism services, as information and communication, booking, restaurants, accommodation, might improve the accessibility of the destination, and can also affect tourists' preferences.

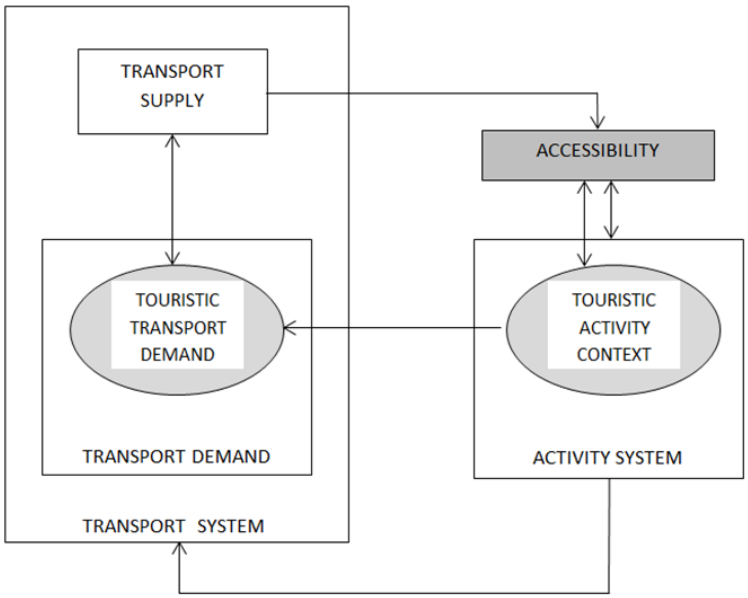


fig. 22. Touristic components in Land Use activities and Transport system

Theoretical approach

The Transport/Tourism synergy can induce positive effects on the economic development of a region. The coordinated promotion of investments in the tourist industry and in facilities and services of transport may encourage a better access to the sites and the reduction of the generalized travel cost. In this regard, the analysis of the integrated Transport/Tourism system, by specific accessibility models, may represent a decision system tool to orient choices of general and sectorial economic policy.

The most known accessibility indicators are those established from the cost function associated with a transport network. Given a system consisting of a land, subdivided into *n* zones, and the relative road network, the matrix of minimum paths can be considered the starting point for accessibility measures. The rows of this matrix correspond to the set of origin nodes and the columns to the set of destination nodes; the matrix elements, expression of the impedance function c_{ij}, constitute the indices of relative accessibility, that is the measure of the cost to overcome the spatial separation between each pair of nodes *i* and *j* on the land:

$$a_{ij} = c_{ij}$$

where c_{ij} can indicate the distance or travel time or the cost of transportation from the zone *i* to the zone *j*. The sum of the elements of the *i* line *i* of the minimum path matrix, on the other hand, provides the value of nodal accessibility relative to the zone *i*. It constitutes the minimum total impedance for the movements from the zone *i* to all the other zones, i.e. the integral accessibility index referring to the zone *i*, which expresses the connection of the zone *i* with the surrounding land (zones *j*):

$$A_i = \Sigma_i \, a_{ij} \qquad j \in D$$

where *D* represents the set of *n* destination zones of the trips. The full accessibility index, introduced in 1971 by Ingram as an extension of the relative accessibility measure, makes possible to compare the accessibility level of the different zones belonging to the region *D*. The highest value of the A_i will belong to the zone of the less accessible zone.

Accessibility in interspatial models

The mathematical measures of accessibility that express the potential of the transport system, seen above, are functions only of the travel cost variable; in reality, experience shows that other factors contribute to determining the possibility to travel from the *i* zone to the *j* zone. These factors are linked to the system of local activities such as job opportunities, transport level of services, accommodation, factors that can act in defining the impedance function. Beyond the different theoretical formulations, an aggregate measure can be summarized with a single formulation:

$$A_i = \Sigma_j \, K_i^{\beta} \, \Phi(c_{ij})$$

where:
A_i is the weighted accessibility for people living in zone *i* related to the zones j in region D;
K_j is a measure of activities and services located in zone *j*;
β is a calibration parameter;
$\Phi(c_{ij})$ is an impedance function, usually decreasing with the cost c_{ij}, which over the years has assumed different expressions, depending on the authors.
Among the different expressions of the impedance function $\Phi(c_{ij})$ some are mentioned here:

A) Hansen's expression (1959) : $\Phi(c_{ij}) = c_{ij}^{-\alpha}$
If $\alpha = 1$, the accessibility assumes the following expression:
$A_i = \Sigma_j \, K_j^{\beta} \, c_{ij}^{-1}$

The accessibility is, therefore, measured by the sum of the activities located on the region *D*, weighted with decreasing values as the transport cost increases according to the gravitational principle. A_i thus formally corresponds to the balance factor of the gravitational distribution models bound to the origin.

B) Wilson's expression (1967): $\Phi(c_{ij}) = exp\,[-(\beta_1 t_{ij} + \beta_2 c_{ij})]$

The transport impedance is expressed as a linear combination of times and monetary costs, and accessibility takes the following form:

$$A_i = \Sigma_j K_j^{\beta} \exp(-(\beta_1 t_{ij} + \beta_2 c_{ij})$$

In literature it is possible to find similar alternative expressions of accessibility, as:

$$A_i = \Sigma_j K_j \exp(-c_{ij}/\bar{C})$$

$$A_i = \Sigma_j (P_j / S_j)\, c_{ij}^{-1}$$

$$A_i = \Sigma_j (P_j / S_j) \exp(-c_{ij}/\bar{C})$$

Accessibility measures are computed with respect to the origin zone *i*, considering the population P_j of region *j* and (P_j / S_j) are densities, given extension area S_j of the zone *j*; c_{ij} is the travel cost from origin zone *i* to destination zone *j;* $\bar{C}$ is the travel cost computed as average of the different alternatives.

C) Ingram's expression (1971): $\Phi(c_{ij}) = \exp(-d_{ij}^2/\gamma)$

In this case the formulation of accessibility becomes:

$$A_i = \Sigma_j K_j \exp(-d_{ij}^2/\gamma)$$

with d_{ij} the distance between the zones *i* and *j*, γ parameter of the model.

In all these expressions the problem is the attribution of values to the different parameters, because accessibility cannot be measured experimentally, i.e. the parameters cannot be calibrated on the basis of real observations. A choice can be to assume parameters by analogy, i.e. values close to those derived from phenomena that can be verified experimentally. Very common calibration methods such as the least squares method, however, appear valid only in those geographical contexts in which the flow structure is characterized by isotropy and homogeneity; on the other hand, a limit remains because such measures imply a deterministic behaviour of individuals (all individuals in the same area have the same level of accessibility) and does not cover the different perceptions of the alternatives.

Accessibility in disaggregated models

A possible solution to overcome the unrealistic hypothesis of the deterministic behaviour of individuals, implicit in interspaces models, refers to a micro-economic approach (Domencich and Mc Fadden, 1975; Ben-Akiva and Lerman, 1979), with the transition towards disaggregated expressions of the accessibility function, based on a model of choice among alternatives of random utilities in which the behaviour of the individual user is envisaged. Through this approach, the probability of choosing a destination by the individual user can be estimated. In general, the travel behaviour for a tourist involves different aspects:

- need recognition (personal, interpersonal, commercial);
- information search (about destination, travel, accommodation, etc.);
- evaluation of alternative opportunities, influenced by socio-psychological factors (experiences, life-cycles stages, income, available time) and by goal and subjective criteria;
- choice of the alternative, as the related perceived risks;
- consumption of the travel;
- post-experience evaluation.

Concerning the travel choice, behaviour is influenced by two fundamentals questions: what motivates visitors to travel to destinations, how do visitors choose a destination. It implies analysis of different destination attributes; the choice of destination is based on different factors as travel cost and destination touristic attractiveness.
The basic hypothesis is that the user behaves rationally. Faced with the desire to make a travel, considering all the available alternatives that constitute his set choice, he will select the *perceived* alternative location as the one of maximum utility. The visitor *f*, living in a zone *i* of a region *D*, is able to associate to the travel towards each alternative zones *j* of his choice set, a perceived utility or attractiveness U_j^f, which is a function of the values assumed by attributes selected to evaluate the usefulness of each alternative:

$$U_j^f = U_j^f (X_j^f)$$

where X_{jf} is the vector of the attributes of the alternative *j* for the user *f*. The attributes can be distinguished into different classes: service level attributes of the transport system (times, costs, comfort, etc.), attributes of the activity system dependent on the land use (number of activities and their types by zone), socio-economic attributes of the user or his family group (driving license, number of cars owned by the family, income, type of job, etc.).
Utility is a random variable; it is not possible to determine, in absolute way, the alternative selected by the user, as users with the same socio-economic characteristics may be differently sensitive to the same attributes. The utility U_{jf} can be decomposed into a deterministic mean component V_j, also called *systematic utility* and a random component ε_j:

$$U_j^f = V_j (X_j^f) + \varepsilon_j \qquad \forall j \in I_f$$

with I_f set of choice alternatives.

Assuming that the random components are distributed with a probabilistic Gumble Distribution, also the utilities U_j are variables of Gumble and the maximum utility perceived is:

$$U_{max} = log\ \Sigma_j\ e^{Vj}$$

In particular, assuming:

$$V_j = \beta_0 log\ K_j\ - \beta_1\, c_{ij} - \beta_2\, t_{ij}$$

where K_j is the number of activities in the zone j, c_{ij}, and t_{ij} are respectively cost and travel time between i and j, it is possible to write:

$$V_j = log\ [K_j^{\beta_0}\ exp\ (-\beta_1\, c_{ij} - \beta_2\, t_{ij})]$$

$$A_i^* = \Sigma_j\ V_j = log\ \Sigma_j\ [K_j^{\beta_0}\ exp\ (-\beta_1\, c_{ij} - \beta_2\, t_{ij})] = log\ A_i$$

The total utility for the user coming from the zone i, is equal to the natural logarithm of the accessibility of the zone i expressed in the inter-spatial model of Wilson. Accessibility can therefore be used as a measure of the social benefits associated with a given region i.
In analogy, it is possible to express the total utility for the destination region j, as sum of systematic utilities for users directed to the zone j:

$$A_j^* = \Sigma_i\ V_j = log\ \Sigma_i\ [K_j^{\beta_0}\ exp(-\beta_1\, c_{ij} - \beta_2\, t_{ij})] = log\ A_j$$

By adopting the representation of the human activities of Hagerstrand (1970), the activities of an individual can be described by a trajectory in space and time. Each event in the life of an individual can therefore be represented with spatial and temporal coordinates; in particular, the position occupied by an individual at any moment will be represented in space with two geographical coordinates and one temporal one.
The advantage of this representation is that it allows us to reveal how the different constraints (technological, participation, social, physiological) limit the participation of individuals in the different activities (Pred, 1977).

Accessibility approach to valuate touristic development policy

The accessibility index may be used as a measure of the impacts on a given region, consequent to the application of specific strategies addressed to touristic development. For this purpose, a disaggregated model was adopted in which the total utility for the destination region j, is the sum of systematic utilities for users directed to the zone j.
This model was adopted in consideration of following elements:

- the context is international;
- a large data-base has been built concerning the air transport supply, the demand for tourist mobility and the activity system of the destination regions of interest;
- some weighting parameters of travel attributes are available from the specialized literature.

Two types of systematic utility functions (or generalised cost functions) have been firstly considered; the one with two attributes,

time (t_{ij}) and monetary cost (c_{ij}) for origin/destination pair (O/D), the other including a third attribute, the flight frequency (f_{ij}), on the same pair *O/D*:

$$V_j = - \beta_1 c_{ij} - \beta_2 t_{ij} \quad (1)$$

$$V_j = - \beta_1 c_{ij} - \beta_2 t_{ij} - \beta_3 f_{ij} \quad (2)$$

The analysis has been extended to consider the potential attraction of the destination area *j*, through an attribute K_j expression of tourist accommodation and an attribute W_j expression of the attractive opportunities of the region (cultural sites, museums, archaeological areas, etc.), and a parameter δ as a marketing (promotional) factor.

In the case *(1)*, the systematic utility will be:

$$V_j = \beta_0 \log K_j - \beta_1 c_{ij} - \beta_2 t_{ij} \quad (3)$$

$$V_j = \beta_0 \log (K_j + \delta W_j) - \beta_1 c_{ij} - \beta_2 t_{ij} \quad (4)$$

In the case *(2)*, instead:

$$V_j = \beta_0 \log K_j - \beta_1 c_{ij} - \beta_2 t_{ij} - \beta_3 f_{ij} \quad (5)$$

$$V_j = \beta_0 \log (K_j + \delta W_j) - \beta_1 c_{ij} - \beta_2 t_{ij} - \beta_3 f_{ij} \quad (6)$$

In other words, the expressions *(3)* - *(6)* can be written as:

$$V_j = \log [K_j^{\beta_0} \exp(-\beta_1 c_{ij} - \beta_2 t_{ij})] \quad (7)$$

$$V_j = \log [(K_j + \delta W_j)^{\beta_0} \exp(-\beta_1 c_{ij} - \beta_2 t_{ij})] \quad (8)$$

$$V_j = \log [K_j^{\beta_0} \exp(-\beta_1 c_{ij} - \beta_2 t_{ij} - \beta_3 f_{ij})] \quad (9)$$

$$V_j = \log [(K_j + \delta W_j)^{\beta_0} \exp(-\beta_1 c_{ij} - \beta_2 t_{ij} - \beta_3 f_{ij})] \quad (10)$$

Finally, the accessibility index for a destination region *j* will be:

$$A_j^* = \Sigma_i V_j = \log \Sigma_i [....] \quad (11)$$

In Italy the tourism sector registered positive results in the last years. The wealth produced by this expenditure is polarised in 5 regions – Lazio, Lombardy, Veneto, Tuscany and Emilia Romagna – where 67,5% of expenditure of foreign tourists and 63% of tourism value added are concentrated. Despite the significant recent improvement, Southern Italy is still marginal. There are many attractiveness factors of the Southern regions (environment and weather; landscapes variety; archaeological sites and historical villages; cultural, monumental, artistic heritage; gastronomy, long and variegated coasts, etc.); except for some limited spatial contexts, the tourism industry, however,

appears still weak, mainly seasonal, anchored to the past and to organizational models unable to meet international demand. For this reason, Italy has structural difficulties in positioning itself on emerging markets and, in general, with regard to the new demand flows. The main results of impact analysis of the Italian tourism sector on national GDP were analysed by a specific model *(MiBACT, 2017)*; according to this model, the percentage of total national GDP produced by tourism is 11,8% (171 bn €) and the impact on employment is around 12,8% (3.1 million jobs).
A strategic national *Plan for tourism* (*PST 2017-2022*) has been recently implemented by Ministry of Culture and Tourism – MiBACT, according to three overarching principles:

- sustainability (reinforcement of tourism in relation to environment, land, protection of heritage, socio-economic system, culture and citizenship);
- innovation (of the products, processes, technologies and organization of tourism activities; of the market and methods, creating new and more advanced skills);
- physical and cultural accessibility/permeability (accessibility of all people; sustainable mobility systems; opportunity for visitors to understand and interpret the history, complexity and variety of the sites).

An application to a Mediterranean region

In a logical of cooperation strategy, supporting the *PST*, recently a *Tourist Mobility Plan* has been elaborated in 2017 by Ministry of Infrastructure and Transport, in order to improve tourist mobility, through definition of targets shared with sector operators and the main stakeholders. Some actions are envisaged in a *soft mobility* plan and some strategic projects were identified to realize a *slow* network, including cycle routes, roads, historical railway lines, integration between railway services and tourism activities. It is also planned to encourage intermodality, starting with the main *gateways* to the system of international flows of tourists (airports, ports, etc.); to ensure local accessibility to the country's tourist destinations and the areas' *permeability*; to enhance infrastructural heritage as part of the overall strategy to make the regions attractive and promote their sustainable development.
The awareness that the national tourism industry can grow through an appreciation of the potential of Southern Italy has led to assume as a case study in terms of accessibility, one of the poorest European regions, Calabria region, with significant resources related to environment, history, culture, archaeology. Calabria has a remarkable historical-monumental heritage linked to the Magna Graecia and to the Byzantine eras. The application, in the context of international tourism, is also extended to a second Mediterranean region, the Greek region of Crete, for comparative purposes in order to highlight the role

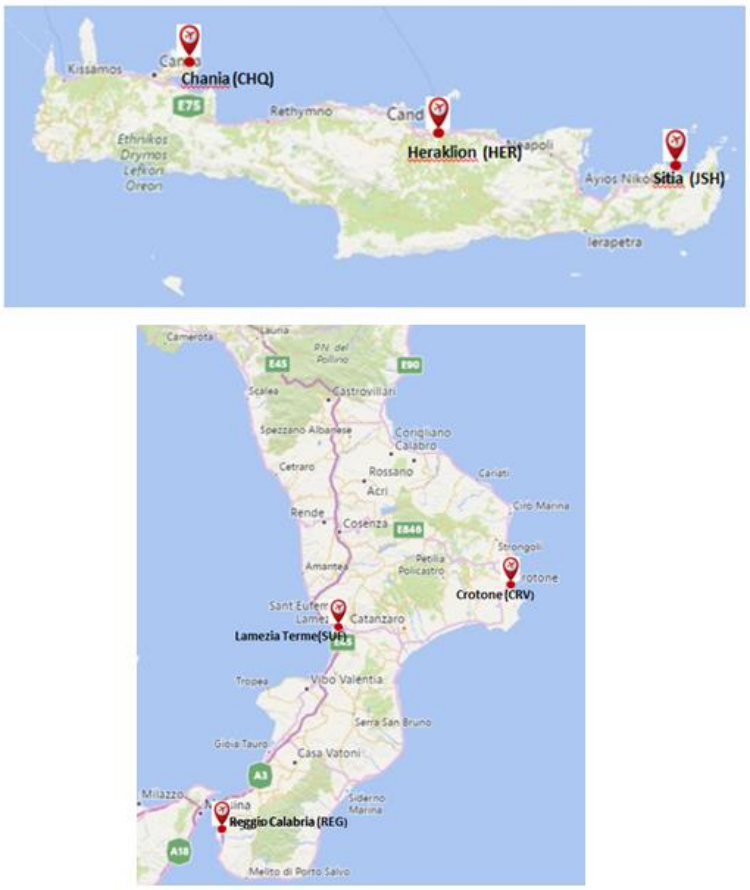
of the different components at stake (supply in terms of transport and attractive factors, also in relation to scenario hypotheses).

Tab. 3 shows some characteristic attributes of the two regions; Calabria has a double extension compared to Crete and a triple population. GDP per capita is similar. The supply of Calabria's networks is much greater both in terms of roads and railways; in Crete there is no rail transport and the motorways are still under construction. The density of marinas, in relation to the length of the coastline, is roughly double in Crete. In both regions there are 3 airports, but in Crete two of them are international, while in Calabria there is only one. Tourist accommodation on the Greek island is almost double. Figg.23 highlights the extension of the two regions, the main networks and the position of the airports.

Indicators	Calabria	Crete
Area (km^2)	15.222	8.336
Population	1.958.296	623.065
GDP per-capita (€)	14.529	14.445
Railway (km)	852	0
Roads (km)	1.924	496
Motorway (km)	294	65
Airports	3	3
Marinas	16	13
Accommodation	3.454	5.765
Beds (*)	187.764	313.393

(*) Crete: estimated value.

tab. 3. General data of the activity and transport system



figg. 23. Crete and Calabria region. Airport sites

Since the interest is focused on international accessibility, some data relating to the air transport in 2016 (Tab. 4) have been acquired, in particular those concerning the main airports of the two regions (Lamezia Terme in Calabria, Heraklion in Crete). The differences do not seem relevant in terms of operating airlines and the number of connected cities; in reality the supply differences are more consistent in terms of flight frequency, especially in the high season, and in terms of direct connection, to the advantage of Crete. It is not random that the difference in terms of passengers is relevant: Heraklion has a more than double transport demand.

The difference in terms of passengers transported is noteworthy even observing the overall regional context, with passenger traffic in Calabria of 3.2 million passengers and traffic of 9.7 million passengers for Crete, about a triple volume. A relevant component of the aerial traffic is the touristic demand, especially for Crete region.

	Lamezia T. (Calabria)	Heraklion (Crete)
Airlines	34 (29 in high season)	37 (28 in high season)
Flights	21.856	50.754
Connected cities	86	82
Passengers	2.521.781	6.867.957
Runways	1	2

tab. 4. Supply and demand data for air transport. Year 2016

For the purposes of the accessibility analysis, 5 international relationships were analysed for Lamezia and Heraklion airports, taking as origin cities for tourist trips 5 European capitals (Paris, Berlin, Moscow, London, Zurich). The analysis was carried out with reference to the month of August, the peak holiday period. From Fig.24 it is possible to see that connections to Crete are all direct, while on Lamezia Terme an intermediate stop is necessary (Milan).

fig. 24. Flights connections from 5 Europeans capitals to Crete and Calabria regions

The air transport supply, day by day, of a representative week (the second week of August 2018) was analysed in detail; individual travel costs, travel times including stops in intermediate airports, flight frequencies were acquired.

Tab. 5 shows a synoptic picture of the supply and demand for air transport over the 10 O/D considered relationships in terms of average travel time (hours), travel fare (€) and number of weekly flights. It also presents the weekly tourist passenger traffic for each relationship.

Origin	Destination	t (h)	C_m (€)	Flights	Tourists
Paris	Lamezia T.	4,1	132	74	750
Berlin	Lamezia T.	5,4	85	65	659
Moscow	Lamezia T.	7,0	127	44	446
London	Lamezia T.	3,7	115	82	831
Zurich	Lamezia T.	2,1	126	68	689
Paris	Crete	3,6	96	68	3013
Berlin	Crete	3,4	97	52	2304
Moscow	Crete	3,8	127	43	1905
London	Crete	3,9	112	68	3013
Zurich	Crete	3,1	142	46	2038

tab. 5. Supply and demand data for air transport. Week of August

In order to evaluate the effect of variations in scenario contexts, starting from the supply and demand data for a whole week, an aggregated demand transport model has been derived through an appropriate interpolation of the same data; it express the dependence of transport demand (TD_j) from related systematic utility V_j (or generalized cost);

In the generalised cost functions, β_1 is equal to *1*, β_2 = *50 €/h* for touristic aerial travel (Meunier and Quinet, 2014). In equation *(2)* the flight frequency attribute was considered as a dummy variable (Y) which is worth *200 €* in the case of absence of direct flights over a period of one week, 0 in the case of daily direct flights and assumes inversely proportional intermediate values in relation to the frequency from 1 to 7. The formula *(2)* becomes:

$$V_j = - \beta_1 c_{ij} - \beta_2 t_{ij} + Y \qquad (12)$$

according to the formula *(12)* the following transport demand function was carried out:

$$TD_j = 4.155{,}1 \exp (- 0{,}003\ V_j) \qquad (13)$$

The demand indicator is useful to analyse how the variations in accessibility (in terms of generalized cost) influence the mobility demand. The goodness of data fit is given by the coefficient of determination, R-squared measure, equal to 0,47.

Subsequently, the analysis of accessibility from the cost function *(5)* was carried out (tab. 6). In the analysis the potentials of the destination region j is expressed through K_j, an attribute of tourist accommodation capacity.

Origin	Destination	t_{ij} (h)	c_{ij} (€)	Y(€)	K_j	V_j
Paris	Lamezia T.	4,1	339	200	3454	2014,5
Berlin	Lamezia T.	5,4	353	175	3454	2038,0
Moscow	Lamezia T.	7,0	477	200	3454	1754,6
London	Lamezia T.	3,7	301	75	3454	2372,2
Zurich	Lamezia T.	2,1	233	75	3454	2538,0
Paris	Crete	3,6	275	0	5765	4380,8
Berlin	Crete	3,4	269	0	5765	4405,9
Moscow	Crete	3,8	316	0	5765	4203,0
London	Crete	3,9	304	0	5765	4251,9
Zurich	Crete	3,1	299	200	5765	4273,9

tab. 6. Accessibility simulation

For present condition (Scenario Zero), the Calabria and Crete accessibility value, computed by formula *(11)* are respectively A_j^* *(Cal) = 4,03* and A_j^* *(Cre) = 4,33*. Crete results more accessible. And this in coherent with the data about touristic traffic.

Scenario analysis

The developed models are interesting because they allow analysis and scenario assessments to be carried out. In this sense, some scenarios are proposed, aimed at evaluating the impacts of improvement actions relating to the Calabria region, leaving unchanged the situation concerning Crete region. In particular, the following actions have been envisaged to improve the Calabria accessibility:

- Scenario A: reduction of travel time and introduction of daily direct flights from European capitals;
- Scenario B: increase in tourist accommodation in the region;
- Scenario C: combination of scenarios A and B;
- Scenario D: as scenario C, adding touristic promotional measures, through the attribute *Wj*.

Scenario A. Tab. 7 shows the variation of travel time component (before – *b*; after – *a*) and the related generalised cost (V_j). Travel times were calculated, assuming an average flight speed comparable to those of existing relationships on Crete. The daily direct flights imply Y =0. The global accessibilities of the two regions are: A_j^* *(Cal) = 4,12* and A_j^* *(Cre) = 4,33*. The impact is a light improvement in Calabria accessibility, not much significant.

Origin	Destination	t_b (h)	t_a (h)	V_{ja}
Paris	Lamezia T.	4,1	3,1	2586,7
Berlin	Lamezia T.	5,4	3,4	2673,5
Moscow	Lamezia T.	7,0	4,0	2489,9
London	Lamezia T.	3,7	3,0	2649,9
Zurich	Lamezia T.	2,1	2,0	2755,3
Paris	Crete	3,6	3,6	4380,8
Berlin	Crete	3,4	3,4	4405,9
Moscow	Crete	3,8	3,8	4203,0
London	Crete	3,9	3,9	4251,9
Zurich	Crete	3,1	3,1	4273,9

tab. 7. Travel time reduction for Calabria destination. Accessibility impact

Scenario B. Tab. 8 shows the variation of accommodation (before – *b*; after – *a*); it was assumed to double the accommodation capacity (number of structures) in Calabria. It is possible to observe the effects on regional accessibility. *Y* keeps initial values. The global accessibilities of the two regions are: A_j^* *(Cal) = 4,33* and A_j^* *(Cre) = 4,33*. The impact is a relevant increase in Calabria accessibility that brings it on par with Crete.

Origin	Destination	K_{jb}	K_{ja}	V_{ja}
Paris	Lamezia T.	3454	6908	4029,1
Berlin	Lamezia T.	3454	6908	4076,0
Moscow	Lamezia T.	3454	6908	3509,2
London	Lamezia T.	3454	6908	4744,4
Zurich	Lamezia T.	3454	6908	5076,1
Paris	Crete	5765	5765	4380,8
Berlin	Crete	5765	5765	4405,9
Moscow	Crete	5765	5765	4203,0
London	Crete	5765	5765	4251,9
Zurich	Crete	5765	5765	4273,9

tab. 8. Accommodation increasing in Calabria region. Accessibility impact

Scenario C. The combination of the effects derived from both the actions hypothesized in the two previous scenarios (daily direct flights with reduction of travel time and expansion of accommodation, for Calabria, *Y=0*) translates into the following values of global accessibilities of the two regions: A_j^* *(Cal) = 4,42* and A_j^**(Cre) = 4,34*. Calabria accessibility overcomes, even slightly, that of Crete.

Scenario D. The scenario *C* evolves and in this case the influence of regional attractive opportunities (cultural sites, museums, archaeological parks, etc.) is added by the attribute W_j, weighted by a parameter δ, expression of a promotional action of policy makers. The attribute W_j is equal to the main regional cultural sites (136 recorded

in Calabria, 25 in Crete). A value $\delta = 10$ has been adopted. The following global accessibilities values result for the two regions: *Aj* (Cal) = 4,50* and *Aj* (Cre) = 4,33*. Calabria accessibility overcomes that of Crete (tab. 9).

Origin	Destination	t_b (h)	t_a (h)	K_{jb}	K_{ja}	W_j	V_{ja}
Paris	Lamezia T.	4,1	3,1	3454	6908	136	6191,9
Berlin	Lamezia T.	5,4	3,4	3454	6908	136	6399,7
Moscow	Lamezia T.	7,0	4,0	3454	6908	136	5960,2
London	Lamezia T.	3,7	3,0	3454	6908	136	6343,3
Zurich	Lamezia T.	2,1	2,0	3454	6908	136	6595,5
Paris	Crete	3,6	3,6	5765	5765	25	4380,8
Berlin	Crete	3,4	3,4	5765	5765	25	4405,9
Moscow	Crete	3,8	3,8	5765	5765	25	4203,0
London	Crete	3,9	3,9	5765	5765	25	4251,9
Zurich	Crete	3,1	3,1	5765	5765	25	4273,9

tab. 9. Reduction aerial travel time, accommodation and attractiveness increasing in Calabria region

Comparative analysis

The comparison of different scenarios shows how accessibility index change subsequently to the different action plans activated by policy makers. It is possible to act reducing transport impedance in order to increase accessibility, but the accommodation capacity and touristic promotion are important too. Fig. 25 shows the index accessibility evolution for Calabria Region by present state to different Scenarios; the increasing accessibility corresponds to the extension of measures able to improve transport supply and land attractiveness. It is plausible that the better accessibility of the region pushes the increasing of tourism demand.

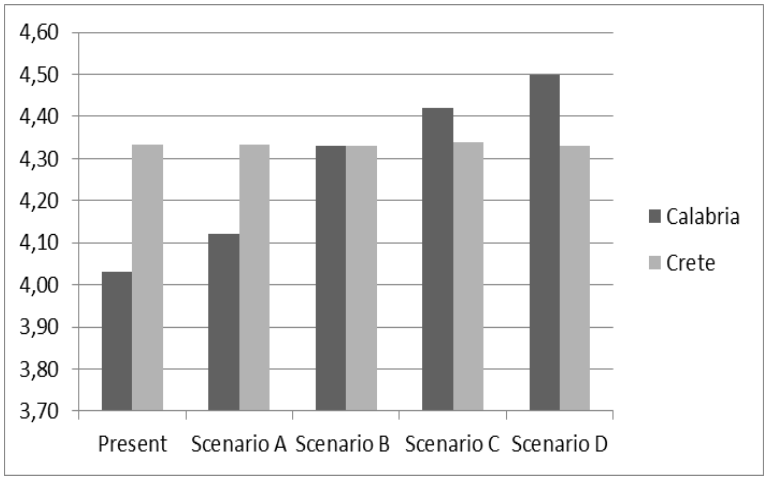


fig. 25. Accessibility regions. Compared analysis

The touristic transport demand, computed by the demand function *(13)* for Calabria region, considering the reduction in generalized costs

(daily and direct flights) increases from 5218 to 9215 passengers/week (+76,6%). But the R^2 of the exponential transport demand function is not very satisfying; In fact, there is a consistent difference between real value and estimated value in current Scenario. Certainly it is possible to explore news demand models, based on a large set of experimental data, but the trend is evident.
Other research insights could be possible. It would be interesting to appraise the influence of the local transport services in the destination regions on the choice of the potential tourists; or still the weight of the f transport fares. As also the evaluations after the tourist experience, to understand the effect in terms of loyalty, as in the Crete region case, in order to have significant and useful terms of comparison to drive transportation and land use planning. Specific further researches would deserve some aspects of people behaviour that today have great importance in the international tourism; the people look for the beauty and the comfort through the discovery and the sharing of the local cultures; it would be opportune to investigate such behaviours and therefore to hold them in count in the analyses of accessibility and touristic development policies.

The tourism development is tightly tied to the availability of efficient transport systems. Many planning studies and the experience show the dependence of the transport demand from the characteristic variables of the transport services. Building an infrastructure to make easier the access to a given region (highway, railway, airport) can make more attractive the same region. But the tourist's presence is also tied strongly to the attraction factors of which the region is provided. So in the analyses of accessibility it is convenient to consider both the attributes of the transport supply and characteristic land use factors.
The application proposes a review of reference models concerning integrated Transport/Tourism analyses (transport/ land use models, demand models, supply models, etc.), but focus overall the accessibility models. A theoretical approach to accessibility analysis is proposed, including travel costs and land use attributes. An application of the modelling approach is presented, with reference to an international tourism context, able to highlight the role of the different attributes on accessibility in relation to some measures planning applied to improve the touristic attractiveness of the Calabria, a region of the South Italy. Finally, some remarks on the analytical approach adopted and on possible future research developments are suggested.

INTEGRATED URBAN REGENERATION POLICY AND SOFT MOBILITY PLANNING FOR TRANSPORT ENERGY-SAVING

Urban regeneration policies are today also oriented towards environmental sustainability and energy consumption restraint. Vehicle mobility in cities is often one of the factors that most affect energy consumption. It may therefore be interesting to combine urban requalification actions with measures able to limit or remove energy consumption from vehicular traffic, in particular soft mobility measures (pedestrian areas, traffic calming, limited traffic areas, shared mobility). These policies can contribute to improve environmental quality and the public economy: reduction of polluting emissions (harmful gases, noise), improvement of people relations and social inclusion, accessibility to people with disabilities, green spaces expansion), energy savings. The attention is focused on transport models able to provide quantitative impact indicators of these integrated policies in terms of less energy consumption for the urban community.

The environmental quality of urban areas is strongly influenced by the widespread and difficult to control atmospheric pollution, substantially linked to the production and consumption of energy for:

- the energy needs of buildings;
- support for production activities;
- vehicular mobility.

An environmental requalification action also generally aims at the goal of atmospheric *de-pollution* of the urban environment and, therefore, at reducing energy consumption connected to urban mobility.

Soft mobility and its promotion in urban policies is related to the problem of emissions generated by vehicular traffic. Such a promotion is also based on the awareness that the increase of soft mobility would reduce private car traffic, particularly as regards short trips. The emerging attention to environmental concerns has been leading many cities towards the development of specific infrastructures and services dedicated to soft mobility. This should ensure highest levels of urban safety increasing occasions of public spaces regeneration. In the following section are presented general policies in terms of urban regeneration and soft mobility.

Reconstruction, revitalisation, renewal, redevelopment and finally regeneration: these are terms that have outlined policies of urban degradation since the post-war period (Healey, 2013). Today the city is understood in a global sense, in which economic and environmental issues interact (Roberts and Sykes, 1999).

Over the year, in fact, the city has changed its constituent canons. The city, from a place of social life, has become a space to be used to take advantage of the infrastructure and services. This mentality has generated degradation, disorder, waste, lack of resources, poor services. It shaped to a new model of city that determined the

processes of urban sprawling. Today the areas appear strongly unbalanced, denaturalized, defrauded by their characteristics (Panuccio et al., 2015).
It is useful to define new models of urban development, in which cities play the dual role of policy takers and policy makers (Faludi, 1973). The European Union tries to push the city to recover its cultural and territorial origins in order to reorganize the available space, according to the new principles of logical and sustainable development (C.E.C., 1999).
The regeneration process must be based on a detailed analysis of the conditions of the urban area, must be related to the adaptation of social, physical, economic base and environmental conditions of the area, must ensure that the strategy is developed in agreement with the goals of sustainable development, it must make the best possible use of human, economic and social resources and must seek to reach consensus through the participation and cooperation of all the actors involved in regeneration (Busacca, 2000; Moulaert et al, 2005; Carta, 2007). It should also indicate ways to integrate policies vertically and horizontally, monitor the outputs of the strategy and assess their impact. The urban regeneration approach applied to city waterfronts is today a key concept in literature (Bruttomesso, 1993); in particular, for our application we will focus on the city of Reggio Calabria (Martinelli et al., 2014).

Policies for soft mobility in urban areas

Urban mobility has a greatest impact on cities' energy consumption and pollution levels (Fallanca et al., 2011).
In 2014, around a quarter of the EU's total greenhouse gas emissions were produced by the transport sector. According to preliminary data, cars accounted for 44% of emissions in the sector, and heavy commercial vehicles and buses for 18% (Agenzia Europea Ambiente, 2016). For these reasons, sustainability is a key concern for modern transportation systems and so for urban planning. Modern urbanization is leading to the continuous expansion of urban areas, and the consequent strengthening of the commuting phenomenon that generates increased demands for mobility while creating congestion (Herrero, 2011). This increases the time spent travelling, the pollution and the predilection for private vehicles over public transport. These problems have resulted in a degradation of the quality of life of citizens. Private traffic induces many road accidents (in Italy there were 3.283 victims of road accidents in 2016, www.istat.com) which have a strong impact on public spending and contribute to increase operating costs and time spent travelling (Cheba et al., 2015).
The emerging attention to environment quality has been leading many cities towards the development of specific infrastructures and services dedicated to soft mobility (pedestrian and cycle mobility, zero emission vehicles, shared mobility, green and clean public transport,

etc.). This should ensure highest levels of urban safety and increasing opportunities of public spaces regeneration (Borchiellini et al, 2017).
Generally, soft mobility and its promotion in urban policies is linked to the problem of emissions generated by vehicular traffic. Such a promotion is also based on the belief that the increase of soft mobility would reduce private car traffic, particularly as regards short trips.
Despite this increasing attention, the idea of a "network" for soft mobility has not yet been carried out. The supply of integrated facilities and services, being alternative to the car use, seems to have still difficult of accomplishment. By some years, the European Union is working on strategic policies to implement integrated models between public and private operators and to encourage new planning tools as Sustainable Urban Mobility Plans (PUMS). The design of an efficient and sustainable urban mobility system is a vital component of the new smart cities.

Models for estimation of energy consumption from urban traffic

Quantitative indicators should be used to assess the impacts of integrated urban regeneration and soft mobility policies (Mutani, 2018). Among others, it can be assumed that the reduction of energy consumption is a valid and effective indicator of the impact on the environment and, consequently, the effects on the levels of environmental pollution and on the quality of social life could be derived (Gulotta et al, 2018). In order to estimate the energy consumption of vehicular traffic, we now have general modelling tools (simulation models of transport networks and the interaction between mobility demand and supply) as well as specific models such as those designed to determine consumption energy in relation to attributes of the transport system such as vehicle flows, distances travelled by vehicles, infrastructure service levels (congestion, run-off speed).

Models of transport supply

The analysis of urban mobility can be tackled by adopting transport models. Typical approaches focus the supply transport, the demand of users (origin, destination, modal choice, path) and interaction supply/demand (Cascetta, 2013).
The activity system influences the transport demand and, in turn, undergoes the influence of the transport system structure, through accessibility. Indeed, a good transport system improves accessibility to the territory and reduces the negative impacts as pollution and energy consumption.
An important element in mobility modelling is the transportation network, which includes the alternative routes from the different origin/destination couples. The construction of the network is usually divided into two steps:

- the drawing of a graph G (N, L) through the identification of nodes and road branches;

- the attribution to nodes and branches of specific cost functions (CF), typically functions able to represent the dependence of flows from congestion levels. You can therefore assume: N (N, L, CF).

The network is also important because it can be associated with the nodes and branches of the graph Performance Functions (PF) such as polluting emissions and energy consumption. Various models useful for estimating these social cost components are now available in the specialist literature. In the following we focus on the models of energy consumption.

Models of energy consumption

Several experimental models are proposed in the literature that express fuel consumption according to other measurable or calculable quantities; these can be: the vehicles-km travelled, the number of stops per unit of time, the total delay of vehicles per unit of time, the speed, etc. The most widespread fuel consumption patterns are those that express speed dependency; they are divided into instant models (which establish a ratio between consumption and instantaneous speed variations) and average speed models (which link consumption at average speed on a route).

Two variants are the basic driving models (D.M.E.M. = Drive-Mode Elemental Models) and the models of average speed (A.S.M = Average Speed Models).

The basic driving model (D.M.E.M.) groups the elements that contribute to the fuel consumption in relation to the vehicle's driving characteristics: acceleration phase, regime phase, slowdown phase. The running elements are assumed mutually independent, so that the total consumption is carried out as the sum of the consumption relative to the individual elements. The simplest form of D.M.E.M is the following (Torrieri, 1990):

$$C = k_1 D + k_2 T_\alpha + k_3 N$$

with:

C = fuel consumed by a vehicle;

D = length of the trunk;

T_α = stop time (time delay due to stops);

N = number of stops;

k_1 = fuel consumption rate per unit of distance at normal speed;

k_2 = consumption rate during the stop;

k_3 = over-consumption of fuel during acceleration up to speed and deceleration until stopping.

For distances greater than 1 km, a good correlation between fuel consumption and a single variable, the average speed v, on a given path is obtained:

$$C = k_1 + \frac{k_2}{v} \qquad \text{per } 10 \leq v \leq 60 \text{ km/h}$$

with:
C = fuel consumed by a vehicle per unit of distance (in lt/km);
v = average speed measured on a given distance, also taking into account arrests and phases of various motion;
k_1 = coefficient associated with the fuel consumed to overcome the rolling resistance, and approximately proportional to the mass of the vehicle;
k_2 = coefficient associated with the duration of the trip.
This model explains 70% of the variance in fuel consumption. However, it is limited to the speed range not exceeding 60 km/h (fig. 26). For higher values of speed, the influence of aerodynamic drag begins to increase in importance.

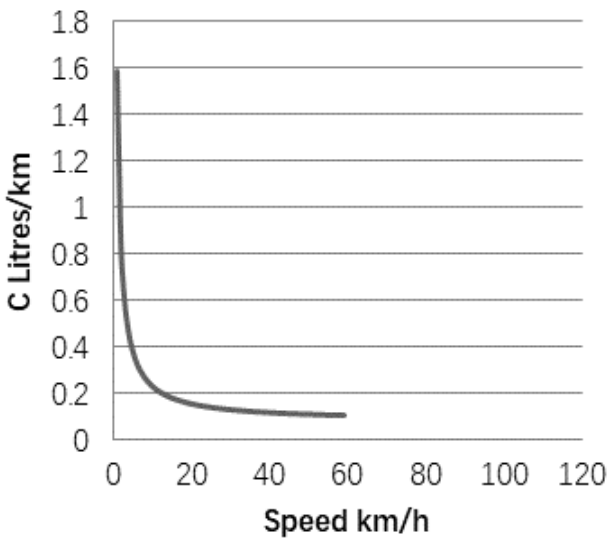


fig. 26. Energy consumption versus average urban runoff speed (k1 = 0,085 lt/km; k2 = 1,5 lt/h).

The validity of the model has been extended (particularly in extra-urban areas) at higher speeds, according to the following specification (Luca, 1996):

$$C = k_1 + \frac{k_2}{v} + k_3 v + k_4 v^2$$

Fig. 27 shows how fuel consumption varies with speed for Cars and LGVs (Large Goods Vehicle), using this kind of function.

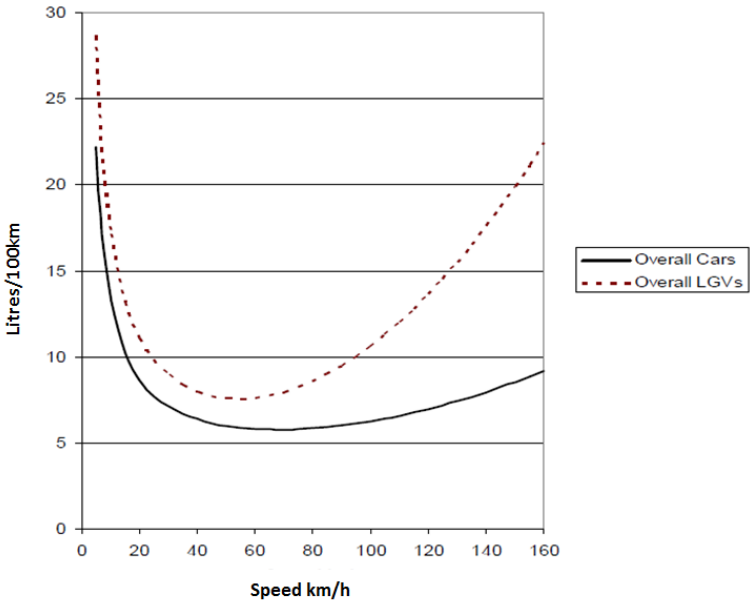


fig. 27. Energy consumption versus average outflow speed (k1 = 0,438 lt/km; k2 = 0,06 lt/h; k3 = -0,0005 lt h/km2; k4 = 4,1·10-6 lt h2/km3).

Speed fluctuations can have a significant influence on consumption. The model can be further clarified with the introduction of a term that takes into account the various accelerated phases of motion:

$$C = k_1 + \frac{k_2}{v} + k_3 v^2 + \frac{k_4}{D}\int_0^{T_v} a_m \, v_i(t) \, dt$$

with:

a_m = acceleration;

v = average speed;

v_i (t) = instantaneous speed;

D = length of the route;

T_v= travel time.

For difficulty in measuring accelerations, the fourth rate can be expressed as a summation of the positive changes in kinetic energy:

$$C = k_1 + \frac{k_2}{v} + k_3 v^2 + \frac{k_4}{D}\sum_i^N v_i^2$$

In Italy, the CNR (Department for Transport, 2014) has proposed a model still used today in practical applications. The model assumes (in terms of first approximation) the variable energy consumption on a road trunk of unit length with the speed and slope according to the expression:

$$C = \left[\frac{(v-60)^2}{35000} + 0{,}066\right](1 + 0{,}13p) \quad \text{in } lt/km$$

with:

p = road slope in%;

v = average travel speed in *km/h*.

The CNR model can also be rewritten in the form:

$$C = k_1 + k_3 v + k_4 v^2$$

Fig. 28 shows the typical symmetrical parabolic trend, with a minimum consumption when v = *60 km/h*, having taken a flat road (p = 0).

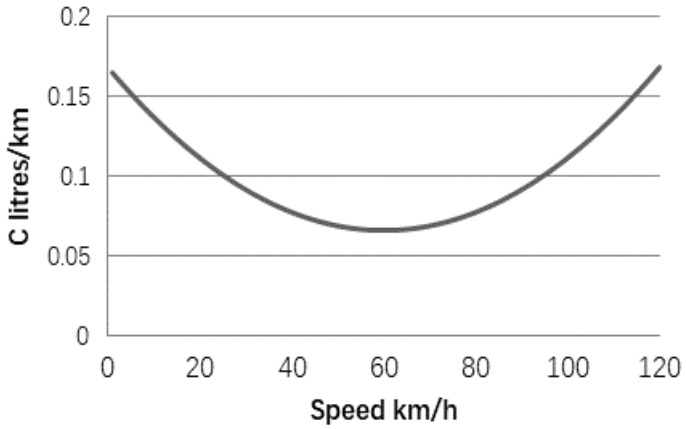


fig. 28. Energy consumption versus average outflow speed (CNR model, k1 = 0,169 lt/km; k3 = - 0,0034 lt h/km2; k4 = 3·10-5 lt h2/km3).

Finally, is proposed in fig. 29 a model of energy consumption developed at LOGICA Laboratory of *Mediterranea* University of Reggio Calabria. The model assumes the additive expression (Luca, 1996), but it appears, in relation to the parameters, as an average expression among the previous functions.

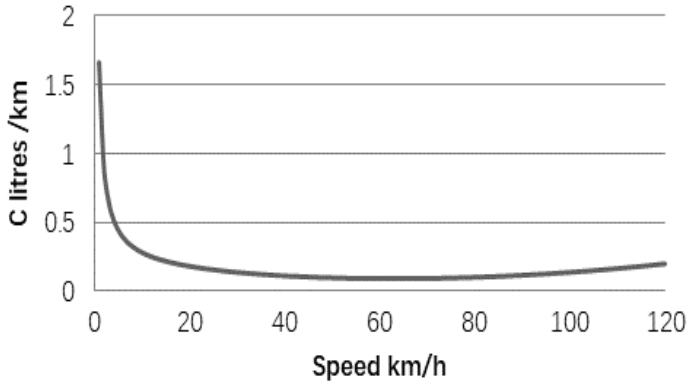


fig. 29. Energy consumption versus average outflow speed (LM - Logica Model, k1 = 0,166 lt/km; k2 = 1,5 lt/h; k3 = -0,0034 lt h/km2; k4 = 3·10-5 lt h2/km3).

Tab. 10 shows a synoptic overview of the proposed energy consumption estimation models. The estimation refers to a unit value of distance (1 km) and a single vehicle; on the network the calculation of consumption is carried out in relation to the lengths of the individual branches of traffic and of the vehicular flows in transit on the same by time bands. Flows that, of course, will depend on the offer model or the infrastructural endowment and the organization of the circulation. A comparison with the trend of the different functions is shown in fig. 30.

Model	k_1 (lt/km)	k_2 (lt/h)	k_3 (lt h/km^2)	k_4 (lt h^2/km^3)
2. $C = k_1 + k_2/v$	0,085	1,50		
3. $C = k_1 + k_2/v + k_3*v + k_4*v^2$	0,438	0,06	-0,0005	$4,1*10^{-6}$
8. $C = k_1 + k_3*v + k_4*v^2$	0,169		-0,0034	$3,0*10^{-5}$
LM. $C = k_1 + k_2/v + k_3*v + k_4*v^2$	0,166	1,50	-0,0034	$3,0*10^{-5}$

tab. 10. Energy consumption estimation models.

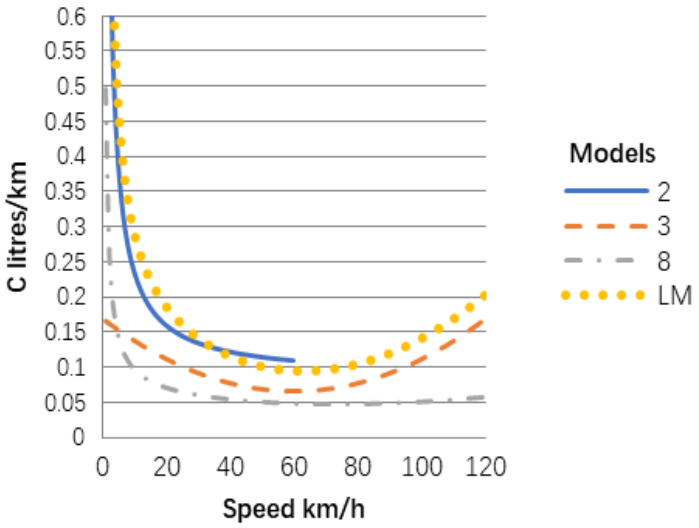


fig. 30. Energy consumption versus traffic flow average speed by different models.

An environmental requalification and soft mobility proposal

The analysis of integrated policies of urban regeneration and soft mobility planning can be a useful approach to the study concerning new urban spaces design. An integrated approach to urban regeneration policy and soft mobility planning, aimed at significant transport energy-saving and environmental sustainability is proposed.
The focus of the application is the estimation of traffic energy consumption following an environmental requalification and soft mobility project in the context of an urban centre; some models are proposed, related to transport supply models.
The applications reference to an ordinary day and a specific area of the Reggio Calabria city centre (figg.31). The city is located on the eastern shore of the Strait of Messina and has about 180 thousand inhabitants.

Through a modelling approach, the impacts resulting from a regeneration project of the Reggio Calabria waterfront are simulated and the effects on energy consumption are estimated. The results are finally analysed and commented.
The approach appears innovative in the context of the sector literature as an interdisciplinary combination of two differentiated research

fields (urban regeneration and soft mobility planning). Furthermore, an original model for the consumption estimation is presented.

figg. 31. Reggio Calabria City Center. Reggio Calabria Lungomare (waterfront).

The advanced hypothesis is an environmental regeneration of the seafront, an important two-way road about 1.8 km long (called *Lungomare*, fig 32) through a reorganization of the transport offer both in terms of infrastructure and technology and services, in order to also affect the demand for travel. The basic goal of this action is to expand the opportunities for the soft mobility components, minimizing the presence of private motorized vehicles and, at the same time, the harmful emissions of vehicles and energy costs.
Three types of measures are planned:

A. Closure of access to motorized vehicles and controlled access to service vehicles;
B. Specific accesses and internal routes for pedestrians, cycles, electric means of public transport, with particular attention to People with Reduced Mobility (PMR);

C. Advanced technologies (Intelligent Transportation Systems) according to Smart City advanced standards.

fig. 32. A stretch of the waterfront (Lungomare).

Naturally, the new organizational structure of mobility in the area will be reflected on the rest of the City and, more particularly on the marginal areas, given that traditionally usable routes of North-South and Mare-Monti crossings by motorized vehicles will be inhibited. In particular, it will be necessary to estimate, in a logic of the plan, the exchangeable car parks at the extremes, also provided for in some municipal planning documents (Porto, Piazza del Popolo, areas adjacent to the railway stations), able to drain the vehicular traffic coming from the suburbs, favouring interchange with public or low-impact vehicles.
It should be noted that the demand for mobility will be subject to a substantial change in its characteristics, especially in terms of spatial and modal distribution.

Closure of access to motorized vehicles and provision of controlled access systems for service vehicles

In correspondence to various arteries, artificial barriers will be set up to prevent the transit of motorized private vehicles; the barriers will be of 2 types:

- permanent rigid barriers;
- removable barriers (fig. 33) by remote control, to allow access to particular categories of vehicles such as public transport shuttles, ambulances, service vehicles, law enforcement, garbage collection vehicles).

fig. 33. Retractable mobile barriers.

The freights distribution and pick-up service at the shops located at the edge of the area can only take place through manual-guided carriages (fig. 34); parking spaces reserved for freights vehicles on the adjacent road will be set up, and parking of the same vehicles within the area will not be allowed; the vehicles will be able to circulate only on pre-established routes and on limited time windows (for example in the early morning hours).

fig. 34. Freight distribution system

Also for taxi services, car sharing or tourist buses, special areas will be set up in the margins, the use of which will be appropriately regulated. The very short duration (for passenger loading / unloading) and that of vehicles with a lower environmental impact will be privileged.

At the entrances, bike-sharing parking lots will be set up (fig.35) and solar-powered battery charging stations for electric vehicles (bikes, shuttle buses, service vehicles). The regulation of use will be aimed at favouring the frequent turnover of the means among the users and a rewarding combination for those who leave the car in the parking lots of interchange (reduced parking rate + ecological vehicle).

fig. 35. Bike sharing

Specific accesses and internal routes for soft mobility service vehicles

The routes inside the area are divided into two types:

- a marginal viability for use by public transport and service vehicles, consisting of the lane adjacent to the buildings of the current viale Matteotti and the lane of long coastline for the use of service vehicles authorized. On the first the vehicles will be able to transit in the South-North direction, facilitating the operations of contact with the activities on the margins, in safety; an extension of the sidewalk is foreseen in order to make the circulation of substantial and bidirectional pedestrian flows possible, but also the stationing of people in correspondence with buildings or public services; on the long coast route, only the occasional circulation of service vehicles, in the North-South direction, will be allowed;
- an internal road system dedicated to the various components of soft mobility, largely surrounded by greenery: bi-directional cycle path; paths for running or running; pedestrian promenade, equipped and reserved paths for children, green paths for slow walking, "tourist" routes for the protected visit to prestigious places and / or botanical observation. Adjacent to the paths will be distributed themed pitches (areas with sunny benches in the shade, social and cultural meeting areas, squares for art exhibitions / shows / games, widgets with fountains, toilets, kiosks, totems and information panels, silent areas for reading, study, internet connection, sports activities and outdoor gym, etc.). The basic model is the Valencia City Park, the Jardì de Turia. Grassy paths will be preferred, in clay or pavement in light pavement, and the green surfaces will be far dominant. The routes will be equipped with appropriate information signs, appropriately distributed.

ITS technologies, according to smart city standards

In order to encourage the use of the spaces of the new urban Park and absorb the effects induced by the foreclosure to circulation by motorized private vehicles, some specific measures are envisaged,

partly technological and partly organizational. Among the new technologies, are included:

- a pair of medium-capacity ecological buses that will shuttle between the South and North terminals, along the lanes dedicated to service vehicles; the lap times will be contained in half an hour thus ensuring a good frequency (4 trips / hour);
- a dozen environmentally friendly vehicles for transporting people and freights and for additional services (fig.36);
- 4 bike-sharing stations on the edge of the area, with the commitment of 120 pedal assisted bikes with related management accessories;
- access control systems (fixed, mobile, concealed bollards, video surveillance systems and sensors);
- Wi-Fi network with sensors installed on light poles, in order to guarantee network coverage over the entire area;
- totems and intelligent information panels, which can also be used by blind people, who are also able to communicate with transport operators, assistance and rescue centres.

fig. 36. Ecological vehicles for local service

The impacts of the project on the mobility system will be multiple; positive effects are expected, in particular:

- on soft mobility (pedestrians, people with disabilities, cyclists, children, tourists), in terms of facilities and opportunities for moving and enjoying urban spaces;
- on the environment, with the reduction of atmospheric and acoustic pollution on a large urban area (with consequent contraction of related negative health effects such as allergies, dermatoses, respiratory diseases, etc.) and in terms of widening green spaces for public use;
- on road safety, with a significant reduction in the risk of accidents caused by motorized vehicles;
- on safety in terms of civil protection against catastrophic natural or anthropic events, being able to assume the area as a host function in case of rapid people evacuation need;
- on the quality of social life, with new opportunities for relationships and expression by citizens;

- on the image of the area, with a strong ecological, cultural, recreational and tourist impact;
- on the urban economy, with positive effects in terms of tourist flows recalled, associated cultural and commercial activities, employment opportunities;
- on energy costs, saving urban economic costs.

Scenario simulations and impact assessment on energy consumption

Some evaluations about effects on energy consumption related to the mobility system have been deduced, through a simulation model (fig.37), in relation to the knowledge of traffic volumes and stops, the structure of the road network in the current and future scenario, and experiences consolidated in other urban contexts. The analysis concerns the city centre. The dotted area corresponds to the new urban park (waterfront) of the city.

There is no doubt that, compared to the current State in the Project Scenario, the availability of approximately 3.2 km of roads, about 500 parking stalls, and the possibility of transit on the North-South route will be blocked for motorized citizens. as well as that of penetration from the west into the city centre, on the sea-mount route. Considering an average time to stop the order of 2 hours on the sea network, in the morning rush hour (8:00-12:00), it is estimated that about one thousand accesses to the parking lot should be less. The most intense traffic flows are today on the *via Marina Bassa* (*Lungomare* Falcomatà, two-lane) route in the North-South direction, which reach peaks of 1600 veh/h between 7:30 am and 8:30 am; in the opposite direction (*via Marina Alta*, or viale Matteotti), with only one lane of transit, traffic volumes are less consistent, reaching around 1500 veh/h. It is worth noting that traffic flows in via Marina account for 70% of the exchange flows between the centre and peripheral areas and only 30% is represented by crossing traffic.

However, the functional reorganization of the project area will not result in a simple transfer of flows and parking to other arterial roads, given the limited amount of road and residual capacity; if this is the case, unwanted congestive effects or traffic crisis phenomena may occur in the city centre. Instead, after a transition phase, a new balance of traffic flows is predictable, determined by behavioural changes induced on drivers. In fact, we expect a broad use of intermodal mobility, or the spread of Dial & Ride mobility; users coming from the suburbs in the car should leave their vehicle in an interchange car park and continue the journey to the centre by public transport, by bike or on foot. The distances to be covered are few hundred meters, which in the big European cities are usual.

Naturally, it is necessary to have adequate interchange parking spaces both in terms of space distribution and capacity; the parking facilities, in relation to projects in advanced stages of definition, appear to be

sufficient. Dial & Ride parking and parking-bike sharing fares are considered in order to facilitate and encourage modal interchange.

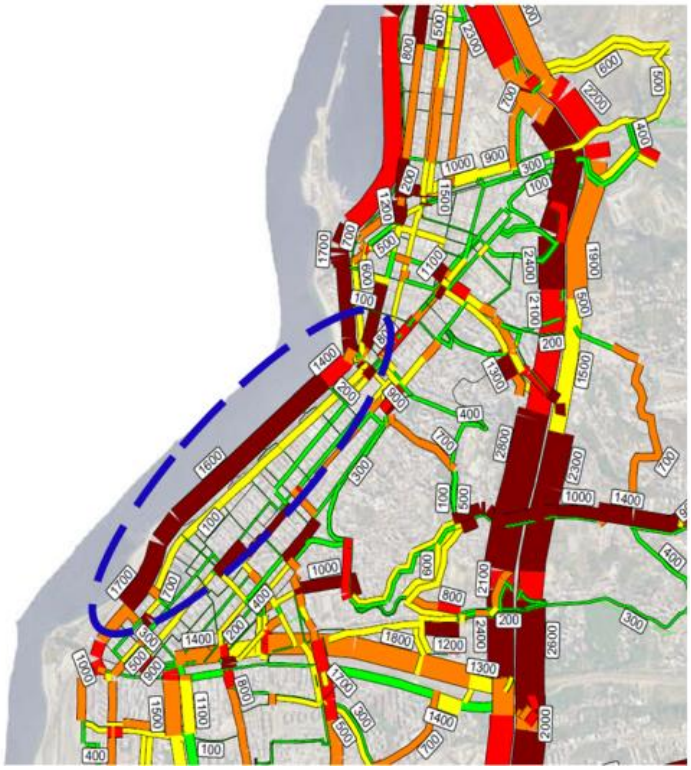


fig. 37. Reggio Calabria City Centre, urban flows(vehicles/h). Modelling example of traffic

The analysis was carried out through a calculation of energy consumption on the primary road network, adopting the Logica (LM) model, in particular a set of roads able to compose alternative routes to the waterfront roads; some urban roads and longer but less congested routes through the urban belt (Via Libertà, Tangenziale, Calopinace). Consumption was calculated on the three representative hours of an ordinary day: a rush hour (C_{hp}), an off-peak hour (C_{hd}), a night hour C_{hn}). The total daily consumption on the analysed network was carried out, assuming 6 rush hours, 10 off-peak hours and 8 hours at night:

$$C = C_{hp} \cdot 6 + C_{hd} \cdot 10 + C_{hn} \cdot 8$$

Tabb. 11-13 show the results of simulations and derived consumption.

	Scenario	v (km/h)	F (cars /h)	L (km)	C (lt/km)	C_{tot} (lt)
Via Aschenez	Present	20	800	1,89	0,19	279,0
	Future	15	1100		0,22	445,8
Via Torrione	Present	20	600	1,79	0,19	198,1
	Future	15	900		0,22	356,2
Viale Matteotti	Present	20	1500	1,61	0,19	446,2
	Future	-	-		-	-
Lungomare Falcomatà	Present	20	1600	1,60	0,19	473,6
	Future	-	-		-	-
Tangenziale A3 S-N	Present	60	2400	2,56	0,10	584,1
	Future	50	2650		0,10	685,7
Tangenziale A3 N-S	Present	60	2100	2,56	0,10	510,3
	Future	50	2350		0,10	607,1
Viale della Libertà E-W	Present	30	800	0,69	0,14	77,8
	Future	30	1050		0,14	102,2
Viale della Libertà W-E	Present	30	800	0,69	0,14	77,8
	Future	30	1050		0,14	102,2
Lungo Argine Calopinace SX	Present	50	1200	1,82	0,10	220,6
	Future	40	1450		0,12	304,8
Lungo Argine Calopinace DX	Present	50	1200	1,82	0,10	220,6
	Future	40	1450		0,12	304,8

tab. 11. Simulation of rush hour

	Scenario	v (km/h)	F (cars /h)	L (km)	C (lt/km)	C_{tot} (lt)
Via Aschenez	Present	35	320	1,89	0,13	76,4
	Future	25	520		0,16	156,6
Via Torrione	Present	35	240	1,79	0,13	54,2
	Future	25	440		0,16	125,5
Viale Matteotti	Present	35	600	1,61	0,13	122,2
	Future	-	-		-	-
Lungomare Falcomatà	Present	35	640	1,60	0,13	129,6
	Future	-	-		-	-
Tangenziale A3 S-N	Present	80	960	2,56	0,11	257,6
	Future	60	1060		0,10	258,0
Tangenziale A3 N-S	Present	80	840	2,56	0,11	225,1
	Future	60	940		0,10	228,4
Viale della Libertà E-W	Present	40	500	0,69	0,12	39,8
	Future	40	675		0,12	53,8
Viale della Libertà W-E	Present	40	500	0,69	0,12	39,8
	Future	40	675		0,12	53,8
Lungo Argine Calopinace SX	Present	60	700	1,82	0,10	121,0
	Future	55	920		0,10	162,5
Lungo Argine Calopinace DX	Present	60	720	1,82	0,10	124,5
	Future	55	930		0,10	164,2

tab. 12. Simulation of off-peak hour.

.

	Scenario	v (km/h)	F (cars /h)	L (km)	C (lt/km)	C_{tot} (lt)
Via Aschenez	Present	40	80	1,89	0,12	17,4
	Future	40	123		0,12	26,8
Via Torrione	Present	40	60	1,79	0,12	12,4
	Future	40	113		0,12	23,3
Viale Matteotti	Present	50	150	1,61	0,10	24,4
	Future	0	0		0,00	0,0
Lungomare Falcomatà	Present	50	160	1,60	0,10	25,9
	Future	0	0		0,00	0,0
Tangenziale A3 S-N	Present	90	240	2,56	0,12	73,6
	Future	80	265		0,10	71,1
Tangenziale A3 N-S	Present	90	210	2,56	0,12	64,3
	Future	80	235		0,10	63,0
Viale della Libertà E-W	Present	50	300	0,69	0,10	20,9
	Future	50	350		0,10	24,4
Viale della Libertà W-E	Present	50	300	0,69	0,10	20,9
	Future	30	345		0,14	33,6
Lungo Argine Calopinace SX	Present	70	180	1,82	0,10	31,6
	Future	70	240		0,10	42,1
Lungo Argine Calopinace DX	Present	70	180	1,82	0,10	31,6
	Future	70	240		0,10	42,1

tab. 13. Simulation night hour

It can be observed that:

- the overall energy consumption decreases, even slightly (-3,0 %);
- the substantial before/after equivalence is due to the fact that a part of the eliminated traffic from the waterfront, net of new soft mobility, is drained by alternative routes, reducing service levels, and average flow speeds;
- other external effects (accident rate, pollution and noise, landscape impact) are reasonably positive;
- the new waterfront set-up is therefore a positive choice, revealing a prestigious urban park on a corridor about 1.6 km long and about 75 m wide, connected to other green spaces such as the Villa Comunale.

REGENERATION AND ACCESSIBILITY IN SEASIDE TOWNS. SALINE JONICHE AS A CASE STUDY.

By definition, urban regeneration implies an action of urban renewal, a process of physical redevelopment of a city area. Alongside these actions, however, in the redevelopment of a territorial area, the accessibility that we have described extensively in the previous chapters is of particular importance. It represents a tool capable of expressing the connection speed of a site with respect to the surrounding region and can therefore be considered a synthetic indicator that lends itself to assessing the degree of organization and connection of the Transport / Territory complex.
Accessibility measures make it possible to assess the degree of use of a territory, therefore they are proposed as quantitative indicators for impact assessments relating to interventions on the transport system and / or on the settlement system. Urban regeneration actions can therefore be evaluated, already in the design phase, using these indicators as orientation tools. Below we propose an application case of accessibility analysis in relation to a hypothesis of functional recovery of a large degraded area in Calabria and the reorganization of road infrastructures in the area.
The measures aimed at the regeneration of the territory, the reorganization of the road system and the enhancement of the port in an eco-sustainable perspective are outlined; the analyzes lead to the emergence of the impacts of these actions on the accessibility of the area under study in quantitative terms.

Saline Joniche is a small town on the outskirts of the metropolitan area of the Strait of Messina, located about 25 km from Reggio Calabria. Saline J. represents an emblematic case of a territory wounded by industrialization events that seeks to recover a new environmental value. In the seventies an impressive industrial chemical plant (Liquichimica) was built for the production of bio proteins / feeds from microorganism cultures on petroleum derivatives. The plant was completed in 1974 in an area of seven hundred thousand square meters; where previously there was a disused salt pan and a bergamot plantation, extensive industrial plants took place, a port dug on the coast and a tower of about 70 meters high, which still stands out over the area (fig.38). A few years later (1989), about 2.5 km further south, a shed was also built for the maintenance of railway locomotives (Officine Grandi Riparazioni, OGR) connected to the coastline by an elevated viaduct. Over time, minor industrial activities have also settled in the surrounding area.

fig. 38. Saline Joniche. Panorama Area Liquichimica Biosintesi

Overall, a questionable territorial structure has been determined, with the forced coexistence of areas with landscape value and naturalistic and high-impact production plants. But the peculiarity of Saline lies in the fact that the two large plants industrialists never went into business, so that an extraordinary heap of scrap metal and avery large container that has never housed machinery or trains. Over the decades, the state of decay of the area it is accentuated. The port itself, conceived for the movement of freights for industry use, was left to itself, with the consequence that erosion and silting phenomena dictated by the waves have caused its impracticability. Today the area appears to be made up of an unrelated succession of large unproductive structures, more or less urban agglomerations dense (the centre of Saline Joniche, the system of historic villages), open spaces with different degrees of naturalness (agricultural areas of prestige, hydrographic system of the rivers, coast, naturalistic area of the Pantani), infrastructure systems (SS 106 and railway along the coast) which accentuated the break between the hills and the sea. For some time now, the need has arisen for a regeneration intervention capable of redeveloping the area of the Saline waterfront, heal the wounds still open, restore dignity and composure to an extraordinary environment to affirm its potential development from an eco-sustainable and tourist point of view. A project proposal is made based on the recognition of the identity of Saline as a strong territory naturalistic - environmental connotation and value. The affirmation of this identity becomes the basic goal and backbone of the area's redevelopment strategies, seeking the right balance between the connotation environmental characteristics, which are linked to characteristics of high quality but also fragility, and the provision of infrastructures, equipment and services capable of supporting and consolidating the role of new centrality. Four types of measures are planned: structural and functional restoration of the port, definition of new destinations of use of the rear port areas, reorganization and recovery of the industrial areas around the port, redevelopment of the road networks to make the port and waterfront more accessible.

Intervention to restore the functionality of the port

The Port of Saline Joniche (fig.39) is a dock port, originally intended for industrial-commercial built to serve the industrial agglomeration of Saline Joniche.

fig. 39. Port of Saline Joniche

It is currently classified among the commercial ports of regional or interregional economic importance; in the Masterplan for the development of the Calabrian ports in 2011 it is included in the list of Calabrian ports with a tourist function only and pleasure boats with a capacity of 40 berths. In order to restore operational capacity to the port, it is necessary to recover the breakwater and to recover the quay, transformation of the internal eastern reef into a quay, dredging of the basin and the access channel. The tourist port is defined as that complex of removable and immovable structures built with works on land and sea for the purpose of serving solely or mainly the recreational boating and the nautical yachtsman, also through the provision of complementary services (DPR 509/1997). In this sense, one is proposed for the Grecanic port mixed use, with a predominantly tourist function dedicated to pleasure craft, but with functional commercial area sand fishing boat (fig.40). Both the sizing and the localization of functional areas are aimed at a use infrastructure as a port of call. In addition to the areas dedicated to strictly port services, dedicated spaces are foreseen commercial services (info point, local guide, supermarkets, recreational shops, newsagents, tobacconists, sales souvenirs, bars, car parks, etc.), as well as the establishment of a cultural tourist centre (hotel, nautical club, private beach, multifunctional conference room, restaurant, night clubs, etc.). To the west of the basin, an area a commercial-industrial vocation, while, on the western quay and in correspondence with the piers of the pier of superfluity, an area dedicated to the fishing function has been planned. Planning was then completed with areas for refuelling and storage and with a repair dock. On the eastern quay, a slipway has been provided for the drying and launching of small boats, while the availability of an evolution basin with a diameter of 210 m and the draft foreseen for

the entrance channel and the basin could allow the entry of ships to 100 m in length and draft up to 6 m. Finally, the activation of a continuous bypass system is foreseen which, intercepting the sand carried by the currents, to the east of the mouth, before the S. Elia stream, determines its transfer to the west of the Falcone stream, effectively restoring the original conditions of solid transport.

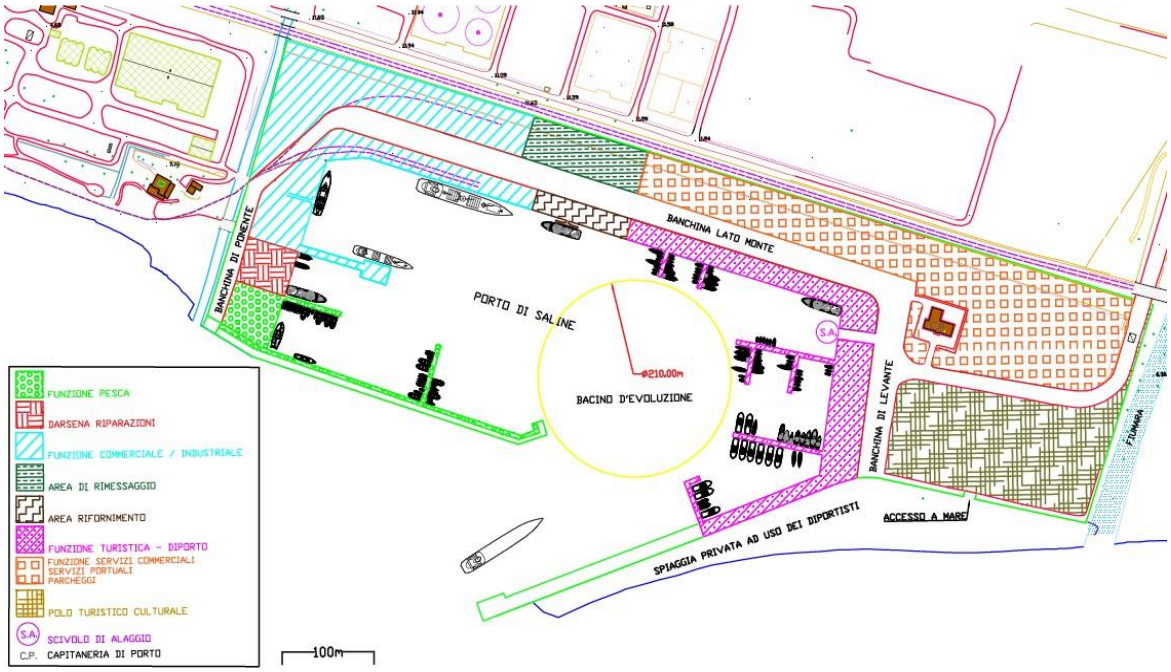


fig. 40. Port functional areas planning plant. Source: Montebello Ionico Municipality

The large surfaces currently occupied by industrial plants should be converted to new functions, maintaining, where possible, the existing structures and instead reclaiming the non-recoverable industrial components. In particular, Liquichimica area could become a park equipped with a large green area and tourist / hotel services.
In the O.G.R. interventions aimed at services for businesses are foreseeable, while the large warehouse could be used on two alternative areas of activity:

- a plant for the collection, processing and shipping of recycled materials, such as ferrous materials or paper, or a center for the collection and distribution of freights for the metropolitan area;
- a disarticulation of the entire surface into parts destined for differentiated functions capable of translating into interesting economic impacts, such as: Transport research laboratory for road and railway infrastructures, Arts and crafts Department, for the promotion of manual work, Auditorium and halls conferences, shared rooms for meetings of associations and

movements, multiplex cinema / theater, recreation room (parties, dance, etc.), sports department, regional railway museum, Euro-Mediterranean Expo / Fair, with variable themes throughout the year, Space for GAS, Solidarity Purchase Groups.

Networks' intervention

Territorial area of the port of Saline Joniche is located outside the inhabited centers and is equipped with roads connecting with the S.S. 106 and with the municipal and provincial road network that allows you to reach the nearest towns. The port area and the industrial area are connected to the main railway infrastructure by means of a non-electrified single track connection that reaches the local Saline railway station. Along the railway line there are also the stations of Annà, a well-known seaside resort, and of Melito di Porto Salvo, the main center of the Grecanica area. Also from the railway station of Saline a second railway junction departs, partially in viaduct, which extends to the disused industrial plant of the OGR. Fig. 41 shows the reference road layout.

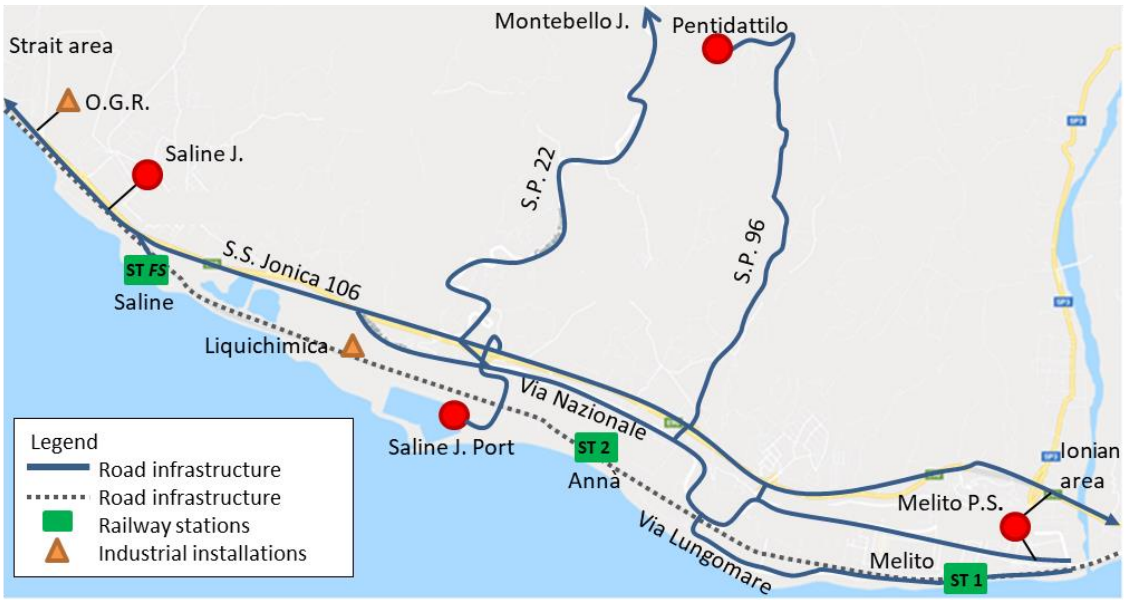


fig. 41. Minimum network scheme

To promote the area of the Port of Saline and make the waterfront more accessible, an intervention by connection with the surrounding urban fabric, with the completion of the road network, appropriate connections to the stations railway, some pedestrian and cycle paths. Fig.42 highlights the proposed intervention.

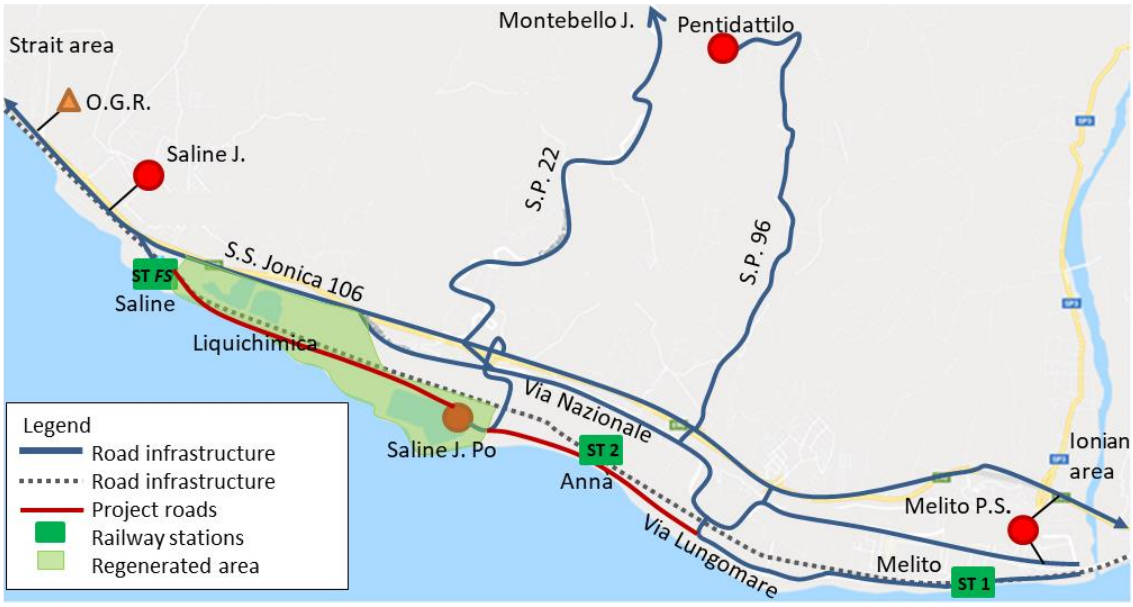


fig. 42. Proposal for intervention on the port connection networks

Users arriving from outside with their own vehicle (Strait Area, Ionian area, Montebello) could leave their vehicle in an interchange parking lot and continue the journey to the pole of interest by public transport, in bicycle or on foot. The distances to be covered are a few hundred meters. The industrial area would thus be transformed in a green area, more liveable, becoming a prestigious area, suitably equipped, and an opportunity for the development of social relations. The urban centers of Saline, Pentidattilo and Melito, in a perspective of multipolar integration, as well as the former OGR area, seat of new economic and social functions.

Impacts on accessibility

The impact analysis of the plan solution in terms of accessibility is based on the adoption of network models and functions specifications. Starting from the minimum current road network scheme, the corresponding graph was constructed (fig.43). Each arch of the network is characterized by length, width and average travel speed. Starting from these data we proceeded to calculate, using a mathematical model, average travel times (t_{ij}) and travel costs (c_{ij}) for an average user in terms of energy consumption.

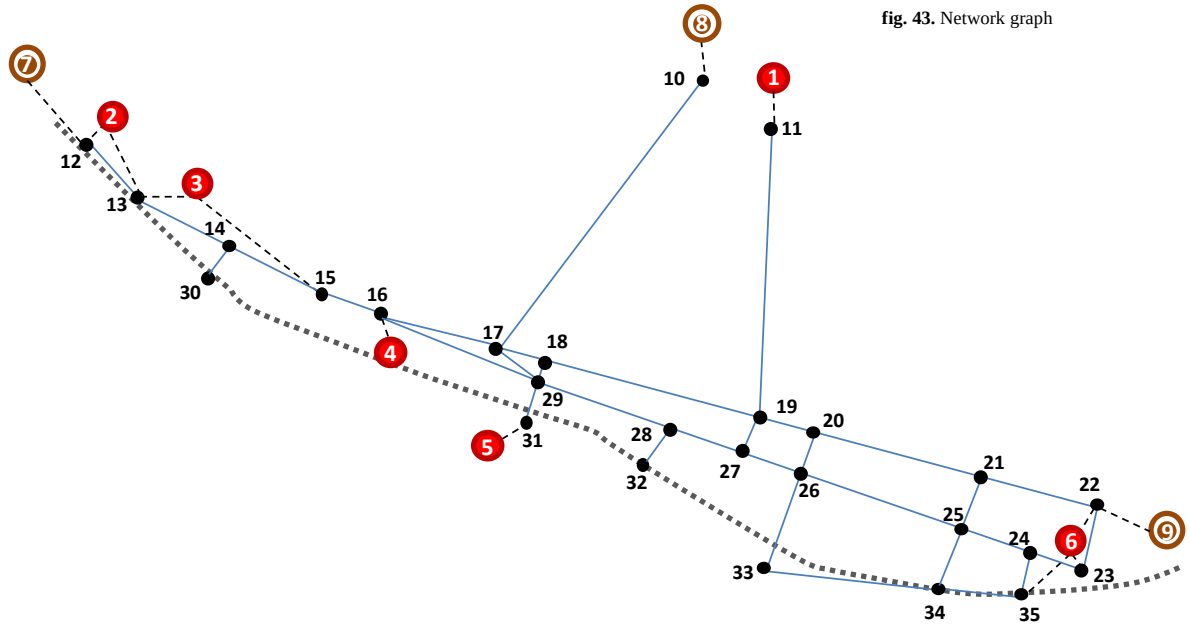


fig. 43. Network graph

Port of Saline is the representative node of the area subject to the regeneration intervention, they have been identified the routes to reach it from the different areas of origin and for each route travel times and costs have been evaluated. Possible alternative routes are identified for each Origin-Destination pair (indicated with alphabetical code). To date, the only viable mode of transport is the car (tab.14).

O/D (path)	Time (min)	Cost (€)
1-5 (A)	19,1	3,0
2-5 (A)	7,1	1,7
2-5 (B)	6,1	1,4
3-5 (A)	4,7	0,9
3-5 (B)	4,4	0,8
6-5 (A)	18,3	3,5
6-5 (B)	9,4	2,5

tab. 14. Current scenario. Travel times and costs

Following a similar approach, the network model corresponding to the plan layout is constructed. The network graph is highlighted in fig.44.

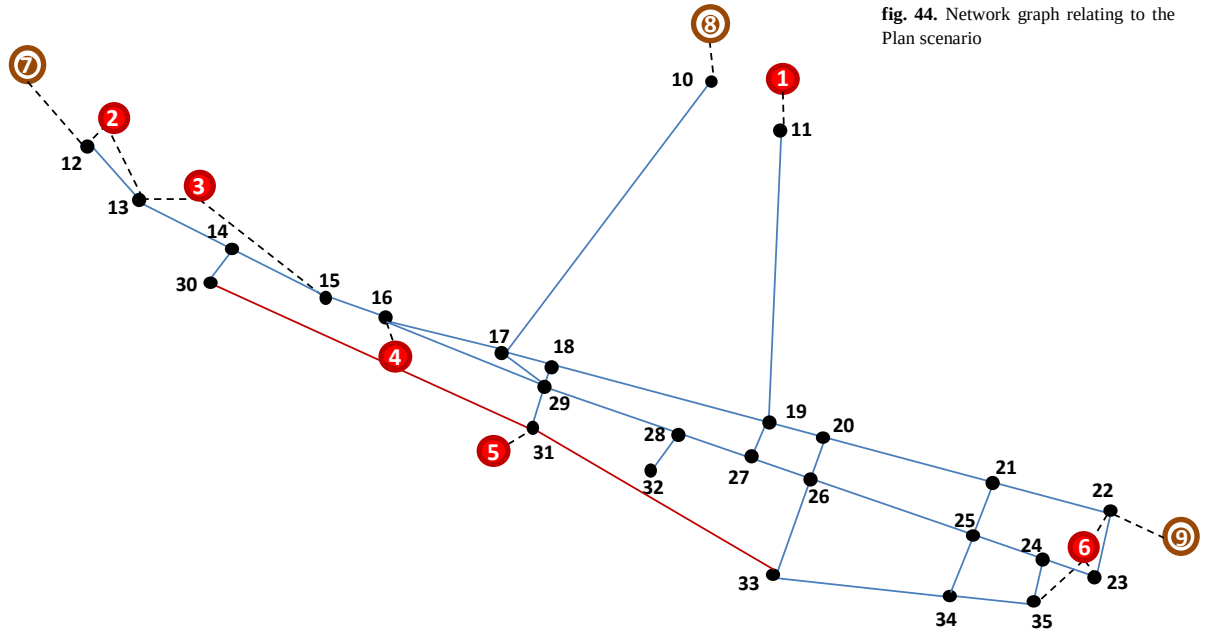


fig. 44. Network graph relating to the Plan scenario

In this case, in addition to the car mode, the pedestrian and cycling modes of transport appear (tab.15). Alternative routes a those currently available are marked with the letter C.

	Car		Bike		Walk	
O-D	Time (min)	Cost (€)	Time (min)	Cost (€)	Time (min)	Cost (€)
1-5 (A)	19,1	3,0	-	-	-	-
2-5 (A)	7,1	1,7	-	-	-	-
2-5 (B)	6,1	1,1	-	-	-	-
2-5 (C)	**2,4**	**0,7**	**5,0**	**0**	**20,0**	**0**
3-5 (A)	4,7	0,9	-	-	-	-
3-5 (B)	4,4	0,8	-	-	-	-
3-5 (C)	**1,6**	**0,4**	**5,0**	**0**	**20,0**	**0**
6-5 (A)	18,3	3,6	-	-	-	-
6-5 (B)	9,4	2,3	-	-	-	-
6-5 (C)	**5,5**	**1,3**	**10,0**	**0**	**30,0**	**0**

tab. 15. Plan scenario. Travel times and costs

For the accessibility assessments the following wording was assumed:

$$A_i = \sum_{j=1}^{n} K_i^{\delta} \cdot \phi(C_{ij})$$

where:

- A_i is the weighted accessibility of visitors coming from the different zones j and going to the port (zone i);
- K_i is a measure of activities and services located in zone i (port), assumed equal to 1 for the current state (conservative hypothesis of invariance of the attractive factor) and equal to

10 (hypothesis of growth of the attractive factor) for status of the Plan, having carried out the regeneration work;

- δ is a calibration parameter, assumed with a unitary value;
- $\Phi(C_{ij})$ is an impedance function (Ingram, 1971), decreasing with the generalized cost C_{ij}:

$$\Phi(C_{ij}) = exp\,[-(C_{ij})] = exp\,[-(\beta_1\, t_{ij} + \beta_2\, c_{ij})]$$

whit β_1 equal to 1 and β_2 = 14,4 €/h (Meunier e Quinet, 2014). The comparative results of accessibility are shown in the tab.16.

	Current scenario		Plan scenario	
O-D	c_{ij}	Φ_{ij}	c_{ij}	Φ_{ij}
1-5	-7,58	0,001	-7,58	0,001
2-5 (A)	-3,37	0,034	-3,06	0,047
2-5 (B)	-2,92	0,054	-2,46	0,085
2-5 (C)			-1,10	0,334
3-5 (A)	-2,04	0,130	-1,74	0,176
3-5 (B)	-1,82	0,162	-1,71	0,181
3-5 (C)			-0,55	0,576
6-5 (A)	-7,88	0,001	-7,71	0,001
6-5 (B)	-4,72	0,009	-4,28	0,014
6-5 (C)			-2,08	0,124
Ai		**0,391**		**1,539**

tab. 16. Accessibility to the port node (K_j = 1)

It can be observed that the accessibility to the port in the Plan scenario significantly increases compared to the current state (about 4 times higher). Assuming K_j =10, to take into account the enhanced attractiveness of the port pole, the value accessibility becomes even more relevant (A_i = 15,39). With this application we wanted to outline a methodological approach of analysis based on the consideration of Transport / Territory report to evaluate the impacts of urban regeneration actions on a territory. All of this thanks also to a reorganization of the mobility networks, through accessibility indicators. In particular, there is a substantial increase in opportunities also in relation to the design of pedestrian and cycle paths that connect the pole itself to the neighbouring urban centres and to strategic interchange nodes such as the stations of the railway line passing adjacent.

EXPERIENCES OF INTERNATIONAL TOURISTIC RAILWAY

Acting to enhance the tourist opportunities of an entire coast always represents a tool for rebirth, a lever which favors the accessibility and attention of potential tourists, helping to enhance an area that is considered marginal.

Rail transport has marked the historical evolution of the economy in many regions of the world. Over time, thanks to technological innovations, trains capable of great performance have also established themselves, also in terms of comfort and speed, offering a service that is often competitive with that of other means of transport. A role that has not been fully exploited is that of tourist railways, but in recent years interesting solutions have been proposed, with increasing attention to the transport / tourism combination. Today new tourist opportunities based on the use of the train are proposed in different parts of the world and sometimes some old and disused railway lines have been reactivated to allow to offer new forms of travel such as luxury railway cruises or organized trips for the purpose of vacation or cultural events.

In this application, a proposal is made regarding the organization and implementation of a multimodal tourist itinerary on the southern Ionian coastal corridor in Italy. There are four alternative and complementary modes of transport (rail, route, cycle path, sea route) from south-eastern Sicily (Syracuse) to Puglia (Taranto) crossing the Strait of Messina and 4 regions. The four routes pass through some relevant sites and are connected to some important airports. The Ionic corridor has a high tourist value, touching numerous archaeological sites of the Greco-Roman period, Byzantine villages, very rich museums, extraordinary and varied natural landscapes and a typically Mediterranean gastronomic offer. The basic idea is to provide this corridor with high quality mobility services, without producing negative impacts on the environment, to allow excellent tourist entertainment, thus favoring the economic growth of the regions concerned and the regeneration of a territory that is currently very far from European development standards, a sort of prolonged regeneration of the seafront on an interregional dimension of about 650 km. Particular attention is given to the railway component, focused on the creation of a luxury cruise train service, based on a consolidated experience in other regions of the world. The description of the transport alternatives, to be structured or adapted with limited investments, is followed by a specific study on the feasibility of a commercial initiative for luxury tourist trains, the Magna Grecia Ionio Express, through the evaluation of investment costs and management, potential revenue, economic indicators both from the point of view of public and public entities.

Train-tourism combination expresses multiple forms of expression on the international scene. Tourist travel by train can be classified into two broad categories:

- thematic trains, on short routes in areas with a high landscape and cultural value;
- hotel trains, which offer a sort of railroad cruise and also cover considerable distances.

The former are trains designed and built specifically for short-term tourist needs, usually a daily trip; in countries such as Switzerland a wide range is offered. Widespread have also found "old" trains, sometimes historical, which run along minor lines especially during holidays or on the occasion of special events, often with the contribution of passionate volunteers (Italy, France): literary train, wine train, balloons), trains to the sea, mountain trains. There is no shortage of unique initiatives such as the provision of some trains with special carriages for the entertainment of children.

In this context, some policies aimed at the recovery and regeneration of disused stations, for social, tourist or cultural purposes, also appear interesting. In Italy, the railway heritage manager (Rete Ferroviaria Italiana, RFI) has identified 1,700 unattended stations to be granted through free loan contracts to associations and municipalities for social projects that have positive repercussions on the territory and for the quality of the services offered in the same stations. The general goal is the "regeneration" of goods warehouses, waiting rooms, offices and apartments of the stationmasters who have lost their original function with the evolution of the railway system (fig.45). To date, after 5 years from the start of the initiative, 350 stations have been recovered; over fifty of them were sold on loan for free use or facilitated lease to associations and local bodies and perform 4 main functions:

- tourism and environmental promotion;
- cultural and meeting centers for young and old;
- places of solidarity activities such as the distribution of food and clothing;
- logistical bases of civil protection.

fig. 45. Regeneration of railway stations (source: RFI, 2018)

The hotel-trains are convoys proposed to offer a rail cruise, both for the quality of the furnishings of the carriages and the service (fig. 46). Offers of this kind are present in various parts of the world, from

South Africa to North America, from Northern Europe to Siberia (Thirumaran and Raghav, 2017). Tab.17 suggests the specifications of some of the most famous trains currently in operation; it can be observed that the cruises cover distances between 250 and 10,000 km, with stay times between 4 and 15 days. The transport capacity of a train varies between 30 and 90 passengers approximately; the frequency is diversified with peaks of 50 trains / year. The cost per person is very variable in relation to the duration, the type of service more or less luxurious, the offer of additional services, such as visits to museums and prestigious local sites; it varies from € 2,000 to € 7,000.

fig. 46. Luxury tourist trains

	Country	Railway company	Train
1	Canada	Canadian Pacific Railway	Royal Canadian Pacific
2	South Africa	Rovos Rail	The Pride Of Africa
3	USA	American Orient Express	American Orient Express
4	UK	Belmond	Belmond Royal Scotsman
5	Russia	Golden Eagle	Transsibérien
6	Spain	El Transcantabrico	El Transcantabrico Clasico
7	Spain	El Transcantabrico	El Transcantabrico Gran Lujo
8	Spain	El Transcantabrico	El Expreso De La Robla
9	Spain	Al Andalus	El Andalus Express
10	China	Golden Eagle	Shangri-La Express
11	Iran	Golden Eagle	Heart of Persia
12	Thailand	Belmond	Eastern and Oriental Express

tab. 17 Relevant features of some Luxury trains.

Among others, some trains operating in Spain are particularly interesting, for various reasons: Mediterranean atmosphere, the management by a state company (Renfe), the environmental similarity with Southern Italy, the historical and cultural richness of the places crossed. The Al Andalus Express crosses Andalusia starting from Seville and touching Cordoba, Granada and Jerez de la Frontier (fig.47). It is a luxury rail hotel, belle époque style, completely renovated, equipped with modern technology and air-conditioning. It is equipped with 14 carriages including the kitchen, two dining carriages, the bar car, the lounge and a dining room, seven sleeping cars for 74 passengers. The sleeping cabins, with bathroom and

shower, are located in the carriages built in 1929 for the King of England. Tour prices range from € 2,700 / person for the double to € 3,800 for the single.

fig. 47 El Andalus train

Transcatabrico is a train that allows a week-long journey from Leon to Santiago de Compostela (and vice versa) through Galicia, Asturias and Cantabria. The train, consisting of 4 sleeping cars with air conditioning, sauna, hydromassage and telephone, also houses a ballroom, a bookshop, a library, a bar, a projection room (fig.48). The cost is of the order of € 2,300-3,000 / person.

fig. 48. El Transcantabrico train

There are numerous itineraries in Europe of historical-cultural-landscape value that attract tourists and encourage active mobility, that is the mobility of pedestrians and cyclists. The routes are sometimes linked to historical events or religious pilgrimages and develop over varied distances. Some well-established representatives on the European scene are proposed.

The Camino de Santiago de Compostela is one of the most famous pilgrimage trails in the world and perhaps the oldest, beaten since the Middle Ages. It is 800 km long and reaches the Sanctuary of Santiago de Compostela where the tomb of the Apostle James the Greater is located. It takes a month to walk all the way, or rather the most famous route from the Pyrenees to Galicia. However, it must be said that the Way is not just one, but a set of paths that reach Santiago and then to the Atlantic Ocean, in Finistère. There are several appendages to this journey that also develop in Portuguese and French territory; the French way to Santiago was declared a UNESCO World Heritage Site in 1993. There are an estimated 250-300 thousand travelers who reach Santiago each year. The Camino de Santiago has revitalized entire regions; an induced amount of over 60 million euros is estimated.

In 1987 the Council of Europe launched in Santiago de Compostela the "brilliant and far-sighted" idea of a "Cultural Itineraries Program"

in order to encourage knowledge and relations between citizens and peoples of Europe in the spirit of the values of intercultural dialogue interreligious, mutual respect and democracy. The Via Francigena was certified in 1994. It is based on the diary, kept in the British Library in London, of the 79 stages of the journey of Bishop Sigeric of Canterbury who in 990 went to Rome to receive the episcopal pallium from Pope John XV. The itinerary winds for 1,800 km through England (Kent), France (Hauts-de-France; Grand Est; Bourgogne-Franche-Comté), Switzerland (Vaud; Valais), Italy (Valle d'Aosta; Piedmont; Lombardy; Emilia; Liguria; Tuscany; Lazio). Today there are 135 local and regional institutions in the four countries. The number of travelers and cyclists from all over the world along the Via Francigena is estimated at around fifty thousand.
Over time the paths have multiplied, but few are adequately structured and equipped. In a Directive of the MIBACT of 2015 which established the Year of the Paths and an "Atlas of the Paths of Italy", a specific definition is contained: *Paths are considered cultural itineraries of particular European and / or national importance, which can be covered on foot o with other forms of sustainable soft mobility, and which represent a way of using the widespread natural and cultural heritage, as well as an opportunity to enhance the natural and cultural attractions and the territories concerned. In line with the vision of the Council of Europe, the paths cross one or more regions, can be part of European routes, are organized around themes of historical, cultural, artistic, religious or social interest.*

In a similar way, and sometimes overlapping, trans-regional and international cycling routes (cycle paths) are spreading. In Italy, a Memorandum of Understanding between MIT and MiBACT (MiBACT, 2017) allows the recognition of cycle paths in the national planning of priority infrastructures, in relation to certain minimum standards and requirements, promoting specific itineraries with a touristic and cultural value.
In general, the characteristics of a cycle path are those defined by the CROW (FIAB, 2008), or the guidelines developed in the Netherlands in 1993, also taken from the EuroVelo project. A cycle route must respond to specific safety attributes (minimize the dangers for cyclists, pedestrians and other users, giving a feeling of safety), coherence (continuous itinerary with its own identifiable national character, integrated with local roads and cycling routes), linearity (itinerary that avoids unnecessary tortuosity, although it can deviate to allow the visit of characteristic landscapes or sites of interest), attraction (itinerary that integrates and enriches the environment in which it is located in such a way that it is attractive to travel by bicycle), comfort (which allows an easy flow of cycling traffic and is easily accessible).

The Danube Cycle Route is the most popular cycle route in Europe and runs along the course of the river that cuts the old continent from the source of Donaueschingen in Germany to the mouth near the city of Constance on the Black Sea, for a total length of 2,860 km. The cycle route runs both on cycle paths and on secondary roads with low traffic, crossing 10 states and numerous cities, including the three capitals Bratislava, Budapest and Belgrade.
Ciclovia del Sole is one of the four priority Italian cycleway since it runs along Eurovelo 7, the itinerary of over 7,400 km that goes from the North Cape to Malta, and includes the stretch of the Ciclovia del Sole from Verona to Florence. This winds for over 650 km and affects four regions (Emilia-Romagna, Lombardy, Tuscany, Veneto) and 75 municipalities.

A proposal for a multimodal itinerary along the Italian Ionian coast

The awareness that the national tourism industry can grow through an enhancement of the potential of Southern Italy has led to the adoption, as a case study, of the Ionian coastal corridor from Sicily to Puglia, equipped with significant attractive factors from a tourist point of view. This area has a significant heritage of environmental, historical-monumental, cultural and archaeological resources, particularly linked to the Greco-Roman era (Magna Graecia) and the Byzantine era. Fig.49 helps to clarify the location of the itinerary in Southern Italy and allows us to observe how it touches a considerable part of the Greek colonies. Representatively, Table 18 shows some of the main historic cities, with archaeological finds of great value and international appeal

fig. 49. Territorio della Magna Grecia (a) e fascia costiera ionica (b)

The Ionian coast that stretches from Syracuse (Sicily) to Taranto (Puglia), passing through Calabria and Basilicata, is currently served

by a road route of about 650 km in length. There is also a railway line with a length of 665 km along which there are about 100 stations. The Ionic itinerary could also be covered on foot, assuming as an alternative the gentle and slow mobility typical of many European paths. It could wind along the Via Dromo which, at the time of Magna Graecia, connected the Greek colonies, running parallel to the coast line, about 1 km away from the sea. Some segments of the Via Dromo already exist, but it would be necessary to reconstruct the ancient route, perhaps integrating it and adapting parts of inter-country roads, with the aim of configuring a real Way of the Ionian Magna Graecia, with characteristics similar to the Way of Santiago de Compostela or the Via Francigena.

City	Historical name	Found.	Main sites historical-architectural-monumental
Syracuse	Syraka	734 a.C.	Temple of Apollo, Museum Archaeological P. Orsi and Park Archaeological Neapolis
Augusta	Megara Hyblaea	728 a.C.	Archeological area
Catania	Katane	729 a.C.	Greek Archaeological Park-Roman, Civic Museum, Roman aqueduct
Taormina	Tauromenion	753 a.C.	Greek-Roman Theater
Messina	Zancle	757 a.C.	Regional Museum
Scylla and Charybdis	Skylla e Charybdys		
Villa S.Giovanni	Cenidéo	-	Temple of Poseidon
Reggio Calabria	Rhegio	730 a.C.	Magna Grecia Museum, ParkArchaeological Promenade,Roman thermal baths
Casignana	-	I d.C.	Roman villa C.da Palazzo
Locri	Locri Epyzefiri	VII a.C.	Archaeological Park of Locri Epizefiri, National Museum
Monasterace M.	Kaulon	VII a.C.	Archaeological Park
Roccelletta	Scolacium	123a.C.	Archaeological Park
Crotone	Kroton	718 a.C.	Archaeological National Museum, Capo Colonna Archaeological area
Cirò Marina	Krimisa	VII a.C.	Punta Alice Archaeological Site
Sybaris	Sýbaris	VIII a.C.	Archaeological Park
Policoro	Heraclea	434 a.C.	Archaeological Park
Metaponto	Metaponton	VII a.C.	National Archaeological Museum, Archaeological Park, Tavole Palatine
Taranto	Taras	VIII a.C.	Spartan Museum, Bellacicco Hypogeum, Temple of Poseidon, Archaeological Museum

tab. 18. City of Ionian Magna Graecia

The national government has recently proposed a project for a “Ciclovia della Magna Grecia" which should run parallel to the railway and path along the whole Calabrian Ionian coast (fig.50), extending along the Sicilian Ionian coast up to the extreme southern edge (Pozzallo); probably it will develop along the coast, close to the beaches, with sections that could run partly on the current marine

routes of the coastal centers and others close to the railway line (fig.51).

In perspective, the Calabria Regional Transport Plan aims to strengthen the structure of tourist ports along the coast, with interesting planned investments (ports of Scilla, Roccella Ionica, Isola Capo Rizzuto, Cirò Marina) to integrate ports such as Reggio Calabria, Bova Marina, Crotone, Corigliano, Sibari lakes, so that a recreational maritime transport mode could be outlined, along the whole Ionian route, with landings not too far away (70-100 km).

fig. 50. Cycle path along the Magna Graecia coast (a) and Roccella Ionica Port (b)

Overall, excluding the road network, a corridor of parallel linear paths is configured, with four alternatives for gentle mobility (rail, path, cycle path, via del mare), all of merit and marked by eco-sustainability, capable of to interface at relevant sites such as port docks or railway stations.

Last but not least, the itinerary also appears accessible in relation to a multiplicity of airport nodes of great interest, such as the airports of Comiso, Catania, Reggio Calabria, Crotone, Grottaglie, Brindisi.

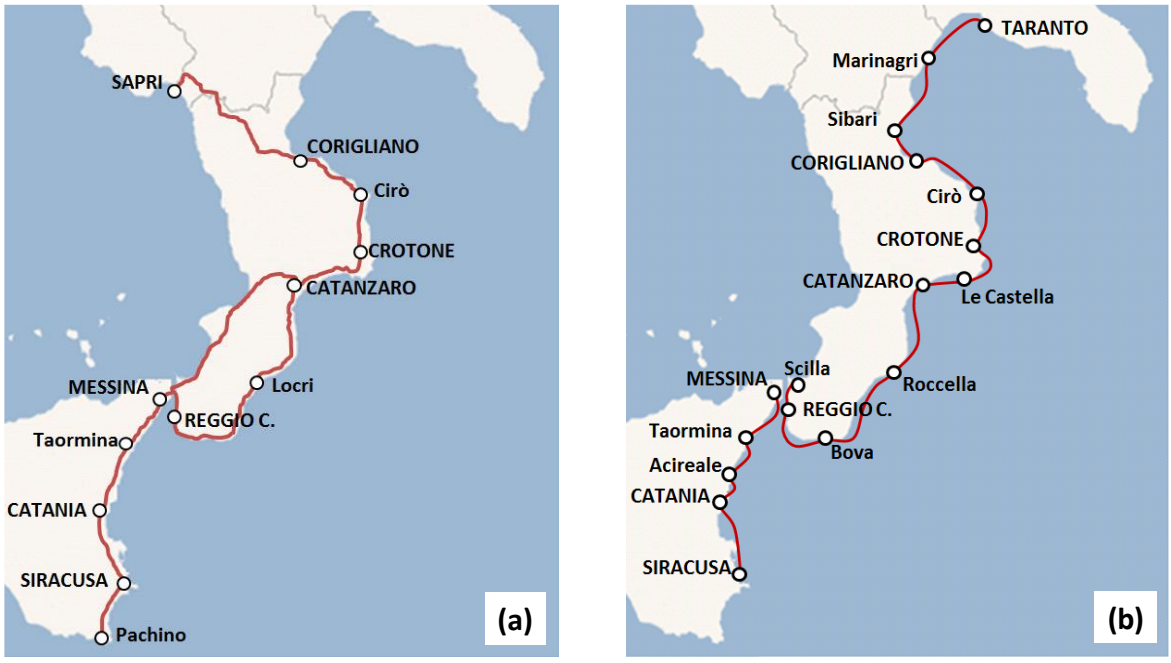


fig. 51. Magna Graecia cycle route (a) and Ionian cabotage sea route (b)

Along this corridor there are, in addition to the rich archaeological sites already mentioned, numerous naturalistic sites, "natural monuments", hill villages, extraordinary historical centers (for example Pentedattilo, Gerace, Stilo, Santa Severina, Corigliano), singular historical-architectural emergencies such as buildings from the Byzantine era, medieval palaces and castles, cathedrals and monasteries, prestigious architecture built between the sixteenth and nineteenth centuries, millstones, water mills, farms, pristine bathing areas, varied reception facilities.
The linear ionic, multimodal and integrated transport system, properly maintained and enhanced, could therefore constitute the backbone of a tourism development project for the entire underlying territorial belt. A Transport / Territory integration project capable of revitalizing the settlement system and the economy, attracting significant tourist flows, inducing innovative forms of growth also on the socio-economic system.

Luxury train "Magna Grecia Jonio Express"

An important component of the multimodal system configured along the Ionian coastal corridor is the railway one. The basic idea is to enhance the line through the activation of tourist services by train, also helping to safeguard a railway heritage that in recent years has risked being decommissioned. There are two types of services: thematic trains of historical-cultural value for short trips over limited distances, and luxury cruise trains, with greater entrepreneurial commitment.
In the first case, reference can be made to the consolidated experiences of thematic trains, or to structure a short-term travel offer (from a few hours to a weekend), at affordable rates, easier and more frequent to organize, with special attention particularly to families and study trips (excursions of tourist groups, educational trips, visits to archaeological sites, formative experiences in the community, participation in festive or religious events, etc.), to the slow enjoyment of the landscape crossed, or to promote the achievement of valuable environmental sites. The second type of service would be addressed to a niche clientele, demanding and with greater willingness to pay, but which could contribute to enhancing the image of the area crossed. In Italy, to date, there is no experience of cruise trains, even though the nation is very rich in tourist opportunities that can be reached with this means of transport.

Project hypothesis

The hypothesis of operating a first cruise train along the Ionian coast of Southern Italy is presented below, a train that could take the name of "Magna Grecia Ionian Express Train", offering a high quality tourist stay to users from other regions and nations, interested in discovering and experiencing the atmosphere of Magna Graecia up close.

The proposed train cruise follows a route of about 670 km from Syracuse to Taranto (and vice versa), through 4 Ionian regions: Sicily, Calabria, Basilicata and Puglia, and involves crossing the Strait of Messina. The line is largely single-track, ordinary gauge, absence of electrification; the transhipment from the Sicilian coast to the Calabrian coast takes place by ferry-boat. Following studies and surveys of specialized literature, a hypothesis has been put forward about the general characteristics that the Magna Grecia Ionio Express should possess in order to be competitive with other offers in Europe. The operation requires first of all the provision of convoys suitable for the purpose, even if other aspects should not be overlooked such as the revitalization and care of the numerous railway stations along the route in order to make them pleasant and welcoming and the organization of local tourist tours for every stage. The initiative could be activated by the State Railways, through its own institutional foundation which also manages the National Railway Museum of Pietrarsa (FS Foundation), or by private operators, on their own or with public support.

The typical train could consist of a locomotive and 14 carriages; in particular, 4 day carriages (two used as a restaurant and bar; one as a lounge and bar; one as a panoramic / relaxation area), 8 night carriages (4 each equipped with 4 standard compartments and the other 4 equipped with 3 luxury compartments each), 2 service carriages (one used as a kitchen and warehouse, the other to accommodate the service personnel). The train could accommodate 64 passengers, of which 24 in the luxury cabins and 40 in the standard cabins) over twenty employees. Some D445 type locomotives could be used as rolling stock, a pair of "Centoporte a salon" type 37.000 Series carriages (fig. 52), a series of WL ABm Series MU 1982 sleeping cars, suitably restored and renovated. The train would have a total length of approximately 342 meters, thus not exceeding the upper limit in the stations.

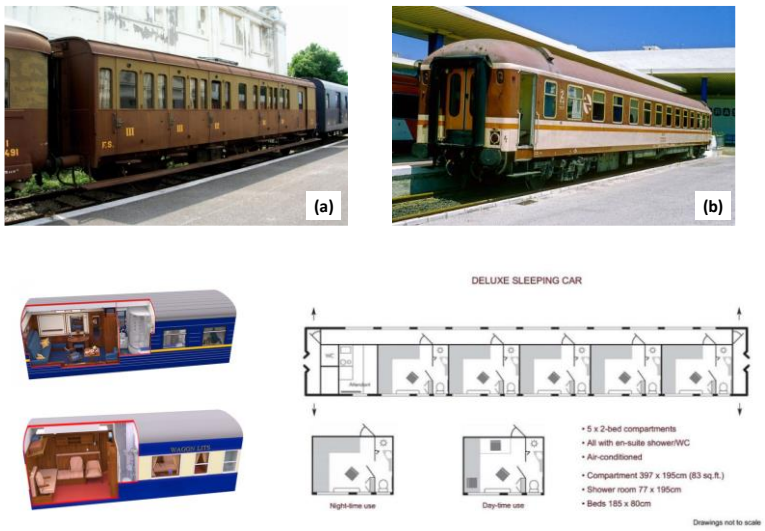


fig. 52. "Centoporte" type 37.000 series coach and WL ABm series MU type sleeping coach 1982. Layout examples for train-hotel rooms "(source: Danube Express)

Train's cruising speed is expected, on average, to be 30 km / h; certainly lower than that of a regional train running on the same Ionian line, since it will be possible to admire the scenic beauty of the landscapes crossed along the entire itinerary; moreover, it is foreseen that the hotel train always gives priority to other railway trains for the ordinary passenger and freight service. In relation to the territorial and line context, a cruise could have a duration equal to 12 days. An eight-month operation (March-October) is assumed with a couple of trips (round trip) per month, in analogy with the Spanish experiences being the Mediterranean climate; excluding the month of August, 16 cruises could be carried out a year, with a total accommodation capacity of 1024 tourists / year.

During the journeys between one stop and another, travellers will be free to use the services offered on board the luxury hotel train; at each local outboard visit they will be accompanied by a tour guide and a member of the crew responsible for safety and first aid. Movements in the local area must take place by bus equipped with all the comforts of the same degree expressed by the train. Travelers will be free to choose whether to follow the guided tour program, to independently visit the cities reached or to stay on board the hotel train while continuing to use the on-board services. The only restrictions to be respected are the departure times from the scheduled stations. The overnight stays of the train will take place exclusively in the station in order to facilitate the night's rest and relaxation for passengers; moreover, it offers the possibility for those who want to enjoy the nightlife of the places visited by providing an on-call service, not included in the ticket prices.

The construction of a train such as the one configured requires an evaluation of costs and revenues, for the purpose of economic and financial feasibility analysis. A summary analysis is proposed below, distinguishing the costs in the two macro-items investment and

operation. Furthermore, two types of body proposing the project are considered: a public body, such as Ferrovie dello Stato, and a private tourism entrepreneur.
The initial investment includes the costs of purchasing, modernizing, renovating and overhauling the cars making up the train and a locomotive. Tab.19 shows the estimated unit costs by vehicle component. A rough analysis led to estimate a capital cost of the order of € 20 million, including 3 reserve cars.

Vehicle components	Unit cost (€)
Locomotive D445	2.000.000
Car Series 37.000 tipo 1928R "Centoporte a salone"	1.000.000
Sleeping Car Series WL ABm tipo MU 1982	1.000.000

tab. 19. Magna Graecia Ionian Express. Unit costs of rolling stock

The costs thus defined would be relevant for a private entity, partial in the case of a public entity, such as *Ferrovie dello Stato* as the latter owns the means, but would have to take charge of their modernization and revamping.
Operating costs refer to the operating costs of the cruise (a trip between the two ion terminals) over a period of 13 days (12 nights); table 5 shows the items by type of expense (costs of on-board personnel, energy, food supplies, tolls on the railway line, ferry service, bus rental with driver for local tourist visits, a share for unforeseen events), from which a total amount of 60 thousand € is deducted (tab.20).

Type of expenditure	Cost (€)
Railway line toll	10.000
Ferry service on the Strait of Messina	1.000
67-seat bus rental with driver	5.000
Entrance ticket to museums / parks / archaeological sites	100
Stocks of food	15.000
Crew	28.000
Unexpected costs	900
Total	60.000

tab. 20. Magna Graecia Ionian Express. Operating costs related to a trip

The value of the basic ticket (tab.21) was determined in analogy with the Spanish experiences, with a slight increase due to some competitive improvements, the duration of the trip and the stops.

Type	Double	Single supplement	Triple supplement
Deluxe suite	3.800 €	2.000 €	2.000 €
Standard suite	3.000€	1.800 €	-

tab. 21 Magna Graecia Ionian Express. Individual travel rates

Some comparative economic evaluations were then carried out to verify the feasibility of the project. In particular, the following project hypotheses have been assumed:

- number of cruises per year equal to 16 (8 per director);
- distribution of users per train: 40 seats in standard compartment, 24 seats in luxury compartment;
- initiative from the perspective of a public body (economic approach) and a private body (business financial approach); in the first case with a discount rate (r) of 3%, in the second case of 10%;
- full investment cost in both cases (public and private initiative) or zero (for example if there is the availability of own means by a public body such as RFI, or by taking on a non-repayable public loan to support a business);
- as a precaution, an average degree of occupancy of 75% of the train (48 passengers compared to the capacity of 64 seats);
- an additional cost of overhauling the train after 10 and 20 years of operation, of the order of € 1 million;
- start-up of the project one year after the provision of the means and the standard concessions;
- useful life of the project equal to 30 years (N).

We then proceeded to evaluate the cash flows and calculate some classic indicators such as NPV (Net Present Value), SRI (Internal Rate of Return), AR (year of return on investment, or recovery of capital). Here we recall the definitions relating to the first two indicators:

$$VAN = -C_0 + \sum_{t=1}^{n} \frac{C_t}{(1+r)^t}$$

Where C_t represents the cash flows in overtime t,C_0 the value of the initial investment, n number of periods considered and r the discount rate.

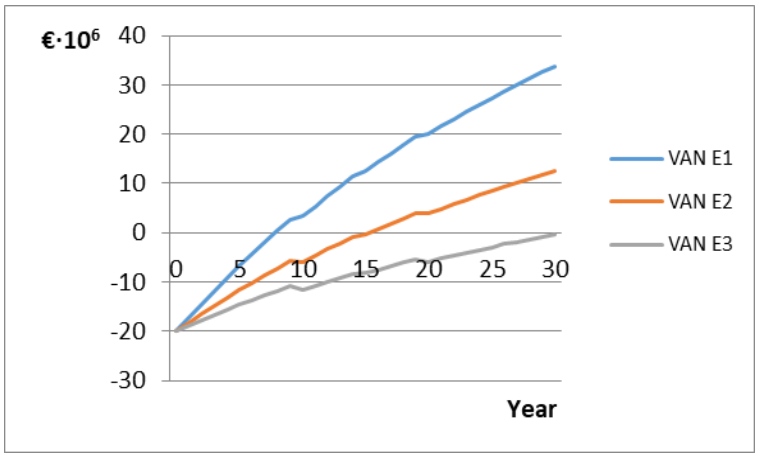
The Internal Rate of Return is the exponential law rate that makes a financial asset fair. Mathematically, the SRI is defined as the discount rate r which makes the net present value of a series of cash flows equal to zero, so it is calculated by solving the equation with r such that the value of the NPV is zero:

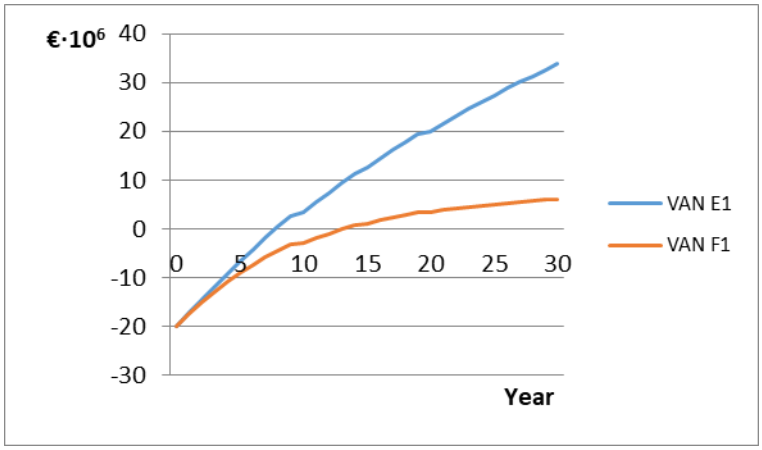
$$\sum_{t=0}^{t=n} \frac{C_t}{(1+r)^t} = 0$$

The results are summarized in some tables and some graphs. Table 7 refers to the scenario with an initial investment (year zero) of € 20 million, distinguishing the initiative in relation to a public body (economic analysis, marked with code E) and a private company (financial analysis, marked with code F). Three possible fare solutions have also been envisaged for tourists: full base rate, intermediate rate (equal to 75% of the first), reduced rate (equal to 60% of the first). The analysis shows a better result in the case of the public initiative than in the private case, with positive results in both cases assuming the basic tariff levels; by reducing the tariffs, or rather the revenues, the project remains attractive from a public perspective (positive NPV to almost zero) and SRI, not convenient for a private entrepreneur. If in the case of an economic initiative the coverage of the investment is always achieved (albeit at different times: 8, 16, 30 years), in the case of the private operator it is only possible in the first case and after 14 years of activity (tab.22, figg.53).

SCENARIO	PUBLIC INITIATIVE (E) Investment 20 M € (r = 3%)	PRIVATE INITIATIVE (F) Investment 20 M € (r = 10%)	SRI (%)
1-FULL RATE *Standard*: 3.000 € *Deluxe*: 3.800 €	VAN E_1= 33,8 M€ AR E_1= 8	VAN F_1= 6,1 M€ AR F_1= 14	15
2-INTERMEDIATE RATE *Standard*: 2.250 € *Deluxe*: 2.850 €	VAN E_2= 12,5 M€ AR E_2= 16	VAN F_2= -4,1 M€ AR F_2= NO	11
3-REDUCED RATE *Standard*: 1.800 € *Deluxe*: 2.280 €	VAN E_3= -0,3 M€ AR E_3= 30	VAN F_3= -10,3 M€ AR F_3= NO	9

tab. 22. Scenario analysis, economic and financial, with initial investment, as the cruise rates vary





figg. 53. Economic and financial NPV trend, with initial investment, in relation to the life of the project

The scenario assessments were repeated, from both an economic and financial point of view, net of the initial investment. The absence of capital cost was assumed as an opportunity to lower fares and therefore make the tourist cruise attractive for a wider audience. Five possible tariff solutions have been considered: full basic tariff, two intermediate tariffs (equal to 75% and 60% of the first), a reduced tariff (equal to 40% of the first), a minimum tariff (equal to 25% of the first). Tab.23 reports a summary of the results. The project is not convenient when the rates go down too much.

The best result is that of a public initiative compared to the private case, in the first 4 cases; fig.54 shows how the public project NPV is substantially significant and higher than the private project NPV, resulting in revenues always higher than the annual management costs, with the first four tariff schemes; with a reduced or minimum rate, the benefits are reduced and the NPV is at negative values. The figure expresses a sort of breakeven analysis useful for identifying the minimum admissible pricing threshold.

SCENARIO	PUBLIC INITIATIVE (E) (r = 3%)	PRIVATE INITIATIVE (F) (r = 10%)
1-FULL RATE *Standard*: 3.000 € *Deluxe*: 3.800 €	VAN E_1= 53,7 M€	VAN F_1= 26,1 M€
2-INTERMEDIATE RATE 1 *Standard*: 2.250 € *Deluxe*: 2.850 €	VAN E_2= 32,5 M€	VAN F_2= 15,9 M€
3-INTERMEDIATE RATE 2 *Standard*: 1.800€ *Deluxe*: 2.850 €	VAN E_2= 19,7 M€	VAN F_2= 9,7 M€
4-REDUCED RATE *Standard*: 1.200 € *Deluxe*: 1.520 €	VAN E_3=2,6 M€	VAN F_3= 1,5 M€
5- MINIMUM RATE *Standard*: 750 € *Deluxe*: 950 €	VAN E_3=-10,1 M€	VAN F_3= -4,6 M€

tab. 23. Scenario analysis, economic and financial, with initial investment, as the cruise rates vary

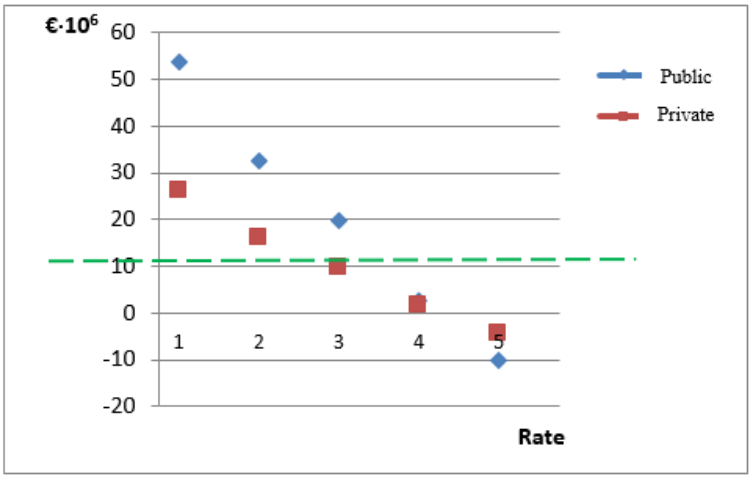


fig. 54. Economic and financial NPV trend, with initial investment, in relation to the life of the project

The economic assessments could be further investigated in the detailed project, considering other components at stake; for example, marketing costs for promoting the product around the world or higher costs for operating rolling stock could be included. The results are

however comforting also in relation to many other experiences of luxury cruise trains, managed by private operators or from a private perspective by public bodies, almost always profitable companies.

CONCLUSIONS

The complex issues concerning the quality citizens' life, especially in urban centers, imply shared strategies and an overall vision aimed at a far-sighted planning with attention to issues concerning land consumption, safety, mobility, sustainability, the protection of the environmental and cultural heritage. From this perspective, the policies of "urban regeneration" are grafted, including initiatives capable of having an impact not only in reference to the urban fabric, but also on the socio-environmental context of the territory concerned, thus not limiting themselves to a simple " requalification "(building), but activating a transformation process that overcomes pre-existing conditions of decay and allows the rediscovery of social values and quality of life in the city. In this sense, the participation of citizens through the use of new technologies becomes fundamental, with a view to forming a virtual network, so as to introduce forms of "planning and administrative action based on consent".

In this perspective, technologies for Smart Cities can be powerful agents of change. The transformation towards resilient and sustainable societies requires the redesign of cities and a radical change in our models of production, mobility, energy consumption. The transition to smart and sustainable cities requires collective intention and great collaboration between citizens, businesses and governments. Only by working together is it possible to design cities that are efficient, ecological and attentive to the person, which favor individual well-being and sustainable development.

Today, the infrastructural, human, environmental and social capital are silently linked together, mutually strengthening each other, with the aim of improving the daily life of each individual citizen. A path that in the near future translates into the design of cities capable of self-managing and adapting to different situations The winning key for the construction of Smart City is the adoption of sustainable practices from an economic, energy, environmental and social point of view; a participatory alliance that allows every citizen to experience

urban spaces firsthand by fully exploiting natural resources, digital tools and their intellectual abilities.
Mobility in any territorial context is linked to the morphological, socio-economic and cultural characteristics of the territorial context, which is why it is an integral part of the urban regeneration process of a territory. The plans, as well as the programs and policies that in some way affect the mobility system and land use, are means - as well as tools - that make it possible to achieve certain goals.
In the research work, an approach has been proposed that ensures effective integration between transport policies, urban policies and spatial planning both at the strategic and operational levels. There is no doubt that the future evolution of urban space cannot ignore the impulses that predominate in a society that boasts more and more digital intelligence. Smart City means implementing a series of design strategies to simplify and renovate physical infrastructures, paying particular attention to environmental sustainability.
Furthermore, it looks at the connection between the human, intellectual and social capital of those who live there and infrastructures, thanks to the introduction of new means of communication and digital technologies. The goal is to improve the quality of life in particularly urbanized contexts, thus satisfying the needs of citizens, businesses and institutions. Starting from these assumptions, the question arose of integrating spatial planning policies with those of transport planning to create a single vision of territorial governance strategies, drawing on numerous based on innovative design, programmatic and operational methods and approaches that guarantee a correct management of the problems and transformations of the territory.

The thesis focuses on the important problem of urban regeneration, bringing it into the integrated transport and territorial planning, as there isn’t still today an integration between the two disciplinary sectors.
The goals, aimed at defining an integrated approach between urban planning and transport planning, is defined within Chapter 1, after a brief introduction on the concept of urban regeneration and a brief mention of integrated planning.
In support of the set goal, Chapter 2 proposes a state of the art on the themes of urban regeneration, the Smart City and territorial accessibility.
The methodology adopted to achieve the goals is described in Chapter 3, starting with a review of the tools of urban planning and transport. Reflections are proposed on the current state of planning and existing critical issues, described in the dedicated section. Starting from these assumptions, a methodological proposal is drawn up for the integration between the urban planning and transport sectors.

Into Chapter 4, integrated planning case studies are reported, adopting quantitative tools of specific analysis, such as those for assessing accessibility in a context of tourism development policies of the territories. Another element of interest highlighted was that of the link and integration between mobility and land management, combining the concept of Smart City with that of Intelligent Transport Systems, through the enhancement of the role of ICT and ITS technologies.
The research made it possible to contribute to the development of new knowledge and innovative planning approaches aimed at:

- reformulating the theoretical framework of urban regeneration policies, linking transport planning and the concept of Smart City;
- highlighting a connection between the development (in particular tourism) of a territory and the actions aimed at improving its accessibility;
- suggesting an integrated methodological approach to transport-territory planning;
- exploring the impacts resulting from the proposed approach and tools, through different applications, and highlighting their potential transferability in the Italian context.

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