BUILDING SUSTAINABLE URBANMOBILITY FOR RESILIENT CITIES: INSIGHTS FROM ATHENS MUNICIPALITY

DOI: 10.26341/issn.2241-4002-2024-3a-2-T02051

Despina Dimelli
Associate Professor, School of Architecture, Technical University of Crete
ddimelli@tuc.gr

Abstract
The need to reduce dependence on the vehicle use and the promotion of alternative forms of mobility are key factors for the development of resilient cities. In this paper sustainable urban mobility is analyzed as a key parameter for the development of resilient cities, and the examined case study is the municipality of Athens.

The first section of this chapter develops the principles of sustainable urban mobility, the international policies that promote its development and the means that must be strengthened to achieve it. In the second section, a critical analysis of the development of sustainable urban mobility in the municipality of Athens is carried out and the policies that have been implemented to date to achieve it are analyzed. The paper analyzes the planning framework, and the implemented interventions are and the pathologies and difficulties to achieve the goals of sustainable mobility planning in the context of the development of Resilient Athens.

Keywords: *Sustainable Urban Mobility, Urban Resilience, Municipality of Athens*

Introduction

The aim of the paper is to connect sustainable urban mobility with urban resilience. These terms are widely used in modern cities strategies to define ways to plan the urban tissue that will be sustainable and able to adjust to changes. But how are they related? Is a city that has developed sustainable urban mobility a resilient city and vice versa? The case study of the current paper is the municipality of Athens an area that is developing for two centuries as the capital of Greece. It is the most populated municipality of the country and the area of experimentation in the field of urban mobility. The aim of the paper is to examine the plans that are proposed and investigate the recent sustainable urban mobility plans and their effectiveness in reducing the dependence from private vehicles. It also examines the strategies for urban resilience in the Municipality and relate their connection with sustainable urban mobility principles.

1. The concept of sustainable urban mobility

Urban mobility refers to the mobility of citizens in the urban space using the available network and means of transport. It is shaped by a series of parameters, related to the social, economic, and environmental city's function and changes based on the prevailing conditions of each era and each urban area.

In the recent decades the concept of sustainable development, that meets the needs of contemporary societies without jeopardizing the needs of future ones, which was first mentioned in 1987, has been incorporated into urban mobility in many ways (Hickman, et al., 2013) at local and regional level (Boussauw, et al., 2012).

Sustainable urban mobility is a complex phenomenon, and its main objective is to adapt

urban mobility to achieve environmental protection, social cohesion, and economic development. The need to develop sustainable mobility in Europe has been highlighted since 1990 when the Green Paper highlighted the importance of using public transport over the private vehicle in the member states of the European Union (European Commission, 1990). In the following years, the need to promote intermodal travel, the implementation of pricing policies to limit the use of private vehicles, and the promotion of pedestrian and cycling infrastructure became objectives to enhance sustainable urban mobility in European cities. In 2011, the "White Paper - Roadmap for a European transport area - For a competitive and energy-efficient transport system", pointed out the need to harmonize urban mobility plans with integrated urban development plans, the adoption of innovative applications to enhance smart mobility and the promotion of cooperation (European Commission, 2011). In 2018, the Report entitled "Towards Automated Mobility", states that automated mobility is expected to change the way of mobility in Europe's cities and supports strategies for new mobility services (European Commission, 2018).

According to Banister, sustainable urban mobility can be achieved based on four main axes: reducing travel needs, promoting intermodal travel, reducing travel distances through the development of compact cities, and promoting improved energy efficiency of the transportation system. (Banister, 2008) In terms of tools and strategies for the development of sustainable urban mobility, support for public and non-motorized transport, integrated land use and transport planning, technological innovations and citizen participation are identified as key parameters (Hickman, et al., 2013).

The World Bank's Sustainable Development Council in 2017 defined sustainable urban mobility as the mobility of people and goods in ways that meet the needs of citizens to move freely, communicate, trade, and develop relationships without sacrificing the values of the natural and man-made environment today and in the future (Global Mobility Report, 2017). Today, the economic conditions that prevail in the urban space, the development of new technologies, climate change, urbanization, social inequalities, and pandemics shape new mobility conditions that planning must include to shape an urban mobility framework that meets the needs of city dwellers.

2. Sustainable urban mobility and resilient cities.

The term urban resilience was used in 1990 to describe issues of social inequalities and environmental degradation (Mileti, 1999) and to identify the city's ability to adapt to change (Godschalk, 2003). In 2005 to study the response of cities to natural and man-made disasters, Campanella and Vale used the term urban resilience to define the ability of cities to return to an earlier state or enter a new one after a sudden or long-term change (Vale & Campanella, 2005).

In the following years, the definition of urban resilience was broadened to include all changes that take place in cities, which can be natural disasters, social inequalities, or economic crises, so the term urban resilience was used to include all dimensions of urban space, natural and anthropogenic (Jha, et al., 2013). The resilience of a city depends mostly on the geographical location and ecosystems of the urban space, infrastructure, civil communities, policy makers, and the possibilities of coordinating actions to achieve it (Collier, et al., 2013). Therefore, for cities to be resilient they should develop all these parameters in such a way as to ensure their adaptability to be able to balance existing and future threats (World Bank, 2012).

For a city to be resilient, its infrastructure and social structures should have the following characteristics (Simonsen, et al., 2014):

1. Flexibility.

2. The provision of excess capacity and backup networks.
3. Ingenuity.
4. Responding to changes
5. Robustness
6. Participation
7. Completion.

Promoting sustainable urban mobility is a key parameter for the development of resilient cities. After all, urban mobility includes a key functional dimension of the city, the mobility of people and goods, therefore ensuring their continuous and uninterrupted operation is a key component of urban resilience. Sustainable urban mobility, which contributes to environmental protection, energy saving, access to all, the possibility of economic transport is an important parameter for achieving resilient urban areas.

In 2013, the European Union directives for the preparation of Sustainable Urban Mobility Plans pointed out the role they can have in the reduction of the emission of vehicles pollutants, (Arsenio, et al., 2016). The European Green Deal aims to reduce mobility caused greenhouse gas emissions by 55% compared to 1990 levels, which are sources of energy consumption and air pollution. More specifically for transport, the goal is to achieve a 90% reduction in greenhouse gas emissions by 2050.

Additionally, the introduction of the principles of resilience in urban mobility that can ensure the continuity the urban space function under expected and sudden changes.

The development of sustainable urban mobility requires the development of infrastructures that (POLIS & Rupprecht Consult - Forschung & Beratun, 2021):

1. Are flexible, through the promotion of easy access and can be easily and quickly adapted to changes.
2. Will ensure the provision of excess capacity and backup networks, through the promotion of favorable mobility conditions for pedestrians and cyclists, and the reduction of the use of motor vehicles. A key condition for achieving this goal is the evaluation of existing networks and their redesign in a way that they can respond to unforeseen changes.
3. Will be inventive, through the development of alternative solutions through the development of synergies between different fields of action and involved communities and agencies.
4. Will respond to changes, through the development of mechanisms that can easily shape new conditions of urban mobility. To achieve this goal, it is necessary to develop mechanisms for monitoring and evaluating urban mobility needs and infrastructures.
5. Will be robust and able to be maintained or reverted quickly after changes.
6. Will be participatory and recognize and integrate the specificities of all groups of the population served. To achieve this goal, the participation of all citizens and organizations in decision-making processes related to sustainable urban mobility is crucial.
7. Will be comprehensive and include all types of mobility means.

3. Planning principles for sustainable urban mobility.

The development of cities based on sustainable urban mobility includes strategies and spatial forms that favor the development of pedestrian and cycling networks, promote the development of infrastructure for Mass Transportation and limit the use of the private vehicle (Fig.1).

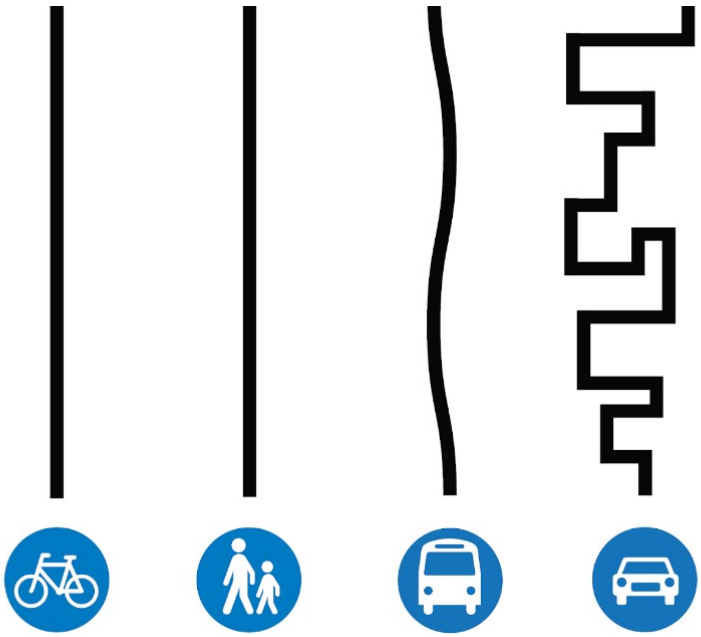

Fig.1 -The principles of sustainable urban mobility
Source: Copenhagenize Traffic Planning Guide, https://copenhagenize.eu/planning, πρόσβαση 10/05/20222

The development of bicycle use in cities contributes to the reduction of fuel consumption and pollutant emissions, offers benefits for physical, and mental health, and enables the commuter to interact with the social and urban environment, enhancing individual sociability and social cohesion (Gavanas, et al., 2015). Bicycle is a mean of transport that can be developed in cities in many ways. Its use and design are influenced by factors as geomorphology, urban density, climate, the distribution of urban functions, but also the mentality of the inhabitants. Cities like Amsterdam and Copenhagen have developed a cycling culture and infrastructure over decades and have gradually expanded their networks, with urban development plans for the coming decades proposing even more infrastructure to facilitate its use. through it.

To promote the use of the bicycle in cities, it is important to develop networks that will interconnect points of interest at short distances, providing comfort and safety to its users through routes with urban equipment that create attractive conditions for its use. A key parameter is the interconnection of the cycling network with other transportation networks, and in particular the network of means of mass transport. for its successful design (Deffner, et al., 2012) but also the development of compact urban areas so that in a short time and by traveling short distances the cyclist can ensure access to areas of employment, education, recreation, and residence.

For pedestrian planning, it is important to develop networks that create conditions of safety, continuity, and synergy with other traffic networks. Pedestrians' mobility must ensure easy, fast, and safe access by developing conditions that facilitate the user and protecting from climatic conditions as well as exposure to sound and air pollution (Gavanas, et al., 2015). The goal of shaping the pedestrians' networks is to connect residential areas with other urban functions of the city with the shortest possible distances. An important parameter for the successful design of the pedestrian network is its interconnection with the other transportation networks and with the networks of Means of Mass of Transportation, cyclists, and the organized parking areas.

A basic condition for the development of sustainable urban mobility is the formation of

Mass Transport networks that provide more economical, compared to the private vehicle, short-duration travel, carried out under conditions of comfort and safety, that connect the central areas of the cities with the rest, and that connect with the rest of the alternative means of transportation.

Finally, the development of organized parking spaces for private vehicles at important points-nodes of the pedestrian, cyclists and mass transport networks is important, to strengthen modal split and to further promote the use of sustainable mobility means.

4. Sustainable urban mobility in the Municipality of Athens

Athens has been the capital of Greece since 1834, which, based on the data of the 2021 census, gathers 637,798 inhabitants, making it the most populated Municipality of the country (Hellenic Statistics Authority, 2021). The political, social, and economic changes that have taken place in Greece have been reflected in the urban space of Athens in a different way by era and by region. In recent years, the changes in the social and productive base of the country, the economic crisis and fiscal policy measures, the relocation of permanent residents and the degradation of the city center, climatic crisis, energy poverty, environmental degradation are important issues that necessitate the development of strategies that will make the city resistant to modern challenges.

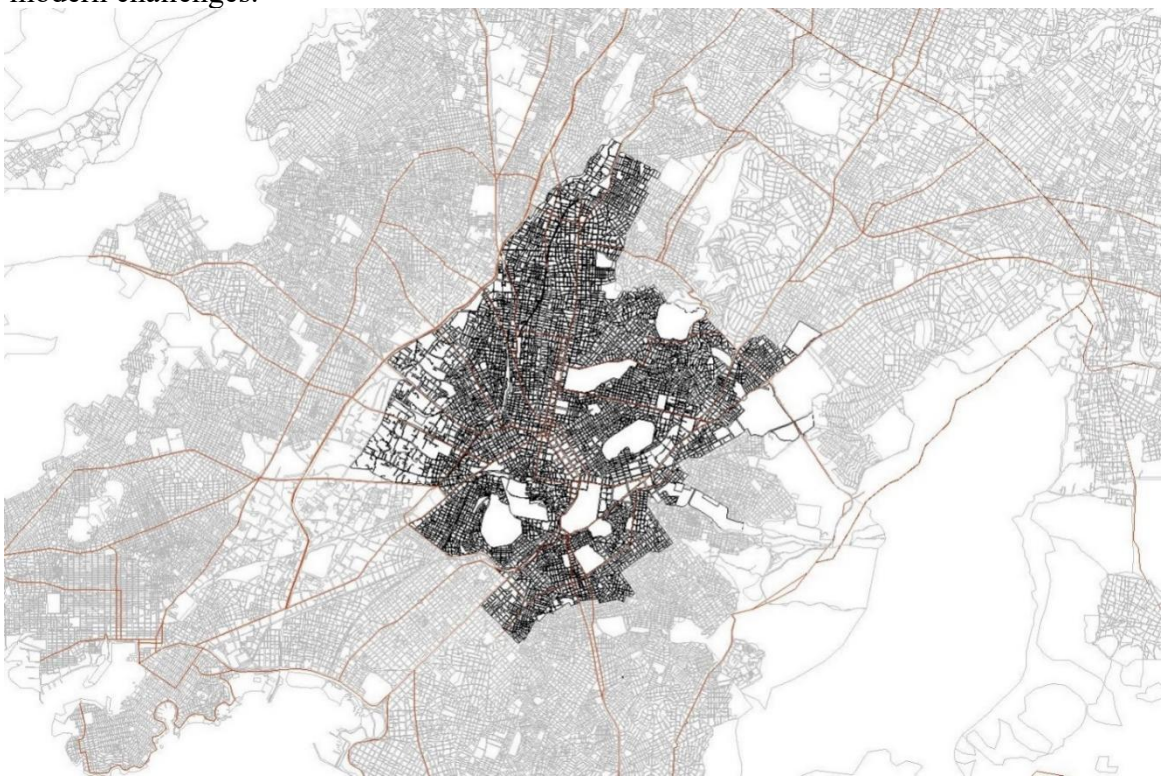

Fig. 2. The municipality of Athens and its wider area

In 2014, the municipality of Athens (Fig. 2) joined the network of 100 Resilient Cities of the Rockefeller Foundation which, in 2013, proceeded in the development of a network of cities responsible for the development of urban resilience strategies (Resilient Cities Network, 2021). Based on this integration, the municipality proceeded to the creation of an Urban Resilience Office, which aimed to promote and develop urban resilience strategies.

In this context three years later, in 2017, the report "Redefining the City - Resilience Strategy of Athens for 2030" proceeded through participatory processes that included workshops and interviews with community representatives and residents in the analysis and

evaluation of the environment of the Municipality and formulated basic strategies for the development its resilience (Municipality of Athens, 2017).

The main sectors-axes proposed for the development of the city's resilience until 2030, were:

1. Maximizing the dynamics of the Athenian Neighborhood.
2. Response of the city in areas of governance, management, and communication.
3. Development of environmental policy.
4. Dealing with crises.
5. Strengthening social cohesion (Municipality of Athens, 2017).

Since its declaration as the capital of Greece, the Municipality of Athens has been formed through successive plans which attempted to adapt the form of the city to the needs of each era. The plan by Stamatis Kleanthis and Edward Schaubert in 1834 envisaged the development of the city based on radial lines in the form of an isosceles triangle. This Plan was not implemented, but it was indicative of the trend of the time, as it symbolized the new role of the capital. In the following years, other plans attempted to settle the city of Athens through successive extensions and demolitions. The Asia Minor Catastrophe and the subsequent population growth brought the issue of refugee housing to the forefront of planning, with the development of new roads being the main planning tool for connecting with the new areas of organized and arbitrary new settlements.

In the following decades, the gradual increase in the use of the vehicle made the development of road networks a basic condition for spatial planning. Characteristic of this tendency was the plan of the Wilbur Smith and Associates office in 1963 which proposed major vehicles networks (Fig. 3).

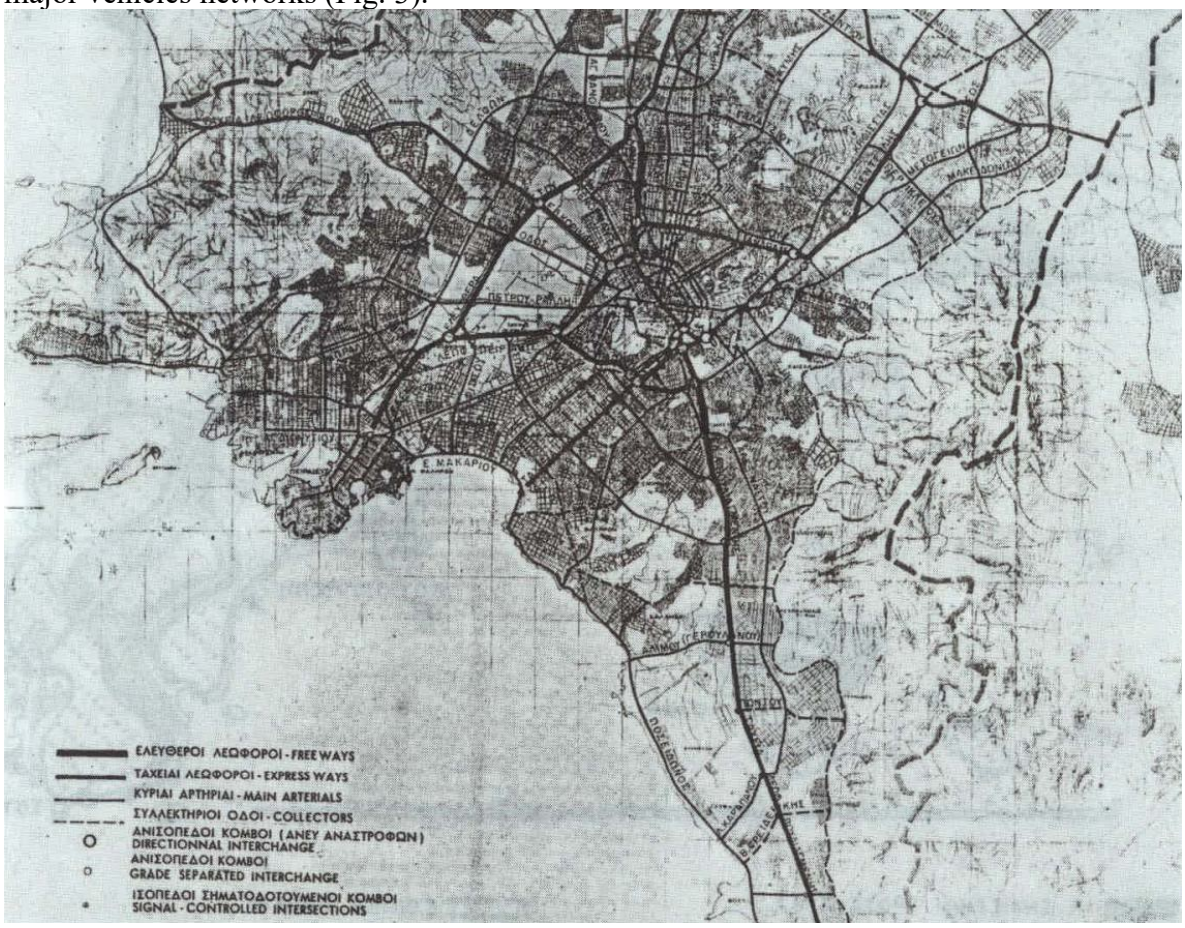

Fig.3. Wilbur Smith and associates plan for Athens
Source: Sarigiannis G., Athens 1830-2000: Evolution -Urban Planning -Transport.

In the late 1970s, to upgrade the historic center, the first pedestrian route was developed while a year later the Decision "Implementation of the traffic research of the commercial center and Plaka Athens" (Government Gazette 467/D/1979) placed restrictions on vehicles use and parking in this historic area of Athens. More particularly, it proposed the creation of an extensive pedestrian network in the area and the establishment of a special entrance card to the area for residents parking in designated areas, to solve intense traffic congestion.

The Regulatory Plan of Athens in 1985, (Law 1515-18/A/1985) promoted sustainable mobility, through the proposal of a public transport system and a multi-centric structure to improve mobility conditions as the center was already facing intense problems of air pollution, due to the vehicles intense traffic. For pedestrians' mobility, primary and secondary networks were proposed in the center of Athens, aiming to connect the important archaeological sites and the green spaces (Fig.4).

In the following years, the interventions to improve urban mobility were limited to pedestrians' streets while ten years later the study carried out by the Athens Urban Transport Organization in collaboration with the Athens Regulatory Plan Organization pointed out the need to upgrade Mass Transport Means, focusing on the role of the urban buses fleet (Ministry of Environment, Regional Planning and Public Works and Organization of the Regulatory Plan of Athens, 1995).

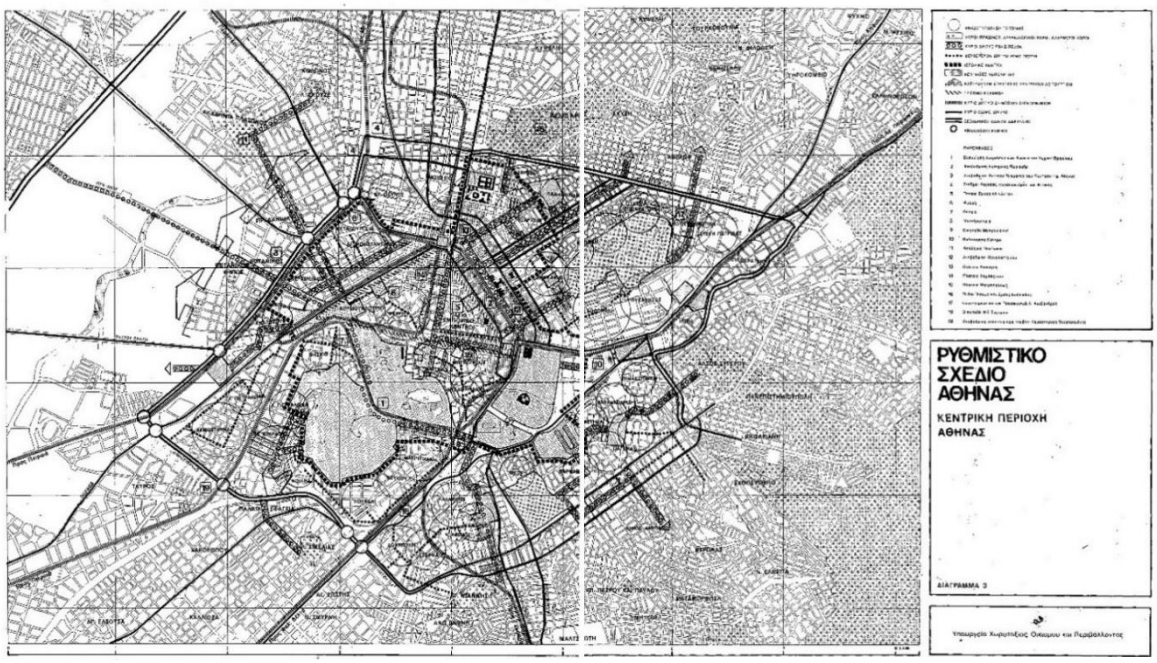

Fig. 4. Part of the 1985 Regulatory Plan of Athens in, (Law 1515-18/A/1985)
Source: Law 1515-18/A/1985

The study proposed interventions in the Athens center based on the development of extensive pedestrian networks, the restriction of private vehicle traffic, the renovation of public spaces and the implementation of parking rules to serve the residents of the city center (YPECHODE & ORSA, 1995). The limited interventions that were finally implemented in relation to those proposed, led to an increase in traffic loads, worsening traffic congestion in the city (Vlastos, et al., 1998).

During the following years, in the context of the Unification of Archaeological Sites and the regeneration of historical districts, the restriction of the private vehicle use, and the promotion of walking were permanent interventions to upgrade the image of the city.

The development of Means of Mass Transportation was further promoted with the operation of the metro in 2000 which connected the center of Athens with a large part of the wider basin. In the same context, four years later, in view of the 2004 Olympic Games, the operation of the tram also began.

Several years later, and when the economic crisis had hit the capital, the discussion began about a symbolic project that would give the city center a new identity, the pedestrianization of Panepistimiou Street, a central road that could symbolize the renaissance of Athens. Although the same project had been discussed in 1985, it came back to the fore in 2012. The main objective of the intervention was to extend the tram line, and to provide more space for pedestrians and cyclists. This proposal was never implemented as it was not foreseen by the overlying plan. The new Regulatory Plan of Athens in 2014, (Law 4277, Official Gazette 156/A/2014) foresees the expansion of the network of pedestrian and cycle paths to connect the monuments of the city and further strengthen the means of public transport.

5. Sustainable urban mobility in the Municipality of Athens resilience program.

Mobility in Athens is characterized by a high degree of private vehicle use, limited cycling, and fragmented walking infrastructure. In the context of Resilient Athens development, in 2017 the report entitled "Redefining the city. Athens Resilience Strategy for 2030" based the development of resilience on 4 main themes:

1. Affordable city. The aim is to promote transparency and accountability.
2. Green city. This theme will be promoted by strengthening environmental infrastructure, sustainable mobility and co-creating public spaces.
3. Proactive city. A key parameter is the development of local communities and the support of agencies for planning the city against possible crises.
4. Living city. Finally, the city's identity is strengthened, and employment is supported.

To achieve the objectives of urban resilience, actions aimed at developing transparency, strengthening communities, protecting the natural environment, and strengthening the city's identity by promoting participatory processes and strengthening governance.

To promote sustainable urban mobility, it proposed the extension of the existing cycling network within the municipality, with particular emphasis on the historic center of the city. Additionally, new bicycle parking spaces are promoted, and communication campaigns are organized for young people and children about the benefits of its use. To strengthen this action, a decisive factor was crowdfunding, which aimed to cooperate with the cycling communities, that can provide data to the agencies for the optimal design of cycling networks.

For pedestrian movement, additional controlled parking areas are planned to be developed to better organize pedestrian space. Taking actions to facilitate the movement of people with special needs is also an important parameter. For Means of Mass Transportation, it promotes the development of new electric bus fleet that will connect the most important cultural and historical landmarks of the city center and residential areas that are currently under-served. Finally, a strategic Sustainable Urban Mobility Plan (SUMP) had to be developed which will define in detail the spatial actions and strategies for the development of sustainable urban mobility in the Municipality.

6. The Sustainable Urban Mobility Plan of the Municipality of Athens

Sustainable Urban Mobility Plans are Strategic Plans that organize the mobility of citizens and the transport of goods in urban areas. They focus on the prioritization of pedestrians, cycling and means of mass transport mobility.

In Greece, according to Law 4784/2021, the Sustainable Urban Mobility Plan (S.U.M.P.) is defined as the strategic mobility plan related to transport planning. (Government Gazette 40/ A/16-3-2021, 2021):
It aims in
a) Strengthening public transport.
b) Promoting walking, cycling and electric vehicles.
c) Ensuring accessibility, safety, and protection in the transport network for disabled people.
d) Promoting road safety.
e) Reducing the use of private vehicles.
f) Promoting electrification and alternative fuels in the transport sector.
g) Organizing parking.
i) The use of new technologies to improve the use of the road network, support modal split and promote the use if means of mass transport.

The S.U.M.P of the Municipality of Athens, recognizes the main problems of the area and through consultation phases determines the strategies to solve them. A key characteristic of mobility in the Municipality is the excessive use of private motor vehicles in the city center, which leads to a significant burden on the atmosphere due to the pollutants emitted especially by vehicles using diesel fuel. An additional problem is the extensive parking of two-wheelers in areas for pedestrians, occupying the already limited pedestrians' space.

The important mobility problems identified in the Municipality of Athens are listed in detail in Table 1.

Mobility sector	**Mobility Problems based on consultation with agencies and residents**
Vehicles management	Traffic Congestion due to intense use of private vehicles. Frequent traffic interruptions in the city center. Crossing of vehicles and machines from pedestrian streets and sidewalks.
Parking management	Lack of parking spaces for vehicles and two-wheelers. Illegal stop / parking of vehicles and two-wheelers Lack of special parking spaces for the disabled. Lack of parking spaces for tourist buses in major tourist attractions. Insufficient utilization of existing parking spaces.
Means of mass transport	Limited bus routes and bus stops High costs. Lack of security at bus stops. Delays and sparse routes. Lack of infrastructure for the disabled. Entry of private vehicles into bus lanes resulting in delays to bus routes Inadequate fleet maintenance.
Pedestrians/ Public spaces	Limited width of sidewalks and presence of obstacles. Lack of free public spaces and green spaces. Lack of infrastructure for the disabled and vulnerable groups of commuters.

	Poor infrastructure of sidewalks. Occupation of pedestrian infrastructure by commercial and other activities. Lack of lighting in the public area.
Cyclists	Insufficient cycling network. Absence of an integrated network connecting the Municipality of Athens with the rest of the Municipalities
Energy/environment	Atmosphere and noise pollution. Large number of conventional fuel vehicles. Environmental pollution due to increased tourism. Lack of information and awareness

Table 1 Mobility issues according to agencies and citizens
Source: SUMP of Athens Municipality 2020

Then, in the next phase of the plan's procedures, two scenarios were published for consultation to improve urban mobility conditions in the municipality the mild scenario and the scenario of radical changes.

In both scenarios the objectives are common: reduction of vehicle traffic, expansion of controlled parking areas, promotion of Public Transport, and the development of 30 km/h zones (Fig.5). Additionally, the creation of Superblocks in areas with a lot of pedestrian traffic, the promotion of carsharing, the expansion of the bicycle path network and the creation of cultural routes in combination with regeneration of public squares are promoted.

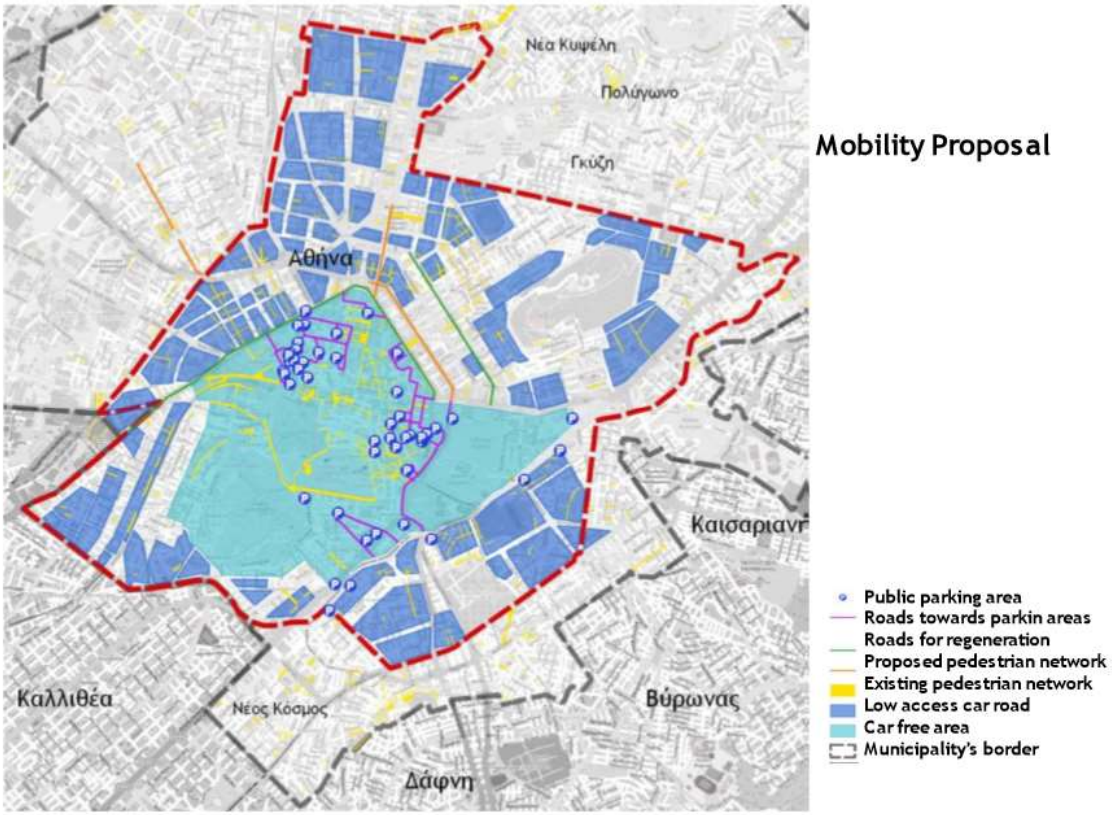

Fig. 5. The proposed interventions according to the mild scenario
Source: SUMP of Athens 2020, https://svakathina.wordpress.com/, accessed 10/06/2020

The proposed measures include:

- Ensuring walkability and accessibility for the disabled in public spaces of the city.
- Development of information and awareness activities for residents and visitors through the development of a sign system
- Incentives for the use of modal. split
- Placing electronic kiosks to disseminate information on the mobility options around the city,
- Strengthening collective ways of commuting to work (carpooling)
- Renovations of public spaces.
- Tackling illegal parking and expanding the controlled parking system.
- Traffic of vehicles on the local road network at a low-speed limit.
- Creating safe cycling routes.
- Proclamation of the Historic Center in a Restricted Access Area
- Consolidation of building blocks in the local road network to protect neighborhoods
- Renewal of the Mass Transport fleet
- Installation of electric vehicle charging points in municipal, private and public spaces.

Before the completion of the Sustainable Urban Mobility Plan of the Municipality and in accordance with the current Regulatory Plan of Athens, an intervention was carried out during the restrictive measures of the pandemic, in the center of the city which, through the development of a network for pedestrians and cyclists, attempted to strengthen the cultural identity of the city center the "Great Walk". The Project upon completion would provide 50,000m2 of free, public space along a 6.8-kilometer-long route (Municipality of Athens, 2021). The operations that were carried out were subject of intense criticism for their cost and aesthetics, but also for the lack of consultation. The end of the restrictive measures of COVID19 and the operation of operations in normal conditions led to the review of this intervention.

A new proposal implemented in 2021 for improving urban mobility was creating more spaces for pedestrians again in Panepistimiou Avenue. It envisaged that the avenue would have wider sidewalks with benches under natural shade, fountains, all with natural materials. Still this proposal is not implemented.

So over time several proposals and interventions are made to improve the conditions of urban mobility in the Municipality of Athens. The question that arises is whether these interventions have contributed to the increase in the mobility of residents and visitors with sustainable means of transportation and whether they have led to the reduction of the dependence on the use of private vehicles.

7. The resilience of urban mobility in the Municipality of Athens.

The development of sustainable urban mobility is a prerequisite for the development of resilient cities as it ensures a better quality of life for city dwellers. But it should be developed under conditions that maximize its benefits and complement the other parameters of urban resilience. Under this condition, it is important to examine sustainable mobility as well as polycentric development, social cohesion, and economic development of the city.

In the context of the development of resilient cities, the development of polycentric zones in urban space is important for many reasons. According to the 100 Resilient Cities Report, to achieve urban resilience, the allocation of land uses is a critical parameter as the activities in the city can, combined with the proper urban forms, contribute to the management of natural phenomena (100 Resilient Cities, 2015). After all, land uses and urban mobility have a high degree of dependence.

In the Municipality of Athens, the functional and spatial division of the city developed as early as 1833, as the then center of the capital concentrated the administrative functions, while the northwestern part was the one in which the industrial uses had developed. In 1985, the Regulatory Plan of Athens attempted the decentralization of activities and the promotion of polycentric structures, a trend which was reinforced by Law 2052/1992 which proposed four additional supra-local spatial planning centers, in peripheral areas of the Municipality of Athens.

The basic tool for shaping the functional structure of the city was the General Urban Planning Plan of the Municipality of Athens which in 1988 defined the uses for the municipality of Athens (Dimelli, 2006). The aim of the Plan was to delineate the hyperlocal city center and define new district and neighborhood level centers in the model of polycentric development.

In the following years, specialized regulations were instituted for specific areas of the municipality which, combined with the regeneration projects that took place, attracted entertainment and leisure activities (Triantis, 2017), resulting in the relocation of their residents. At the same time, areas of the city were abandoned and degraded after the contraction of economic activities due to the economic crisis (Triantafyllopoulos, 2018). Despite the new conditions that have been created, the General Urban Plan of the Municipality has not been updated, so the area is shaped with a framework that does not meet the modern needs of the city.

Regarding the social composition of the city, the plan for Resilient Athens proposes the inclusion of vulnerable groups in employment, the provision of business licenses to refugees and immigrants, the support through employment of unemployed women and the expansion of the resettlement program for vulnerable groups of the population, while in terms of spatial planning it proposes regenerations in degraded areas (Municipality of Athens, 2017). In this context, the sustainable urban mobility also promotes pedestrianization and regeneration, but does not consider the social dimension of the city, setting certain measures or giving priority to degraded areas of the city for their revitalization. As it is a common phenomenon that the redevelopment interventions of the area are accompanied by an increase in land values and the subsequent relocation of low-income residents, it is important that these interventions are also supplemented with measures and restrictions to maintain the social composition of the area. These measures and restrictions are imperative as the urban tourism and the rapid increase of short-term rentals are an additional phenomenon that has largely changed the urban landscape in the central areas of Athens, leading to the relocation of its permanent residents.

It is therefore important that the Sustainable Urban Mobility Plan is complemented by a series of plans and regulations related to the social, environmental, and economic dimensions of the city, which will be monitored by a system of indicators. This way urban mobility planning will be integrated and flexible to lead to resilient cities.

8. Conclusions

The historic center of Athens is an area of cultural value, with significant prospects as it is the center of the capital but also with problems of an environmental, social, and economic nature. Over time, it has been a field of experimentation of many different policies, aimed at improving the quality of life of its residents and visitors. The application of the principles of resilience has been a key issue for the region in recent years as climate change, the mitigation of social inequalities, environmental and economic pressures are constantly increasing. Simultaneously the application of the principles of sustainable mobility, has been attempted in

many different ways for several decades. But has the historical center of Athens managed to become more resilient through the promotion of sustainable urban mobility?

The interventions to improve urban mobility that have been made to date, except for the Master Plan of Athens of 1985, which attempted the comprehensive planning of the city center, are evaluated as fragmental. The lack of coordination of urban and traffic planning and the lack of meaningful consultation, led to interventions that failed to contribute substantially to the improvement of mobility conditions.

In this context, it is important to develop integrated planning, which will include sustainable urban mobility as a key parameter of urban resilience. Through long-term, medium-term and short-term mobility planning, which will take into account the functional development of the city, the social profile and the needs of its inhabitants, the conditions for strengthening and protecting the environment and will result from participatory processes, it is important to resilient mobility systems that will ensure the continuity of the functioning of the urban space under expected and unforeseen changes.

References

100 Resilient Cities, 2015. *Resilience point of view,* s.l.: Transport series.

Arsenio, E., Karel, M. & Floridea, C., 2016. *Sustainable urban mobility plans: Bridging climate change and equity targets?.* Research in Transportation Economics. 55., pp. 30-39.

Banister, D., 2008. *The sustainable mobility paradigm.* Transport Policy, p. 73–80.

Boussauw, K., Neutens, T. & Witlox, F., 2012. *Relationship between spatial proximity and travel-to-work distance: The effect of the compact city.* Regional Studies, pp. 687-706.

Collier, M. et.al., 2013. *Transitioning to resilience and sustainability in urban communities.* Cities, pp. S21-S28.

Deffner, J., Hefter, T., Rudolph, C. & Ziel, T., 2012. *Handbook on cycling inclusive planning and promotion*, Frankfurt/Hamburg: Capacity development material for the multiplier training within the mobile2020 project.

Dimelli D., 2006. *The qualitative evolution of functional Urban* Structure (in Greek), PhD Thesis, Athens: National Technical University of Athens.

European Commission, 1990. *Green Book for the Urban Environment*, Luxembourg: European Community Official Publications Service

European Commission, 2011. *White Paper - Roadmap for a European transport area - For a competitive and energy-efficient transport system,*Brussels, European Commission.

European Commission 2018. *Towards Automated mobility. A strategy for the mobility of the future, (in Greek),*Brussels, European Commission.

Gavanas N., Papaioannou P., Pistiava- Latinopoulou M. and Politis J., 2015. *Urban mobility networks and Mobility management.(in Greek),* KALLIPOS Open Academic Editions.Available at: https://repository.kallipos.gr/handle/11419/2081.

Global Mobility Report, 2017. *Sustainable Mobility for All*, Washington, DC: s.n.

Godschalk, D., 2003. *Urban hazards mitigation: Creating resilient cities*. Natural Hazards Review, pp. 136-143.

Hellenic Statistics Authority, 2021. Population census 2021. Available at: www.statistics.gr

Hickman, R., Hall, P. & Banister, D., 2013. *Planning more for sustainable mobility.* Journal of Transport Geography, pp. 210-219.

Jha, A., Miner, T. & Stanton-Geddes, Z., 2013. Washington, D.C.: The World Bank.

Mileti, D., 1999. *Disasters by design*. Washington, DC: Joseph Henry Press.

Ministry of Environment, Regional Planning and Public Works and Organization of the Regulatory Plan of Athens, 1995. *The commercial triangle of Athens* (in Greek), Athens Ministry of Environment, Regional Planning and Public Works

Municipality of Athens, 2017. *Redefining the City - Resilience Strategy of Athens for 2030* (in Greek), Athens, Municipality of Athens

Municipality of Athens, 2021. *The Great Walk- Municipality of Athens* (in Greek) Available at: http://megalosperipatos.cityofathens.gr

POLIS & Rupprecht Consult - Forschung & Beratun, 2021. 2021. *Topic Guide: Planning for more resilient and robust urban mobility*, s.l.: European Commission.

Resilient Cities Network, 2021. Resilient Cities Network. Available at: https://resilientcitiesnetwork.org/

Sarigiannis G., *Athens 1830-2000: Evolution -Urban Planning -Transport*. (in Greek). Αθήνα Athens: Symmetria Publications.

Simonsen, S. et al., 2014. *Applying resilience thinking Seven principles for building resilience in social-ecological systems*, Stockholm: Stockholm Resilience Centre.

SUMP of Athens Municipality, 2020.Available at: https://svakathina.wordpress.com/σημερινήκατάσταση

The World Bank Annual Report 2012: *Volume 1. Main Report*, Washington, DC.: World Bank.

Triantafyllopoulos N., 2018. *The problem of the empty and abandoned buildings in the center of Athens (in Greek)*, Available at: https://www.dianeosis.org/2018/02/abandoned-buildings-athens/

Triantis L., 2017. *The legislative framework of spatial planning in the Center of Athens (in Greek)* Available at: https://www.athenssocialatlas.gr/χωρικόςσχεδιασμός

Vale, L. & Campanella, J., 2005. *Conclusion: Axioms of Resilience*. in: The Resilient City: How Modern Cities Recover from Disaster 1st Edition. 2005: Oxford University Press, pp. 335-356. World Bank, 2012.

Vlastos Ath, et. al, 1998. *The pedestrianization of Ermou street (in Greek),* Athens, National Technical University of Athens.