

ATHENS IN CRISIS, SUSTAINABLE MOBILITY AND CLIMATE CHANGE

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Abstract

Athens, a metropolis characterized by agglutination and compactness, though with numerous urban and transport issues saw its population swell during the 20th century which led to extensive urbanization phenomena. This continued urbanization increases profoundly all urban activities with transportation being the key driver in energy consumption. According to the UN-HABITAT (2009) 'Emissions in the transport sector and virtually all the expected growth in emissions come from private cars, light duty vehicles and trucks', meaning that cities define the ecological phenomenon of climate change in the 21st century. Athens' compactness though according to Grammenos (2011), in terms of mixed uses combined to the low urban sprawl attributes, appears to have had no stabilizing effect on the increase in car ownership. Instead, between 1990-1999, the number of private cars was increased by 75%. Athens' motorized transport (cars and powered two wheeler) modal split stands at 53%, public transport at 37%, and quite paradoxically little walking (8%) and no cycling (~2%) are demonstrated at the EPOMM Modal Split Tool©. Theories for sustainable cities prerequisite the integration of a number of acts in order to reduce energy consumption, with mobility being the first to consider among others.

The aim of this paper is to critically explore implemented policies and plans as well as forthcoming strategic plans in terms of sustainable mobility as imposed in large scale regeneration plans in contemporary Athens. Research focuses on strategic interventions since the 80's, such as the Athenian Daktylios (ring road for circulation management) and its later adjustments, the upcoming pedestrianization and unification of the commercial triangle and its subsequent tram line extension as well as the notable implementation of the metropolitan cycling network. Moreover, the discussion takes into consideration the implications of the Greek economic crisis in mobility choices, as aimless travels have been reduced to a minimum, several cars have been abandoned and cyclists seem to tentatively claim some space in the urban environment. What will likely be the next day in the Athenian historic centre? Considering the transformations that are expected in the immediate

future, this research paper explores their potential to enhance urban environment, reduce climate change impacts and amplify resilience.

Keywords

urbanization, sustainable mobility, Athens, urban resilience

1. Introduction

Most of the world population lives in cities, which are immensely affected by climate change. It is well-known that urban activities cause the vast majority of impacts in the environment, while also they tend to be one of the main receivers of these numerous impacts. Floods, sea level rising, urban heat island effect, extreme weather conditions, air and noise pollution among others (World Bank, 2010) are encountered daily in urban settlements worldwide. Proposed solutions vary...but, before we start using CDR (carbon dioxide removal) technologies, trying to capture and store CO₂ underground or even simultaneously, we should consider thoroughly the impact of mobility choices in GHG (greenhouse gas) emissions.

The Greek national climate change agenda, in respect to sustainable mobility, is particularly inadequate. Greece is the penultimate of the EU countries in the assessment of policies dealing with climate change, according to the Climate Change Performance Index 2014 (Burck et al, 2014). National policies do not 'convince' citizens to alter their daily habits and yet the shortage of provision in infrastructures and action plans is high. Apparently, the economic recession of the last 5 years (2009-2013) has affected all factors of the daily life and transportation could not remain intact. Though, the results of the above have not yet been researched in depth. Athens, concentrating 40%-50% of the Greek population, is essentially disrupted in all forms of social and economic life however it still attracts funds for some urban regeneration schemes. Data shows that the crisis has drifted transportation factors in a considerable level. Speeds have been reduced in all means to save money and daily trips with public transport have been limited to the necessary.

2. Aims and Objectives

The paper interrogates the relationship between urban planning policies and mitigation of climate change impacts in urban space. The analysis focus on the Athenian conurbation and examines sustainable urban mobility strategies and their implementation during the last decade. A number of past and future regeneration schemes are reported and assessed under the scope of actual contribution on the sustainability of the city. From the implementation of the first ring road for circulation management in 1982 and its evolution till the future plans for partial pedestrianization of Panepistimiou Street and the coming *rebuilt* of traffic and urban characteristics of the city centre.

Moreover, this report is a first approach to the impacts of the Greek economic recession in mobility choices. Authors collected and compiled numerical data and conclusions from completed surveys and

researches, concerning the period between 2009 and 2013, regarding modifications in mobility habits and the factors that have caused these changes. Particularly, the last section reports alterations in car ownership, bus trips and passenger behavior, the boost of walking and cycling. Results extracted from this first approach are temporary and not yet completed, though they show tendencies and immediate impacts from financial cuts in the transport sector of Athens.

3. Athens in the path of sustainable urban mobility?

Athens metropolitan area consists of almost 30 municipalities and is inhabited by almost 4 million people, with the Municipality of Athens being the most dense and compact. Athens is a highly car-dependent city (53% of car share, according to the TEMS Modal Split Tool, 2006) and car is used even for 5-15 minutes of walking distances, especially in less dense areas. During the last 15 years there is a number of implemented measures and completed infrastructures to upgrade the transportation service level such as the development of the metro network, tram network and suburban railway, the renewal of bus fleet with many green buses, the development of Attiki Odos (the mayor peri-urban highway) and many more. However, mobility and accessibility issues had little attention and a few fragmented actions have been considered towards integrated sustainable urban mobility strategic plans.

Sustainable urban mobility is the science field that serves community needs for moving freely, having access to all infrastructures, being able to communicate and interact with fellow citizens, without 'sacrificing' basic human or environmental requirements and prospects today or in the future (Papaioannou,2012). Its basic principles are; environmental protection, safety, protection and promotion of human health, serving of population needs for mobility, support of socially just economic activity, reduction of mobility costs, deterioration of infrastructure costs et cetera. In summary, it is the way of planning cities in a way that is friendly for all users and the urban environment. European Committee has issued on 2007, the *Green Paper: Towards a new culture for urban mobility*, aiming at the development of international and national sustainable urban mobility action plans and strategies. Greece, as a member of the EU, has signed many European directives and laws that require the reduction of greenhouse gas emissions by 2020, the circulation of only *green* vehicles in city centres by 2050 and others. The above require integrated strategies in the national level as well as the formulation of acts and plans in the local level.

Athens has significantly delayed to develop and implement a sustainable urban mobility plan (SUMP), for various reasons, such as the lack of an integrated urban and transport planning attitude, the numerous misconceptions about public and open spaces as well as the involvement of too many 'interrelated' administration bodies regarding the coordination of such plans. Encouragingly though, 2012 was the year that the 'Strategic Plan for transportation and Sustainable Mobility in Athens' was firstly introduced as part of the Strategic plan of Athens and in 2013 a bike sharing system in the Municipality of Athens was strongly debated.

Towards the implementation of such plans there are numerous needed transformations regarding the management of public transport, the development of an extended cycling network, the systematic upgrade of public spaces and the establishment of an integrated pedestrian network, with the most important being the

alteration in planning mentality and development of priorities. The expected benefits from a SUMP concern energy saving, reduce in mobility costs and increase of social cohesion.

The latest history of the Athenian planning attributes shows multiple inconsistencies regarding a strategic vision for city's development; large scale infrastructure that allow urban sprawl and parallel degradation of the city centre's most historic neighborhoods, deficient traffic and parking policies that create endless traffic jams and violent driving behaviors and an unreliable transport system. Athenian urban highways, such as Syggrou Ave., Mesogion Ave., Kifissias Ave. etc., excise neighboring municipalities, districts or even neighborhoods due to their sizing, flyovers and traffic load as well as burden the urban environment with noise and air pollution. International precedents present solutions such as tunneling of highways and development of green open spaces on previous street delineation, degradation of such highways into boulevards et cetera while in Athens similar proposals have only been considered for Syggrou Avenue. In terms of public transport network and policies, there are proposals still pending (since 2009) in order to achieve the needed level of a successful and efficient network, such as the expansion of bus network, the modernization of operating systems with telematics etc. It is also reported that there is an imbalance of investing in underground means of transport (i.e. metro) rather than onground infrastructures (i.e. tram and bus network), an evidence that indicates the indecisiveness of authorities to intervene in the actual urban street level. Regarding cycling, progress is slow but steady with a number of municipalities acting pro cycling however with numerous administration issues. Athens Metropolitan Cycling Network, as planned by the Sustainable Mobility Unit of NTUA with the contribution of the largest cycling group in Athens, has been incorporated in the Strategic Plan of Athens 2021 and since now (2014) a fragmented implementation has taken place in the North suburbs.

The next section explores in further depth some of the regeneration plans and applications that are contributing or expected to contribute to a more sustainable Athens.

4. A review of Athens' large scale regeneration plans and policies towards the mitigation of climate change effects

As mentioned above, the lack of integrated strategies and visions in Athens for a sustainable, prosperous and just city that would respect residents and visitors, setting cars aside in favor of pedestrians, is a fact. Athens was transformed during the last few decades, incorporating the private automobile as a key component of the city, restricting other urban activities and ways of travelling. Vlastos (2012) argues that 'we were making unaffordable cities in terms of urban and transport planning, letting them diffused in the periphery, disregarding the length of travelling, time and cost of the new *mobility character*, as well as the cost of those new networks because that would allow further systematic building of sites in order to allow sufficient road space'. This ended up with the sacrifice of numerous public spaces and a transformation in the role of streets in city life.

Steps towards a more eco-friendly Athens, during the last 20 years, are limited to the development of the underground (metro) network, the beginning of the tram and suburban railway network, the application of simple and green ring road for circulation management (*daktylios*), some fragmentary pedestrianizations mainly in the Merchant Triangle, some also fragmentary cycling routes in the affluent city suburbs, a few regenerations

in open and green spaces as well as the development of numerous underground parking spaces with questionable benefits for the city itself. Dealing with the mitigation of climate change at the institutional level, is mostly disappointing and frustrating. While other European countries were developing environmental campaigns, embodying protective measures in masterplans, Athens was systematically depreciating planet's saturation and its environmental carrying capacity. Furthermore, policies regarding reduction of speed in neighborhoods (zones of 30km/h), better distribution land uses related to transport network and energy saving vehicles, that would add on the existing urban compactness and protect the environment were not considered in depth. Adding to this, the excessive cost of underground infrastructure, the mixed cost for car dependency and the cost from lengthy travels haven't been also considered. Moreover, citizens were not engaged in planning procedures and sometimes not even informed which has resulted in an ignorance of contemporary urban problems and no environmental sensitization.

Urban transformations of the last 20 years (and future ones), that have affected (and expected to affect) positively or not the future of sustainability in Athens are;

- Athenian Daktylios, the ring road for circulation management firstly implemented in 1982 with some later adjustments. It aimed at reducing air-pollution in the city centre and protecting the archaeological sites. The measure indicated that cars with license plates ending at odd numbers would enter a specified zone in the city centre in odd days and similarly for even days and plates. The result was that most Athenians bought a second car with different ending number (odd or even). There were cases also that some drivers issued cards exempting them from the measure with questionable criteria. Later on, the green daktylios was implemented allowing all vehicles developed with Euro 5 technology or later, emitting less than 140g/km carbon dioxide to enter the specified zone regardless of their license plates. Deficient monitoring from traffic police though has led to the actual abolition of the measure.
- Olympic projects developed important interventions in Athens which apart from the new facilities expanded in innovative policies for reducing car circulation in the mayor street network. Olympic lanes were prioritizing Olympic vehicles in urban thoroughfares, which immediately after the games' ending were abandoned. The application of it showed that citizens respected the measure with the proper monitoring from the traffic police. Moreover, Athenians during the Olympic games were using public transport in the majority of their trips, showing an encouraging alteration in travel habits which though stopped when the Olympic games ended.
- Another project of high importance was the Unification of Archaeological Sites of Athens. It included the restoration of historic sites of the city, public plazas and green spaces as well as the extended pedestrianizations of streets such as Areopagitou St. and other small road links. This project is still ongoing and includes the partial pedestrianization of Panepistimiou St. and Vas.Olgas St., the extension of the tram network to Piraeus and Patisia region as well as a number of other traffic policies around the main historic heritage of Athens. The completion of the above is expected to relieve city centre from the intensive car presence and prioritize the use of public transport, cycling and walking, while also upgrade a number of degraded residential areas in its close vicinity.
- The development of the Metro network as well as the suburban railway (Proastiakos) have also contributed at a significant level to the promotion of public transport. Especially Proastiakos is serving

the outer suburbs of Athens connecting numerous important peri-urban nodes of the conurbation and preventing further decentralization of activities.

- As mentioned in the previous section the development and renewal of the bus fleet (with green vehicles) could contribute more to the sustainability of the capital if the network was expanded and telematics were applied regarding timetables and positioning.
- Regarding cycling network, the only implementation of Athens Metropolitan cycling network plan, is a 19km part in the north suburbs which though is partially completed because of administration issues. The foreseen schemes will enable cycling around the whole Athenian conurbation for long distances and are expected to alter notably mobility choices.
- Other large or medium scale projects that have added on sustainability of Athens are urban regeneration schemes in green open spaces such as the National Garden, Pedion Areos and Metropolitan Tritsis Park. These parks could further add on sustainable mobility of Athens, if they were embodied in pedestrian and green networks.
- Future plans in Faliro waterfront including the built of Opera House, the regeneration of the coastal zone and the degradation of Posidonos Avenue in level -1 are also expected to add on the enhancement of the waterfront and create pedestrian leisure routes as well as bike- friendly environment.
- However, traffic policies and new infrastructures in many mayor urban thoroughfares were implemented towards the increase of car speeds, annulling left turns and creating flyover interchanges to reduce delays, challenging cars to dominate urban space more and more.
- Of course, Athens presents exemplary bad practices such as the case of covering Kifissos river, the largest in the capital, turning it into an urban highway in order to serve car connectivity as well as the delineation of Attiki Odos (the newly built urban motorway) that tears city suburbs apart.

Lastly, it is worth mentioning that among the numerous traffic policies that practically allow cars to dominate the city, newly performed taxes and excise duties related to car ownership attempt to reduce car usage, urge drivers to buy energy saving and eco-friendly cars or, as the main criticism stands for, allow mostly the upper class to pollute as long as they pay for it. Another practice, that could have successful outcomes regarding sustainability of the city and transport policies, is the development of the Green Fund, which would collect the fines from illegal building regulation and invest them in upgrading urban public space. However, a number of political and economical reasons redirected the funds in covering part of the fiscal debt.

5. Crisis' impacts in mobility (data)

5.1. General Information

This chapter will explore the data gathered regarding some of the main factors that had a great impact in mobility choices, during the last 5 years (2009- 2013). As mentioned above mobility choices in the Greek capital as well as in all Greek towns and cities have (been) diversified, since the beginning of the economic crisis. The shrinking of the economy has led to a shrinkage in transportation (Vlastos, 2013). Profoundly, this is first of all, due to tremendous salary cuts, pension cuts, layoffs, subsidies and benefit cuts et cetera which forces the economically vulnerable in altering their travel habits to the cheapest as well as reduce the number of travels

to the minimum. At the same time, fuel prices have been dramatically increased and indirect taxes are continuously rising. Consequently, all the above have led to the compression of needs which has a great impact on transportation and mobility in Athens. As mentioned in earlier, the private automobile was and remains the key vehicle for transportation in the capital, which is due to a combination of poor policies regarding the promotion of sustainable mobility, traffic jams, inadequate management of public transport in terms of frequency of travels, consistency with timetables et cetera. Below, a number of data is reported, as extracted from limited surveys and publications, for the transformations of mobility in the meta-crisis metropolis.

5.2. An empirical approach and Data Collection

a) Car trips

Car trips have been decreased due to the increased fuel costs, the decrease in leisure trips as well as a number of other parameters. Data shows (Ypodomes Web, 2012) that during the first semester of 2012, a 30% reduction in car circulation has occurred. Moreover, car speeds seem to be slightly declined. It is worth mentioning that 1.38 million of vehicle license plates have been handed in tax offices during 2009-2013, 1.22 million of them was for private cars (Tsantila, 2013).

In general terms, the cost of car ownership (for circulation taxes, excise duties, fuels and tolls) for a car of 1600cc has been increased 42% (period 2009-2013) and for a 2000cc car 68% (Tsantila, 2013). Though, in some new car types (after 2010, with low carbon dioxide emissions) there is a slight reduction in circulation taxes.

More specifically, regarding fuel prices, there is a rapid escalation of costs related to excise duties. Particularly, a 28.69% increase in unleaded petrol is reported in the first semester of 2009 (Ministry of Development and Competitiveness, 2009). While a mean of 55% increase was developed since March 2013 (Tsantila, 2013).

The main urban thoroughfares of Athens, such as Mesogeion and Kifissias Avenue, previously suffering from extended traffic jams especially during the peak hours, can now be accessed without the previous delays. The Traffic Management Center of Athens (Traffic Management Center, 2013) reports an important shrinkage in the peak hours range (i.e. Kifissou Avenue had a total of 9 hours of peak traffic in 2010 which in 2011 reached 5hours and 15 minutes). The same report presents a mean of 25% reduction in traffic volumes in the main Athenian streets. Athenian highways, such as parts of the National Road System and Attiki Odos, have a 10% to 30% decrease in traffic volumes.

Lastly, taxis in the last decade were replacing public transport in a sense as the fare was extremely cheap and the lack of traffic police monitoring allowed taxis stopping at any place on the road network. Moreover, taxis would serve multiple customers for short trips. The number of taxi licenses was way outraged (almost 8.500 in Athens- more than in New York) and there were also numerous illegal vehicles. Each taxi, according to an NTUA research (Karlaftis et al., 2011), burdens the Athenian urban environment as much as 20 cars. An immediate impact of the crisis was the 80% decrease in passenger traffic (Traffic Management Center, 2013), although the fare is 35% cheaper than the relative European average.

b) Public Transport

One might expect that following the reduction of car trips, use of public transport would have been expanded. On the contrary, public transport use (buses, metro and tram) has been decreased by 9.5% translated in a 20% decline in revenues (Ypodomes Web, 2012), while unofficial data shows a 15-20% decrease in use. Oasa (Athens Urban Transport System organization) has cut numerous service routes that had low traffic and is about proceeding further cuts. Adding to this, the increase in ticket fares (from 1.20€ to 1.40€ in 2013) and the potential further increase (up to 1.80€) restrict further the use of public transport. It is worth mentioning that during the period of 2008-2013, ticket fares have been increased by almost 40%. 'Ticket-evasions' have also been incredibly increased, with 1 out of 10 validating their tickets. Moreover, nearly one third of the bus fleet is underused as there are no funds to replace or upgrade them. Numerous transport engineers advice that further cuts in service routes and increases in fares may lead to a deregulation and liberalization of urban transport as well as an increase in car usage. The research on the use of types of fares and passenger traffic on public transport conducted by OASA (Systema Ltd, 2007) in 2007 has shown that 45.95% of the trips are work relate (to and from work), 14.5% for personal issues, 11.6% for shopping, 8.6% for sports and leisure etc. Given the increase of unemployment in Athens, which reaches 28.3% in Athens in October 2013 (Greek Statistical Authority, 2013), the trips for work, leisure as well as shopping have remarkably been decreased.

c) Bicycle Trips

Bicycle use in Athens was steadily increasing even before the crisis, though during the last 4 years, recession has given an incredible boost- up to 20-25%. Numerous people have replaced car trips with bicycle trips for work, school and shopping related routes. Data shows that almost 10.000 people cycle at least once a week in Athens. In 2010, the increase in bicycle sales reached 10% (compared to 2009) and in the first trimester of 2011 the increase was 12% (compared to the first trimester of 2010). Those sales refer to mostly cheap bicycles (up to 400€) purchased by students and workers aged 20-35 years old (Foskolos, 2011). In 2011, about 11 new bicycle stores have launched and today more than 80 cycling groups have been founded in Athens. Rough estimations show a number of 5.000 active cyclists in Athens.

Public Issue survey (Public Issue, 2013) showed for 2012 that 3.1% of Greeks cycle daily to and from work, school and for leisure purposes. In 2012 Greece was the European country with the second highest proportion in bicycle sales over cars and 320.000 new models of bicycles were developed compared to only 58.000 new car models (IEFIMERIDA web article, 2012). Moreover in 2013, 5 new bike sharing systems have been launched in Athenian municipalities

Although the data provided above can be considered encouraging for bicycle use in Athens, numbers are extremely small compared to other European cities (Amsterdam, Vienna, Stuttgart etc.). The lack of bicycle infrastructure and mobility management schemes is the reason for the 90,7% of the interviewees (Sustainable Mobility Unit, 2009) to not cycle in Athens. As mentioned in section 2 of the present report, there is a number of completed and available cycling network plans in municipalities as well as in the metropolitan level conducted by the Sustainable Mobility Unit of NTUA,

d) Walking

Walking trips have been relatively increased especially for 5-15 minutes distances both in Athens city centre and in the suburbs. Some of the trips for daily needs which were previously conducted by car, are now carried out on foot or by bicycle to the closest neighborhood center, but unfortunately, there is no numerical data for walking growth rate during 2009-2013, so as to identify any effects from the crisis.

Though, car still dominates daily trips as little restoration schemes have been performed in order to create integrated pedestrian networks or eliminate inconsistencies in existing ones.

e) road accidents

According to a study (Folla et al., 2012), the reduction in the family budget has decreased the number of deadly traffic accidents in Greece by almost 47% in the period 2008-2011. This is mainly due to the reduction of car trips (vehicle-kilometers) and speed, in order to save money from the fuels. More specifically, 1.100 people have died in car accidents in 2011, compared to 1.612 in 2007 and 1.553 in 2008. Scientists (Folla et al., 2012) had also encountered the risks in road safety on account of deficient conservation of infrastructure as well as the increase in car ages.

6. Conclusions

Athenian residents were moving mainly on foot since the 19th century. Distances were relatively small and public spaces had a key role in daily life. Nowadays, social cohesion and communication is lost and residents seem armored inside their cars in an environmentally degraded and hostile urban space. Rapid urbanization and urban sprawl managed to gain some extra space for development, though lost the sense of enclosure that sustainable cities should have. New streets impose car usage, land uses are sparsely distributed, walking and cycling are not preferred because of the long distances and public transport remains inadequate to cover existing needs.

Streets should become social spaces again in order to solve technical issues regarding the environment, transportation, urban planning, health and safety. Despite the crisis, Athens is attempting to take measures and apply regeneration schemes such as car and parking restrictions, public transportation enhancement, walking and cycling integration. These transformations should be developed under the scope of a compact city model that applies regeneration schemes and policies like the unification of archaeological sites, the green daktylios and application of modern technologies in public transportation.

Crisis has affected all aspects of daily life and mobility couldn't remain intact. An average decrease in number of travels is apparent in all means of transport apart from cycling and walking. Less cars moving slower due to the increase in car ownership and operation cost, less trips in public transport and increased ticket prices create further inconveniences. It is not superficial to say that among all the various negatives, crisis has revealed some qualities in mobility choices and redefined priorities. Walking and cycling are *reviewed* by residents for their daily trips and we hope it will not be ephemeral.

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