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"Land uses redistribution to enhance walking and sojourning in public spaces"

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Various surveys have shown a strong correlation between the form of urban space and the way the residents or visitors choose to move therein. Generally, the urban density including disparate activities encourages walking, cycling, and public transport. On the contrary, the low densities promote car driving. At the same time, under the current pressure forced by the threat of climate change, and the costs caused by pollution and noise, accidents, congestion etc., are being sought solutions of replacement of the predominant mode of transport, being the car, with others environmentally friendly, consistent with whatever described by the term "Sustainable Mobility". In fact, in search for such solutions, it could not be ignored the major issue of city's form, since it is connected with the movement options. How to change the city, what form to give it to encourage more environment friendly modes of transport? Which is the Sustainable Urban Form that would produce Sustainable Mobility? Would it be right, though, the Sustainable Urban Form being exclusively mobility-oriented or there are other objectives, probably even more essential which the city, under appropriate design, could in tandem with Sustainable Mobility serve?

1. Urban Form and main objectives for the Sustainable City

1.1 Social goal

The primary goal is social and is being related to the organization of a more coherent and sensitive society, in relation to environmental problems. An overview of the European Commission's policies makes apparent that the issue of participation of citizens in planning is of principal objective. Indeed, before the major environmental problems facing the cities and the world, the maturity of inhabitants in responsible citizens is a precondition for being restrained the consumption of space, fuels, products and food, whereupon it is required high-consumption of energy and water for these to be produced. Only when inhabitants cease to behave individualistically, to consent operating more collectively and sharing the city between them more fairy, solutions could be provided. In this regard, shall be directed all the actions of sharing economy, which is indeed a big challenge. There are, inter allia, included public transport, walking and cycling, because they are less-consuming space and energy solutions for urban transport. Following such solutions, the inhabitants share the road gently and friendly in favor of environment. The sharing economy requires consultation, cooperation, coordination and mild conditions, such that can be developed whenever the residents care for their place and the others, get concerned about tomorrow, set out goals, participate in planning. What is, therefore, promoted in Europe is a more social city. In this respect, it is characteristic the Green Paper published by EU in 2007 "Towards a new culture for urban mobility" and refers to a new urban culture and more responsible behaviors.

How could the city form make it further social? The key is the neighborhood, constituting the social cell thereof as it is, primarily, the geographic area that has the advantage of human scale, i.e. the short distance between residents and, secondly, has the advantage that the inhabitants of the community are faced up with common problems.

Which is that urban form beneficial for the development of neighborhoods? Moreover, which is the basic form of neighborhood? It is the form allowing it to host a mild environment without through traffic and high speed, with open public spaces supporting socialization conditions, land uses drawing walking, such as bakery, grocery store and school. The scale is such that the distances therein shall be covered by walking, making easier for residents to meet each other.

In order for a neighborhood to exist, protection boundaries should be needed. Coincide with the ring that surrounds it, necessary to override the through traffic. The interior roads are of low speed and one-way, so cars which penetrate are obliged to follow jagged and no convenient routes at all. The pavements are wide, there is abundant vegetation and the number of parking spaces is limited **(Figure 1).**

Figure 1.   The protected neighborhood road structure

All the aforementioned are necessary but not sufficient condition. The neighborhood form, although it is not enough to protect from what is happening around, whereas the city is given over to the cars. A necessary condition to defend the neighborhoods and be able to play their social role is the overall urban form aim to town sociability. If instead the minor land uses are subject of an asymmetric competition from major activities that are installed in the region, then the first would be forced to flee, depriving the neighborhoods of the necessary wealth which encourages the resident to come out on the road and walk.

If along with the weakening of the commercial activities+ the public transport networks and cycling are also poor, the rate of use of the car will be high and the pressures and degradation in neighborhoods would be great.

1.2 Transport goal

Certain aspects estimate that the reduction of movements would be beneficial for the environment. It is about an incorrect and in any case not feasible approach. The development of economy means an intensification of activities, thus increase in the number of movements. Such development is very positive for the economic and social environment of cities, since more movements mean numerous opportunities for communication, consumption and greater productivity. This is true only under the condition that the dynamic city of tomorrow shall mainly operate due to movements of Sustainable Mobility. With movements falling upon that category, namely public transport, cycling, walking and fewer cars, and since the space consumed by pedestrians, cyclists and public transport users is far smaller than the space attributable to a car passenger, the road acquires the ability to serve far greater number of people than before.

2. The components of the Urban Form and their impact on travel choices

2.1 On the designation of Urban Form

What is actually meant by urban form? Does it make sense to talk about this at the moment? Certainly, now the definition of the form is completely different compared to that mentioned in the historic city. The form thereof was previously identified with a finite pattern, with certain limits posed by the walls.

It was legible, understandable and its reference points were related to historical and geographical landmarks, easily memorable. The end of the city under this traditional form is marked by the demolition of the walls of medieval cities in the 19th century. This was an end to limits. From that point onwards, following the development of railway and especially the car invention, the city shall be spurted forward, constantly increases its size at a much higher pace than the population is growing, and this course is no longer a controlled evolution from morphological point of view. The suburbia, based on conventional criteria, are formless, they instead represent urban formations primarily operating thanks to the car which imposed them. The car city is a deliberately amorphous city, so it leaves it free to go anywhere without restrictions.

2.2 The effect of location in the current amorphous unsustainable cities

How did the amorphous of the current non-sustainable city come about? The characteristics of the landscape on which developed (hills, mountains, rivers, coastline) have determined to a great extent its form. Nevertheless, the above mentioned strong natural elements due to the modern road technologies and underground projects disappear and tend to define less and less the form of urban extensions. The technology unfortunately is competing against nature more and more efficiently.

The location of cities and the distribution of activities shall be largely explained by their history. The transportation factor, as a criterion for selecting the location of a new city, was very powerful. For the convenience of accessibility were chosen points over natural waterways, rivers, next to safe harbors etc. Where possible, the pursuit of safety, or the willingness to avoid occupation of fertile territories in plains led to the selection of places with steep slopes, hardly accessible. Nowadays, this affects movements therein, discouraging cycling, even walking. Within the cities, until the late 19th

century, the only available way of movement was on foot or by animals. Within the 11.000 years of history of cities, until they start to use other means, their extent was such that walking could cover the distance. Subsequently, the diameter of urban area was increasing depending on the range of the new means of transportation. Finally, the unlimited range of automobile and train leads to the amorphous city. As an example the metropolis, a typical amorphous megacity, contains extended gaps hostile for pedestrians and cyclists.

2.3 The general characteristics of the Urban Image

There are three essential components and characteristics of current amorphous developments:

a) the building density,
b) the form of road and track networks,
c) allocation of various activities.

All have a serious impact on the choice of transport mode.

a) building density

The high building density   increases the short-range movements, because   the probability of finding activity you are looking within a short distance is increased. At the same time, the short-range routes are connected with walking as it is competitive with the car. Indeed, walking allows you to follow the most direct route, while using   car or public transport, the access of the stop or of the parking position means loss of time.

It should be noted that the small distance is a necessary but not sufficient condition for the choice of walking. It is important at the same time the ride is pleasant and safe. Such paths for pedestrians are those either traveling through a beautiful and gentle natural environment, or are enriched with centers of interest and stopping points, very useful for relaxing walks.

Apart from walking, cycling is also competitive with the car for even longer journeys, and especially for those traveling through areas where car restrictions are implemented, such as neighborhoods or the historic center.

b) roads and public transport networks

The form of the secondary and local roads network is essentially what determines the image of the city, since these two are makers of the geometry of blocks. The geography of the arterial network and mainly urban highways lays down but only the areas and directions of extensions. Even more crucial to the same goal, is the geography of metro, regional train and tram. In the case of the arterial road network, it ensures quick removal from the city, rather than constraining the installation of activities in a limited range around self-same. Instead, public transport networks gather these around the stations. Indeed the car users, through the arterial network and then the secondary, are easily dispersed over long distances, whereas the users of rail transport have destinations closer to the stations, because, to cover long distances must be transferred from car, solution not always convenient.

The rings could be considered as a new element, which again puts limits on the modern city. Of course, while the walls of medieval cities, for security reasons, functioned as perfectly dams, the rings discourage, but they do not hinder the construction to continue after them. However, they offer a good opportunity for the implementation of urban containment policies.

c) land use

The evolution of locating land uses has followed an interesting path. In fact, as long as the town was small, residence and activities were all very close, about perhaps a starting point that may have been the church, the Town Hall, the palace, the main square, later on, a railway station etc. Trading was generally developing close to them; even main land uses as well, e.g. the University, schools, coffee shops. As long walking was the almost exclusive mode of movement and the distances were short, the access was meaningless to constitute the basic criterion for selecting the location. This is altered by increasing the size of the city.

 As the city grew, the new activities had been chosen being established adjacent frequently visited initial core, whereas housing, being less strong economically, related to commercial and other activities, in search of cheaper land and greater comfort, removed. Accompanied it only uses for which it was important the proximity of their relationship with the dwelling (school, cafe, bakery, etc.). As thickens the building, were added complementary activities in residential areas, in the form of dispersed small shops or small workshops resulting in an interesting mix of housing and jobs. Sometimes the ground was the workplace of resident   lived in the same house. Walking when residence and work is nearby, it is of course the most appropriate way to travel.

The Industrial Revolution has changed the geometric and the economic fundamentals. It created the conditions for high concentrations of jobs in production and trade sectors and that launched a threefold process:

1. Raising of capitals and creating large inequalities of income.

2. Close of small productive and commercial activities and mergers into larger ones.

3. Removal of the largest units in regional locations, where finding great areas is easier and the cost lower.

All three of the aforementioned developments have a negative impact in terms of sustainable mobility. Those residents, who could afford, sought to find a new place in town, in formations of similar higher income which could have more favorable terms of layout, i.e. less density, less coverage, lower heights of buildings, best microclimate, overview and more green. Such dispersion by income and willingness of those who can afford, to live in low-density areas, accelerates extensions, increasing distances and intensive use of the car.

The formation also of larger productive, commercial and office space means decoupling of small-scale activities from the residence and intensive car use by employees and customers. Their new position was either suburbs or along generally radial segments of the arterial roads conducting to the historical center. There were established linear shopping centers accessed only by car and targeted for specific store **(Figure 2)**. Cities, thanks mainly to the car and, secondarily, on the train,

have incorporated more space and largely based their daily operation on the car to the detriment of walking.
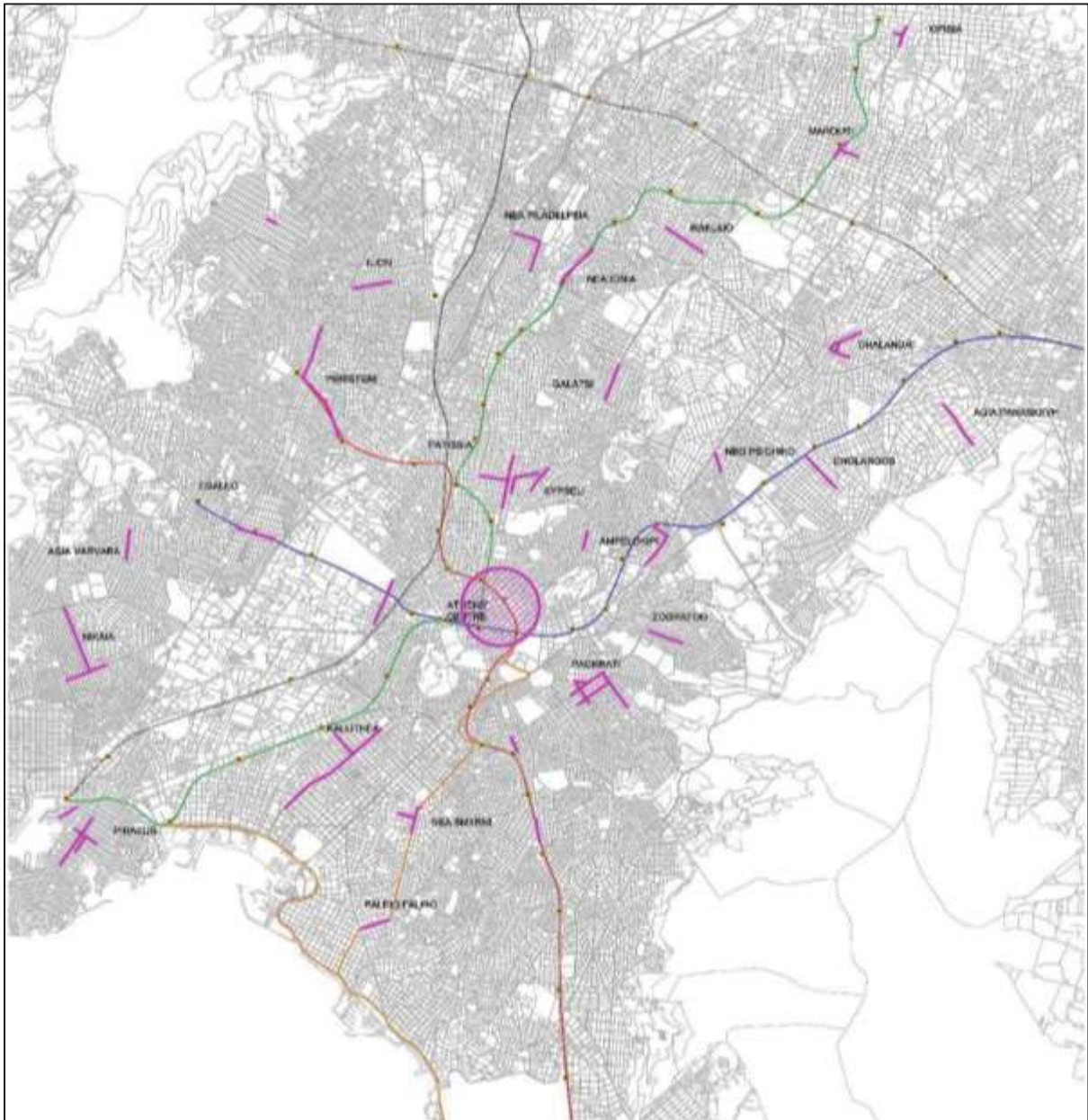
Figure 2. Athens: linear commercial centers

The income disparities in cities have lead to delinquency. Some feel the road, more like risk landscape and no longer as a field of socialization. The city is being shielded. The car further shields and makes certain feeling far safely than being exposed on the road as pedestrians or cyclists. In terms of safety the car poses walls once more, this time around everyone. The sense of insecurity is a serious obstacle to the promotion of walking and cycling. The human presence is the best antidote. Thanks to recreational uses, adjacent to open public spaces, the city is more vibrant and safer. A similar effect is further achieved on streets frequented by many pedestrians and cyclists.

3. Neighborhoods vs. historical and local centers and their role towards the social city

The cities are progressively equipped with regional train, subway or tramway networks, which provide an intense impetus to public transport and consequently to the accompanying walking. This new situation strongly affects their form and resolutely participates in setting up the structure thereof, particularly of the biggest ones. The aforementioned networks have been built on the foundation of the historic / modern center and then of local centers **(Figure 3)**. With stations are enhanced the existing centers and created new ones. Thanks to them they enjoy the best service and acquire an exceptionally powerful role.
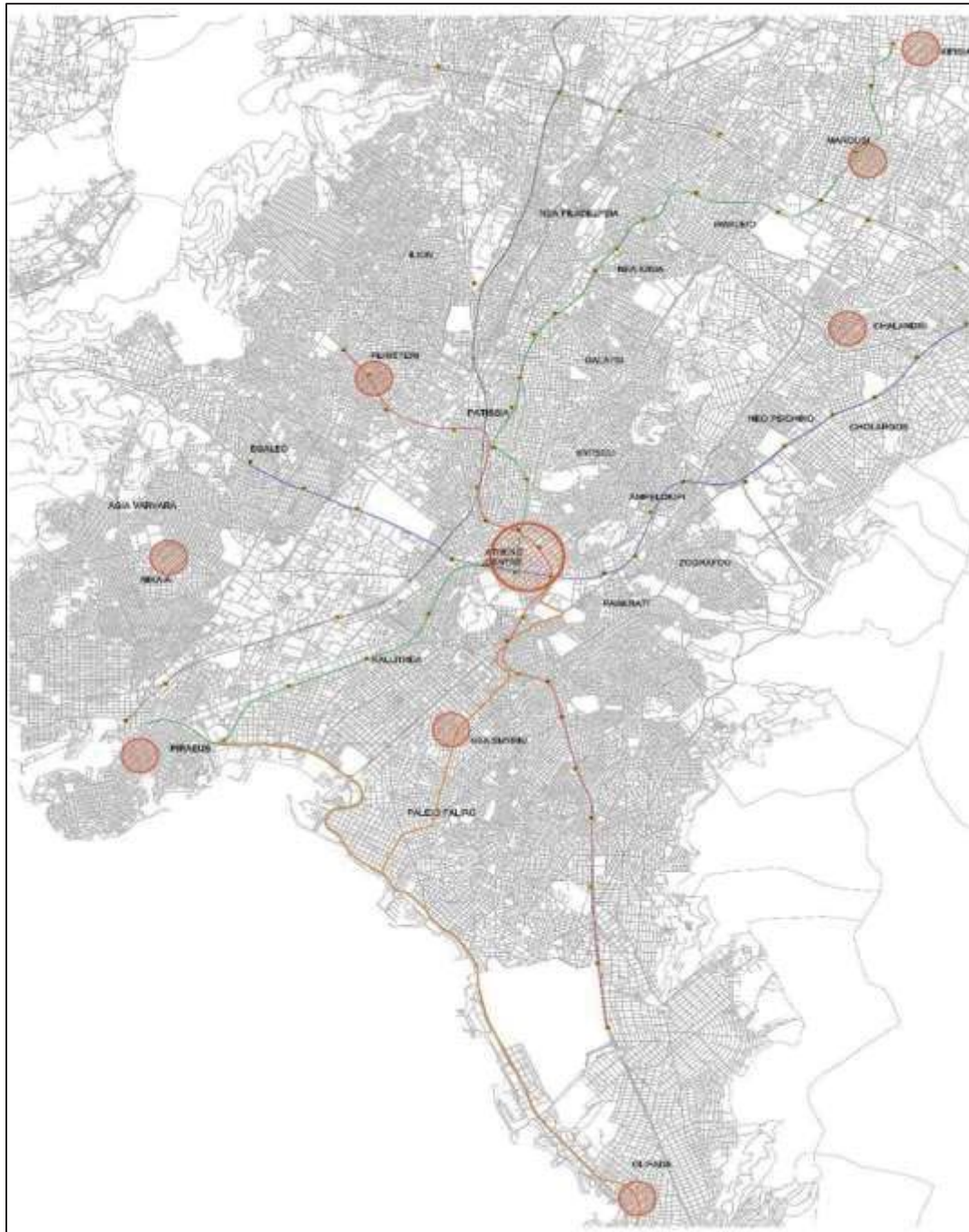

Figure 3.   Athens: Regional Commercial Centers

Generally, as a consequence the development form of urban surface is following the geography of public transport networks. However, the coverage of the city by the above networks is rarely sufficient. Instead, there are left significant gaps. Their stations attract from the surrounding area several trade-, office- and recreation spaces, and naturally pedestrians and cyclists. Interestingly, these new concentrations of activities result from the relocation of uses previously dispersed within a larger radius. Obviously the opening of a new uses causes the closing of another. Whereas attracted high rates of walking around the stations, certain areas at longer distances run out of their previous capacity . The local centers operate as lodestones developing new equilibria and it is not certain that walking before and after is equivalent. What is clearly visible is that neighborhoods, as traditional cores of resident's socialization, lose their power, whereas it will take the new local centers many years to take over a similar role. The disadvantage is that their relationship with the resident is less immediate, because their range is greater compared to that of the neighborhood. With a similar and even most acute problem are dealt the historical / modern centers, being in a longer distance from housing without such situation can be easily compensated by the potency of the activities hosted.

Over the last decades the historical and modern centers have become places of significant renewal projects, providing priority to public transport, walking and cycling. They also draw in new recreational and commercial uses and consequently an ever increasing number of residents and visitors coming from all over the city. This is carry out to a certain extent at the expense of the neighborhood. It is not easy for the centers to create socialization opportunities, similar to those offered previously in neighborhoods, because the visitors of centers are residents of the city areas not communicating and knowing each other. The range of resident within the big city is small. There are distinctive the results of a research concerning the location of dwelling, and the position of travel destinations, for various purposes, of students of the School of Rural and Surveying Engineering NTUA **(Figure 4)**.
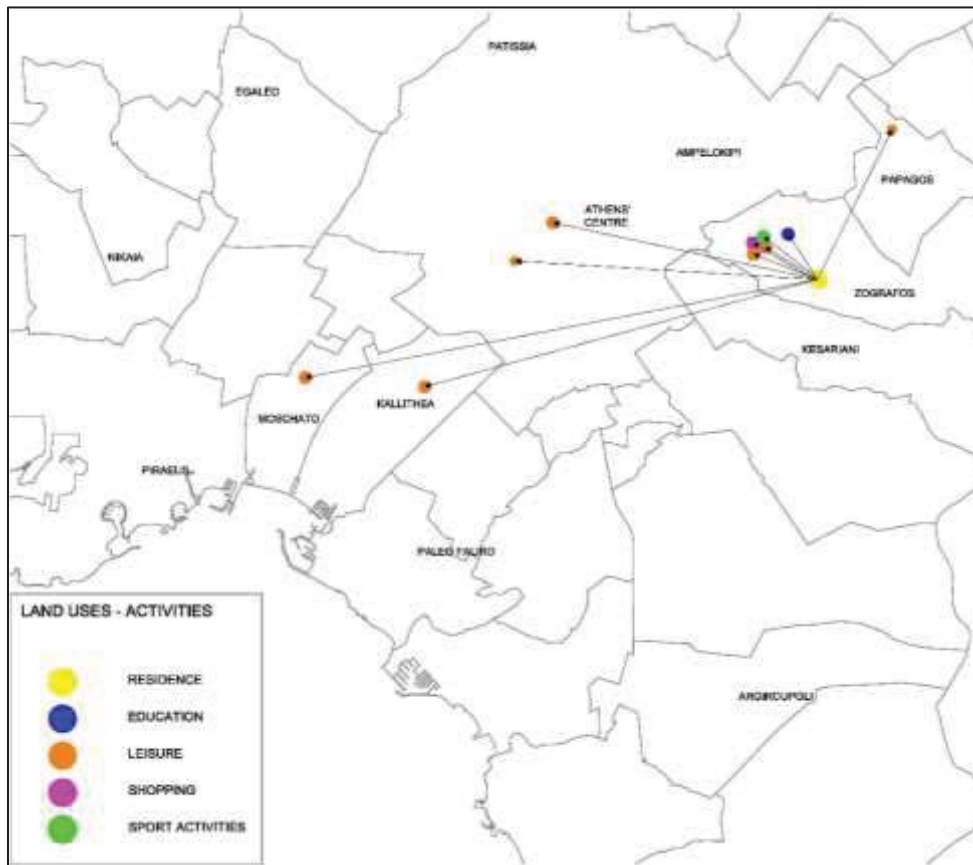
Figure 4. Athens: The range of trips of a student living in the centre

Even if meetings occur in the center, they are not easily repeatable. Instead, the communication in neighborhood could be continuous, since you nevertheless meet over and over again with the neighbor. There are several conditions to be met for building relationships and discussing local problems experienced by all. However, today is lacking the most basic: there are few land uses and limited open public spaces to leave home, walk and stand.

Previously, it was not easy to communicate over long distances in the cities and therefore were developed topicalities grounded on short-range itineraries along with walking. Today, thanks to the expansion of the arterial and track-based networks and increased speed, giving easier access to downtown, the long distance communication is enhanced at the expense of communication in neighborhood. Similar removal is due to the relocation of jobs from neighborhoods to the centers. Employees returning home at night, and the neighborhood results in a city dormitory.

Has the goal of socialization in the big city reached an impasse? What is the future of the neighborhood of such a small cell inside the city? Could the neighborhoods liven up again? Could it be possible small cities to be formed within the big ones under a coexisting small and large scale? To answer positively the above questions it should be made significant changes in land use, both in dwelling and in other activities.

Housing Redistribution

Dwellings distribution is very uneven between central areas and suburbs. All surveys show that residents of sparsely populated suburbs use far more intensively car than residents of central areas

and the impact of their movements in the environment is much greater. It is, however, noted that a research in Athens (SRSE - NTUA 2015), revealed that, on the level of Municipalities, the energy consumption per capita is not very different, whatever the position of the municipality within the city, because the number of long-distance journeys decreases as the distance of the municipality from the center increases. Exceptions are provided for the municipalities wherefrom Attiki Odos passing through, an urban motorway that runs through the capital, where the fuel consumption per capita is disproportionately large, as long distances are covered at high speed in a short time. The same survey showed that the most favored users of public transport are the center's residents, because they have at their disposal lines leading directly to various destinations in the city. They are followed by those, who live outside the center near Metro Station and certainly are handicapped who are off center and away from metro station. They are the ones most commonly used car **(Figure 5).**
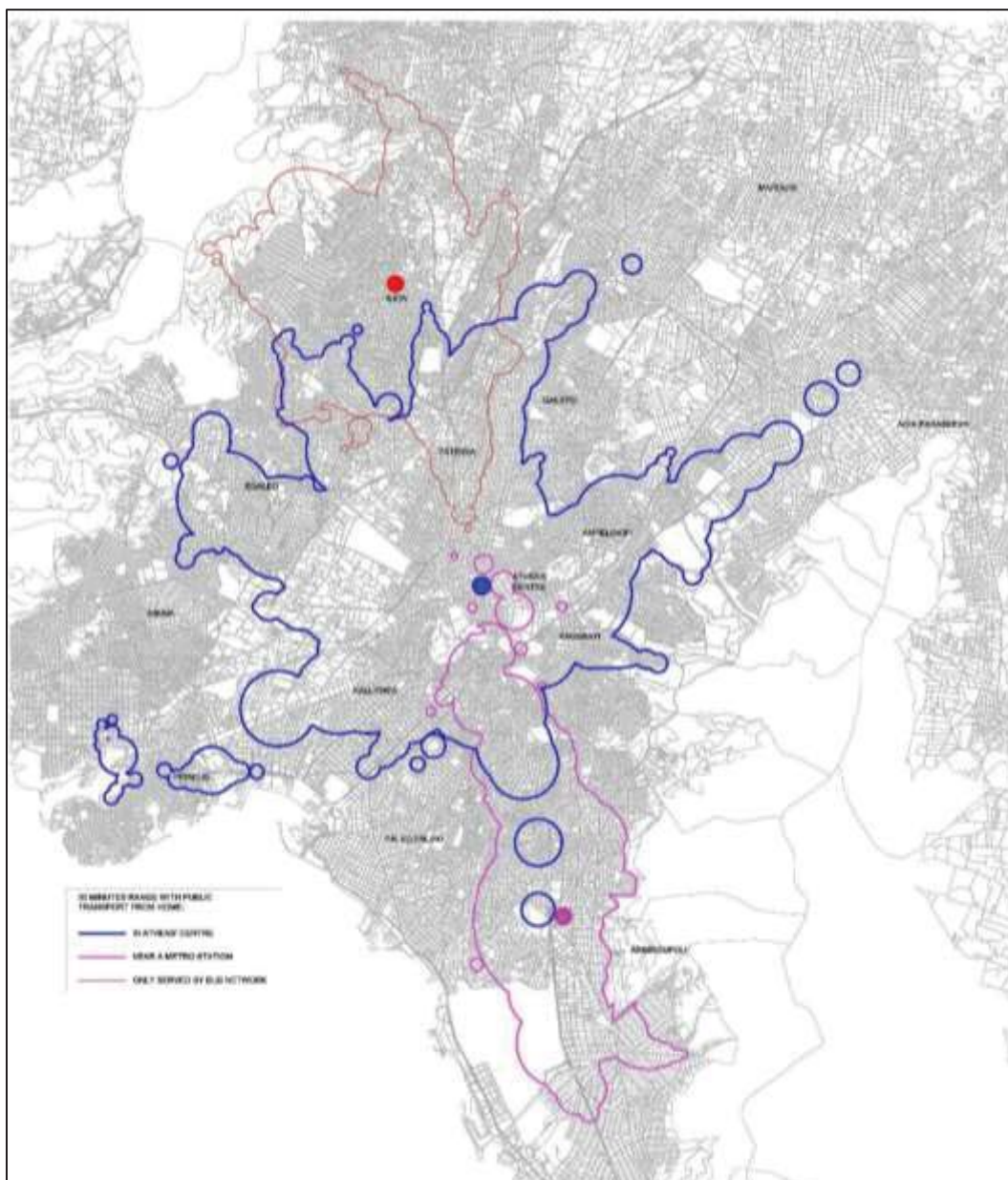

Figure 5. Athens: 30' range with public transport networks

In fact, income inequalities are reflected in the architecture and urbanism and despite their impact on transport modes, the urban policies only to a certain extent can soften it. Tool is to increase the percentage of cover and the plot ratio, to increase the density of the suburbs, with the risk, however, those who have the financial capacity to seek even more removed from the city.

Urban design is equally an important tool for neighborhoods in order to strengthen locality, attracting motivated short-range activities, to be mixed with the residence. Alongside appropriate traffic solutions and small upgrading projects of road geometry it will be also discouraged the car use, giving priority to pedestrians and cyclists.

Urban planning, in addition to attracting conventional small-scale activities, will provide for enclosed communal spaces for the neighborhood, public parks and playgrounds, etc., so as residents meet each other and forge relationships. It will be also supported the same goal with the implementation of solutions, some of which have already been enacted in European cities, as the doctor or the police officer of the neighborhood.

In the field of transport policy for the city generally, and focusing on the neighborhood, without being though ignored the very important role of the center, it should be additionally developed and intra-regional networks, softening somewhat the one-dimensional orientation of the networks serving , almost exclusively, the communication between center and periphery.

Relocation of commercial and recreational uses

In recent decades the strong funds leaves characteristic sores in cities, abolishing balances that exist for centuries. Big business made large investments and this means major projects and major changes, which devise new transport geography of people and goods. This caused new concentrations and gaps. The new, high-intensity activities are installed where there are concentrations of clientele. Instead, small uses, addressed to a limited and consequently small scale public of the neighborhood, are rarely considered as a link in the chain of powerful companies and their financial sustainability is difficult. They need the support of the state.

It should however be noted that in recent years, in Europe and America, has been emerged an interesting shift from the regional malls towards small, often specialized shops, diffused in the central residential areas. It reflects the general current reverse to the consumption of more qualitative products, biological etc. and the detachment from industrialized foods. It is obvious that it is useless these small shops be supplied by large trucks, whose circulation within the city has serious consequences on the environment and the operation of the road network. Small trucks could give a better solution. It is not fortuitous the spectacular increase in cargo bikes for transport of lightweight goods.

The fact is that the malls, as policed places, offer security and it serves many parents leaving there their children free for shopping and entertainment. They replace the traditional historic center with an artificial, fake landscape, where is entrapped a world formerly walked freely visiting shops, open public spaces and other administrative education and culture activities, that one encounters in the city center. However, there are solutions to be addressed safety issues. If, for example, small business enterprises in the historic commercial center, operating in concert as a single undertaking

in the form of an open mall, wherein the transit of vehicle would be excluded and the municipal police would have a more increased presence, the circumstances would be much safer.

So far, economical criteria affected policies of public administration. In Greece, Athens gathered 40% of the population and an even greater proportion of economic activities, leading to massive abandonment of villages and bleeding of small and medium-sized cities. So the state was exempted from its obligation to implement projects of transportation infrastructure and social equipment, everywhere in the territory, which would be costly and is being restricted to cover only the needs of big cities. It is however significant that faced by the problem of economic viability of small towns, now is forced to pursue its support policies, including land use policies, e.g. establishing many small universities which, without any educational reason, scattered anywhere on the territory to stimulate some local communities being unable to survive **(Figure 6)**.
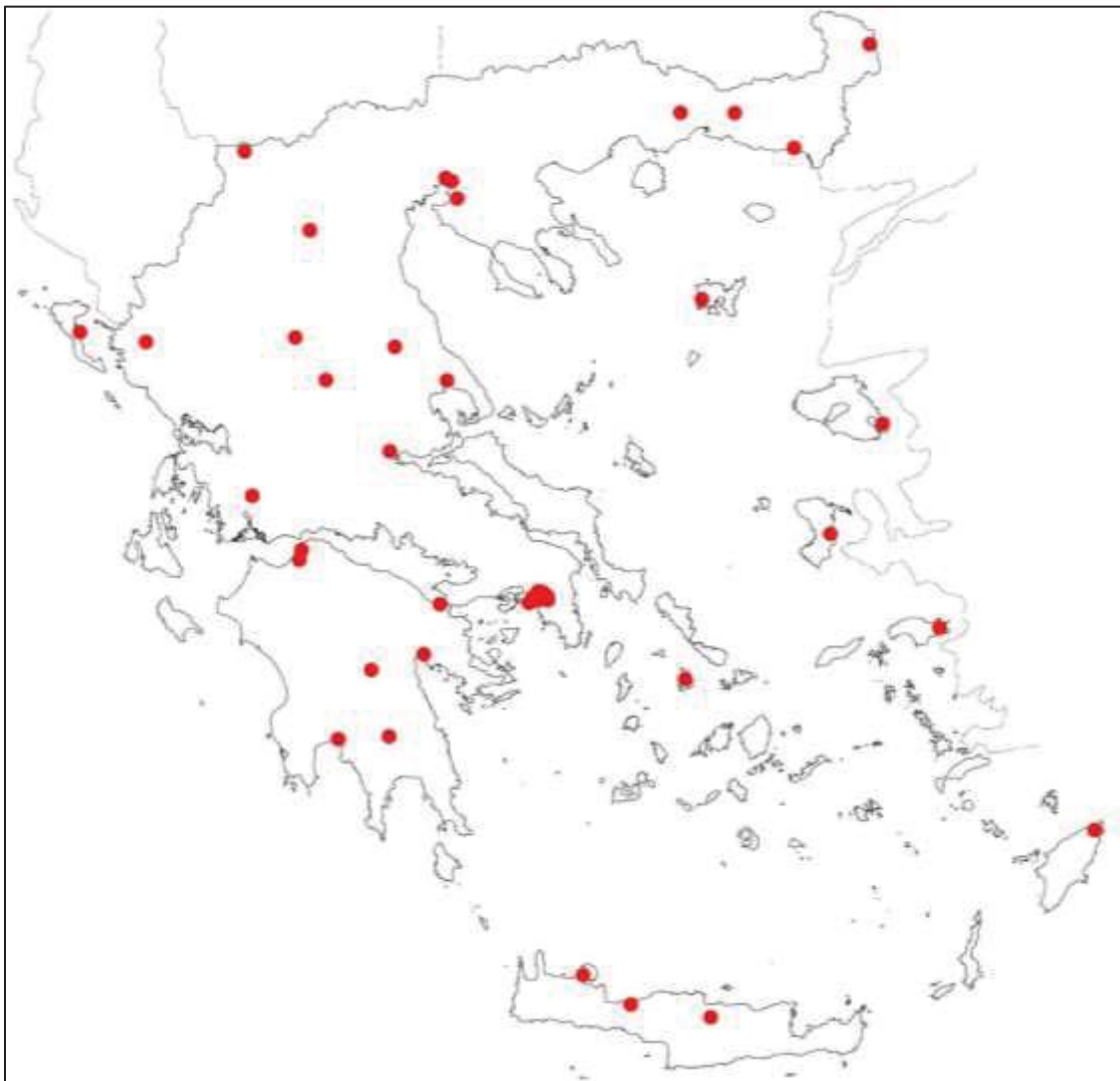

Figure 6.   Greece: Universities' distribution

In Athens, the University facilities followed the opposite course. There were established few regional campus wherein progressively gathered many schools, initially positioned at the center **(Figure 7)**. A significant proportion of students, previously moved on foot, now drive. Could it such tendency be

halted and these university spaces return from the periphery to the centers? Today, owing to the bankruptcy and the general deterioration of downtown Athens, the property values have collapsed, it would not be impractical to be exercised such a policy, at least if Universities were installed in empty buildings. Such a policy will contribute to the regeneration of the center and generally of the urban environment.
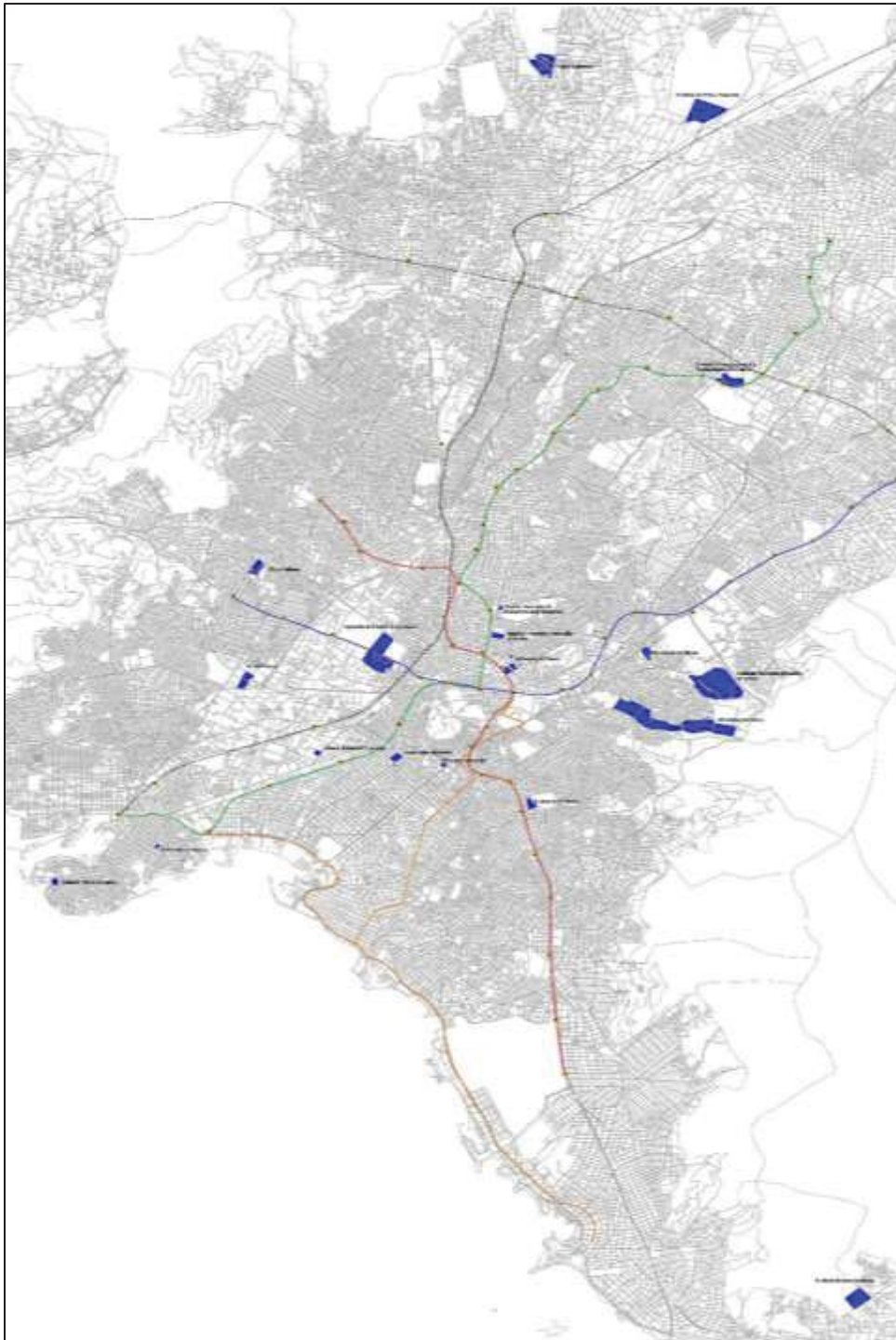

Figure 7.   Athens: Universities distribution

Are there also other large size uses in the periphery, which could now be scattered in residential areas split into smaller size? The hotels are a good example. While the trend was the construction of large hotel complexes in the periphery, whose location to access the center makes the tenants dependent of the taxi, but also keeps them away from the city life, in recent years expressed preference for the boutique hotels, embedded much more directly in the urban fabric. A similar example is of major sports complexes. Specifically as to the Olympic venues, the location policy, typically selected from the host cities, is the concentration of all stadiums in only one open space outside the city, and its connection by train and motorway. In contrast, for the 2004 Athens Olympics preferred to disperse stadiums at various points in the city, hoping thereby to have a development contribution to the surrounding urban areas. It was a more difficult challenge, especially as it concerns accessibility, which was faced with improving public transport networks and creating a first tram line **(Figure 8,9)**.
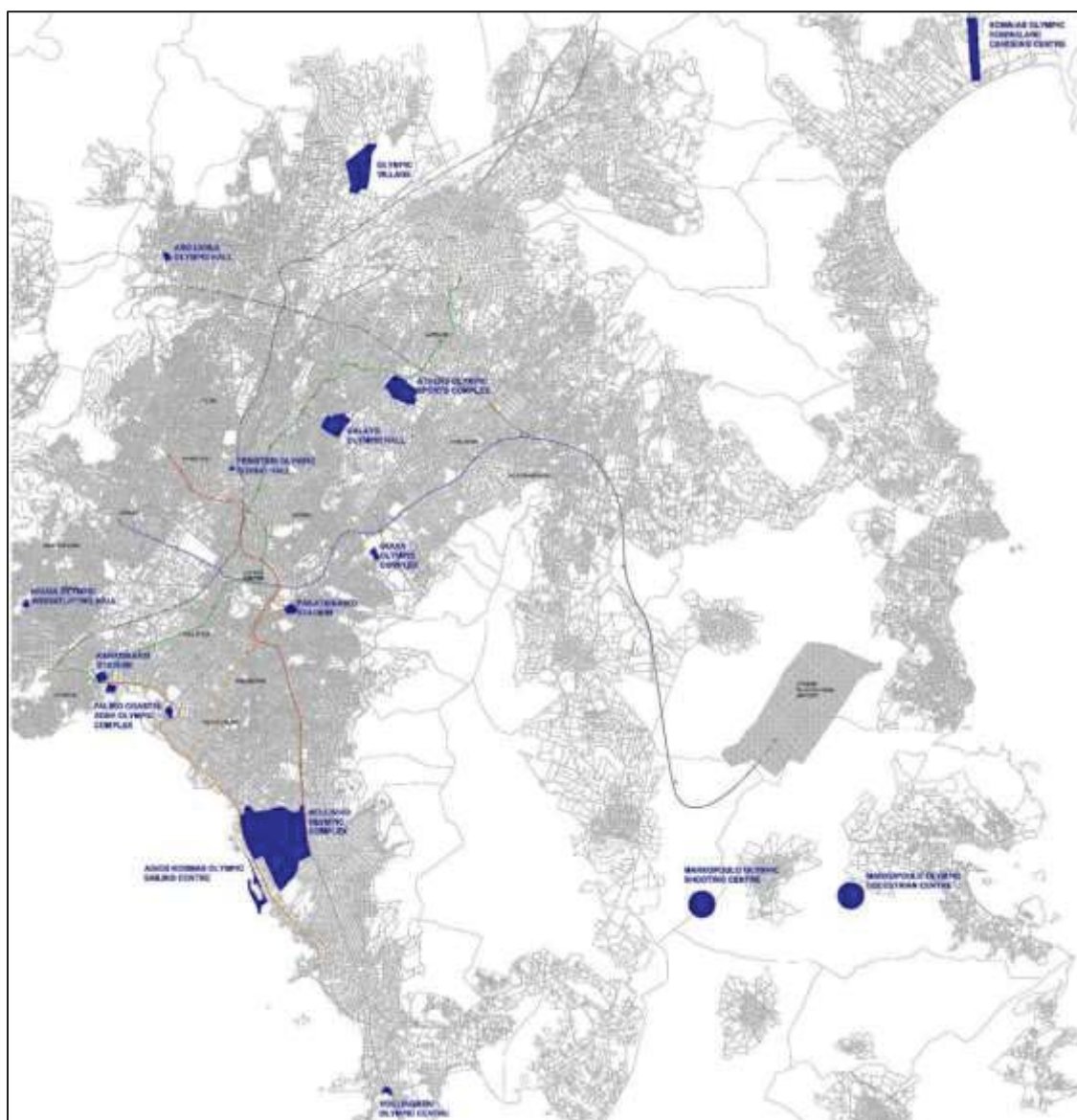

Figure 8.   Athens 2004: Olympic Games dispersed Venues

Figure 9.   London 2012: Olympic Games concentrated Venues

Conclusion

After over 10,000 years of life, the cities of walking gave way to the city of the car. This change was not at all smooth. It was accompanied by explosive industrial growth, dramatic increases in population and revolutionary improvements in technology, including the construction sector. Cities multiplied their surface, replacing much of their building wealth, then changed scale, form and social identity. Now face unprecedented threats to the future, obliging them to mobilize, reduce space and energy consumption, pollute less, to function differently. In the transport sector Sustainable Mobility is the only solution. Strengthening of walking and of the human presence on the street and other open public spaces is essential for functionality, the environment and sociability. But changing function involves changing the form. This challenge doesn't concern construction, would in addition have huge cost. Much could be achieved by splitting large in smaller land uses and their diffusion in space so as to get closer to the house in order to become easily accessible by walking and then by bicycle and public transport.

Great importance will be the strengthening of the role of the neighborhood, with the enrichment of some activities and by creating a more attractive road environment that will make it leavable. The neighborhood thus will be given opportunities for communication and socialization necessary to obtain consensus on sustainable policies and cooperation for a more fair, and economic coexistence in the environmentally fragile urban environment.

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