

THE SUSTAINABILITY OF ATHENS THROUGH ITS ATMOSPHERE UPGRADING

Roido Mitoula

Lecturer at Harokopeio University

Eleftheriou Venizelou 70, 176 71, Kallithea, Athens

Tel: 010-9345386, E-mail: mitoula@hua.gr

Dimitris Bouraimis

Civil Engineer, MSc in Water, Energy & Environment, Liverpool John Moores University

Eleftherias Avenue 24 – Kalamaki – 17455 Athens

Tel: 010-9833482 Fax:010-9839094 E-mail:dbouraimis@hotmail.com

1. INTRODUCTION

The sprawling of Athens, dense population, the generalised use of car and the subsequent circulatory system, overcrowding, created the reported problems of atmospheric pollution, noise pollution, aesthetics diminution, thermal accumulation and flooding in the Attica area. The difficult living conditions in Athens and cut-off of the population from natural environment reflects on the health and the psychism of the man of the city. It fabricates a shortage of spirit, a pathologic state and tendency for escaping to the countryside, to mountains and coasts, to villages and cottages, where he seeks pleasure.

In the area of the capital of Greece, in Athens, where it is established the major population of the country, the atmosphere of the city is worst than the atmosphere of most of the larger cities of West Europe. The notorious “nephos” was originally detected in September of 1979, but commenced earlier in the Attica sky and it keeps on suffering today. [1]

Ground morphology of the area of capital, existence of mountains around its three sides with narrow passageways between them, dense population, substantial and ongoing population, concentration of a great percentage of the total of greek industry and the rest, not agricultural activities, concentration of a lot of road transport means, private and public, very small percentage of coverage with green areas, are the major factor factors which lead to the creation of an important environmental problem for the Attica basin.

The contribution of transport means for certain pollutants is decisive. These pollutants are: Carbon Monoxide, carbohydrates, Nitrogen Oxide, air masses and smoke. Of the same importance is the contribution of industry in generation of other pollutants, like particles and sulphur dioxide. [2]

2. THE PROBLEM OF ATMOSPHERIC POLLUTION IN ATHENS

In the area of Athens, the Attica basin, atmospheric pollution is reported to be one of the worst in Europe. Industrial pollution and releases of private transport means constitute the grid of atmospheric pollution. Furthermore, if somebody adds on top of that, the sprawling of Athens and surrounding suburbs, the tight transport network and the restricted green areas in accordance with the 4.2 million of population, then he has a complete view of the difficulty of the problem that the city encounters.

The observed temperature aggravation in Athens is in under absolute interdependence with the development of photochemical smog (nephos), which endorses the city's atmosphere, and generally the Attica Basin. Nowadays, the rates of some basic pollutants like sulphur dioxide and lead have decreased, unfortunately though, nephos appears to be mutant, with ozone being the top-ranking pollutant.

The concurrent scientific point of view is that the car remains to be the major generative cause of photochemical smog in Athens due to the creation of Nitrogen oxides and ozone (chemical reaction of carbohydrates and Nitrogen Oxide). On the same time, the rates of micro-particles which come from oil utilisation and benzol included in unleaded benzene remain high (cancerous pollutants).

The Ministry of Environment, Land Planning and Public Works of Greece, started installing from time to time in 1974, stations for the measurement of atmospheric pollution for the area of the capital, in order to monitor the atmosphere's state. Data collected undergo statistical analysis for establishing long-time, seasonal, weekly and daily tendencies.[3]

The acceptable limit of smog for the whole year is 80mgr/m^3 . For winter seasons (10th October – 31st December) the acceptable limit is 130mgr/m^3 . The World Health Organisation (WHO) deems acceptable the maximum hourly rate of Nitrogen Dioxide not to exceed 400mgr/m^3 and the maximum 24-hour rate not to exceed 150mgr/m^3 . European Union has set the limit of concentration in atmosphere for Nitrogen Dioxide as well as ways for estimating it. Accordingly with the intended method of measurement, the limit for the capital was calculated to be 200mgr/m^3 .

The rates for Nitrogen indicate a tendency for chronic increase in the precinct of Attica. It also appears to be seasonal ups and downs with greater rates in the summer and smaller during winter, mainly due to the seasonal difference, intensity and duration of solar radiation, directions and average speed of wind. There is a slight reduction for ozone rates during weekends. The variations during a working week range accordingly with the station and the season. Furthermore, it is observed that in winter, in the Attica area, we have greater weekly balance. The cycle of daily variations follows the one of ranging primary pollutants which contribute in the formation of ozone, with chronic lag of three to four hours that is necessary for the completion of photochemical reactions. Higher rates are observed usually during the first afternoon hours and lower during night hours. Regarding the configuration of the daily cycle, a remarkable role is accomplished by the cycle of corruption of relative primary pollutants and solar radiation, which contribute in the constitution of ozone, and the cycle of corruption of Nitrogen Monoxide, which wipes out ozone.[4]

3. THE SHORTAGE OF GREEN AREAS IN ATHENS

3.1. Problems for Civil and Urban green areas in Athens

Up to a certain degree, problems of atmospheric pollution in a city could be cured or moderated by outdoor areas of the civil web, parks and groves, urban forests. Green areas are characterised those areas which are suitable for smaller or larger outdoors installations for servicing urban population, inside or in direct contact with the city.[5] Urban or civil areas are perceived areas, like forests, agricultural areas, or areas adjacent to the city, with inspected development or utilisation. Those areas in Athens neither are sufficient in extend, nor do they have the appropriate propagation. The rapid expansion of residential web in Athens through the whole basin, started during the 1950s decade, without any planning or prediction for urban green areas, resulting in today's Athens, having the smallest percent of green areas from every other European city, just

around 2.5m² for every citizen (while Vienna has 20m², Hague 27.7 m², Amsterdam 27 m²., Berlin 13 m², Rome 9 m², Paris 8 m², Salonica 2.7 m², Washington 50 m²).

Furthermore, the quality of such green areas in those minimal places, where it exists, neither is the best possible from a healthy point of view, appropriateness and composition of vegetation, that constitute them; nor it is the existence of suitable garden techniques modulation and elementary infrastructure , in most cases.[6]

On the other hand, there are capabilities of improvements for such urban green areas regarding their size and quality, as well as potentiality of improvements of their quality. Such attempts should concentrate around the following directions:[7]

- Settlement of proprietary matters and constitution of definitive cadastre with faster proceedings
- Fire-protection of urban green areas
- Land-planning regulations for land-uses
- Inspection of illegal constructions
- Improvement of green areas, with reforestation in urban areas and garden techniques intervention for civil green areas.
- Organization of pleasure works
- Reservation of areas for the expansion of green areas in the city

Nowadays, we could consider as urban green areas of Athens, those areas, which are inclined forest lands of the surrounding mountains of the basin, and have remained with no formation and have a view towards Athens; in other words, the total of mountainous areas of Attica. Urban green areas of Athens (or in broader terms, the formulated Attica) were never released from problems of fire and illegal constructions, despite the great area it possesses, resulting in this way, in a diminished development and framework, which would render it really and effectively operational for the city's system. At this point though, we should note that the best, from a territorial point of view, lands on the foothill of the mountains have been covered by the residential web and whatever has remained, in a great extent, are rocky areas. A lot of self-possessed forests in the areas of Parnitha and Penteli have been destroyed from repeated fires during the last decades and furthermore, a lot of attempts for reforestation had insignificant ending for the same reason.

3.2. Biological conditions of urban and suburban green areas in Athens

Regarding with urban green areas, the relatively big plant-covered areas of Athens are parks and groves. Most of them are originated from older reforestations. They are mainly immiscible, dominated by pines and cypresses. The grounds on which they have been located are mainly hilly. There haven't been any ground improvements and are not irrigated at all or irrigated irregularly. Furthermore, there is not a variety of different kinds. Nowadays though, there are a lot of capabilities for improvements that could render them richer in vegetation, healthier, more aesthetic and more functional.[8]

These parks are situated into areas of dense buildings and comprise the way out for the citizens towards natural environment offering them various leisure capabilities. Bioclimatic behaviour of parks is depends on their configuration on one hand and on their composition density of vegetation on the other. Therefore, these places could be distinguished into two main categories. On the first one, are ranked those kinds of green areas which have dense multi-level vegetation and are been crossed by passageways for walking. Such places are observed to have diminished temperature conditions and increased humidity, especially during the years' summer period. A characteristic

example is the Royal Garden (Ethnikos Kipos of Athens) which constitutes the first modulated space in a park in our country.

In the second category of parks we have modulated green areas which have multi-level but narrow vegetation and are crossed by asphalt roads where it is observed decreased temperature and a rise of relative humidity in places with comparatively dense vegetation, while exactly the opposite is observed on asphalt and slate covered places of the park, like for example Pedion tou Areos. Generally, parks and uncovered areas have an effect on microclimate conditions of the surrounding buildings.

Groves are situated not only in urban, but in suburban areas as well. In urban areas they usually possess hill surfaces and are surrounded mostly by densely built areas with fluctuated traffic pressure. On the other hand, in suburban areas, groves are situated in areas with low-height buildings and limited traffic pressure. From a bioclimatic point of view, during a day it is observed that there is a thermal differentiation which depends on the vegetation density. During nights there is a strong differentiation with clear temperature reduction and simultaneous increase of the relative humidity. Their participation in general improvement of the environment's conditions of the city is positive. This is ascribed mainly on the respectable area that they cover and on the shortage of traffic pressure, building settlements and the asphalt covered surfaces on these vegetation covered areas.[9]

Circulation of stray dogs (or even accompanied) discourages their use from the total of the population. Shortage of lighting during night and, generally, inspection, render parks and groves in shelter for drug-addicts, homeless, emigrants and criminality seedbeds.

Regarding suburban green areas, ground conditions, in a great extent, are extremely difficult for the development of vegetation and the improvement capabilities limited. Irrigation as well. There have been repeatedly burnt massive surfaces resulting to a problematic natural regeneration or it is time-consuming. Furthermore, they run great risks from fires, infringements and illegal construction. There are serious doubts about important damages resulting from atmospheric pollution (ozone was observed in high concentrations in the area of Parnitha).

Despite the previously mentioned problems, a suburban forest land is an open-air natural ground, which it could provide the urban system with important pleasure services and other functions of Athens

4. POSITIVE CONTRIBUTION OF OLYMPIC WORKS

As we know, Athens will undertake the organisation of the Olympic Games in 2004. Operation of the games supposes construction of a series of works. In Athens, there are going to be constructed works of two kinds (and from their construction we will have as a result positive and negative consequences). These works are distinguished in sports works and in general infrastructure works.

The question that turns up is how this construction will not harm the environment, and in general, how Olympic Games of 2004 will lead to the upgrading of atmospheric environment of the Attica basin or at least how they will not harm it, indeed at the moment that these works are rapidly carried out due to time shortage, without making adequate environmental planning and without always taking under consideration the opinion of environmental organisations about vegetation. A characteristic example is the rowing centre at Marathonas Lake, which undermines its flora and fauna.[10]

Athens 2004 has taken control of a series of environmental initiatives and programmes attempting with this way to protect the environment and in long-terms to be a benefit for Athens and upgrade living standards throughout the whole country. The initiatives and programmes are the following: [11]

1. Olympic ground vegetation
2. Environmental sensitization
3. Waste management and recycling
4. Environmental-friendly vehicles
5. Rational water management
6. Olympic Environmental Alliance
7. Protection and support biodiversity
8. Use of new energy technologies and energy-saving practices
9. Protection of natural resources

The targets of the above programmes are:

1. The Olympic Games to be organised and hosted in a healthy environment
2. To improve the environment in the city of Athens and generally in the Attica basin
3. To develop an environmental awareness on all those concerned with Olympic Games of 2004.

To achieve the above it is planned to plant the appropriate vegetation in order that guests coming for the Games will face a beautiful and green Athens.

Olympic Village will be constructed accordingly with the concepts of sustainable development and bioclimatic architecture. Also it will be taken under consideration the right orientation of buildings, good ventilation, and coexistence with places where there are parks and gardens.

Furthermore, provision will be taken for the management of waste, in order to minimise the volume of packaging and waste that will come from Olympic activities. On top of that, recycling of waste is been promoted. It is underlined that it would be positive to inform the educational sector and generally everyone who takes part in the organisation of the Olympic Games in matters of waste management and recycling, and generally protection of environment.

Up to today the application of the recycling programme has had a performance of 30 tonnes of paper and has rescued 510 trees, while on the same time it has preserved 945,000 litres of water and has reduced energy consumption by 123,300 KW. Furthermore, with recycling in scrap heaps there has been saved 756 cubic metres of useful space.

During Olympic Games there will be observed an increase on the use of vehicles due to the transportation of athletes, tourists, and in general, all the visitors that will come in Athens for the Games. On the other hand, vehicles, as it is well known, cause atmospheric and sound pollution, as well as other forms of pollution. Therefore, there should be promoted environmental-friendly vehicles, like small vehicles with low gas and noise emissions. Also, there should be promoted public transport means because they are more environmental-friendly, and on the same time, deteriorate the general movement of private vehicles. With this way we could probably achieve reduction in atmospheric pollution.

In recent years, in Attica, there has been evidence about another problem which is due to the reduction of rainfall. This is called scarcity of water, from which a lot of areas are threatened. Because Olympic Games will demand an increase in the consumption of water, there should be a rationalised use of water.

That is why there should be a reduction on the use of water and promotion of the use of new technologies like for example recycling of used water and pioneer irrigation techniques, in the installations and the village. All these of course, have to be done by taking suitable measures for protecting the quality of water and preservation of health of those who will take part in the Games.

During the preparation of Olympic settlements and mainly during the Games, a big crowd will be gathered in Athens, and this will disturb the usual environmental balance as well as the core of flora and fauna. Therefore, biodiversity should be protected and enhanced with new planning of spaces and other interventions. This should be mainly applied at the Olympic village, the Olympic rowing stadium and the coastal zone of Faliro.[12]

On the same time, the materials to be used for the construction of all works related with Olympic Games should be environmental-friendly and in general, all activities should target the prevention of an environmental destruction.

For the success of the works it is required the cooperation and communication between carriers of the public and private sector, Local Administration Organisations and non-governmental organisations. Therefore nowadays, carriers like Y.PE.XO.DE, the National Weather Bureau, and a lot of university constitutions and industrial unions are concentrating their attempts for the normal and successful organisation and carrying out of the Games in relation with environmental matters. Thus, cooperation, continuous communication, updating, information and coordination will refrain from unpleasant consequences and will resolve the problems.

As previously mentioned, Olympic Games will become the reason for working-out a series of works, essential for their holding. These works should be carried out with caution and planning, as well as absolute respect to the sensible environment of the Greek capital. If Greece succeeds in this, then Olympic Games of 2004 will benefit Athens and Greece, will not harm coming generations, but, on the contrary, will help them creating the best possible living conditions, quality of life and a lot of other benefits.

The results of such an attempt could comprise a permanent environmental heritage for Greece and after the ending of the Games could grant a clearer atmospheric environment.

5. THE ENCOUNTER OF ATMOSPHERIC POLLUTION THROUGH UPGRADING OF TRANSPORT AND CARRIAGE

The most characteristic from the changes that came with industrial revolution in developed countries, was the revolution in transport means. Past the railroad and steamboat, car and airplane are constructed. The last decade of the 19th century the take-off of a flying device is achieved with the aid of an engine. The first decade of the 20th century the airplane will cross the English Channel for the first time. On the first time, electric energy is used for the movement of railroads and is increasing their speed. In cities, there appears the first electric-driven tram, which replaces bus-coaches pulled by horses. Furthermore, the first trails for urban electric-driven underground locomotives (metro) were created, urban transport is improved and it is constantly increased the speed of the public transport means.

All the above took place in the industrially developed countries. In Greece, an economically-bounded country, the development of public transport means delayed to appear. With great difficulty until the 1880 decade the railway connecting Athens and Piraeus was constructed, and had just 9km length, while it took 12 years for the construction.[13]

Buses and taxis of that era were really inexistent. For that reason, citizens of Athens were transporting mainly on foot. In order to encounter this situation, the Greek government assigned public transportation to private enterprises. In this case, owners would buy buses, (of which most of the times they were drivers as well) and undertook all the obligations concerning operation and maintenance. The response from the private sector was huge, but this attempt, being very provincial, didn't prosper.

The next attempt that took place, and was successful as well, was the creation of KTEL (Common Funds of Buses Incomes). These KTEL were created for the management and coordination of buses.

The year 1953 could be characterised as landmark for the history of public transport means in the region of Athens since during that year we had the appearance for the first time of electrically driven buses (in Piraeus they had appeared 4 years earlier, in 1949). Time by time, electrically driven buses replaced all local Tram routes.

That was the time that started the attempt for the development of a metro system in Athens. The subordinate line was related with the first steamer rail track in Greece that was created in 1869.

During 1961, population in Athens started increasing importantly, with direct consequence the increase of the number of private vehicles and as a result of that the minimisation of use of public transport means. In order to confront this problem the following changes:

- The private company of Electro driven Transport was replaced by the public company ILPAP (Electro driven Buses if Piraeus-Athens and Suburbs).
- The private company of Greek Electro driven Rail tracks was replaced by the public company ISAP (Electric Rail track of Athens-Piraeus).
- The buses with diesel engines that were operating under the control of KTEL came under the possession of the public company EAS (Company of Urban Transport).

Despite all the attempts that took place from the Greek Government, the problem of existence of an extremely big number of private vehicles kept not only existing, but became even worst. The existence of the problem came clear with the degradation of the centre of Athens, entity of high rates of atmospheric pollution, high rates of accidents, as well as with the extremely high cost of transport in the area of the Attica basin.

For all the above reasons the need for finding a solution was imperative. One of those attempts, was "ATTIKO METRO" which was concerned around 1995 with the research of transport systems and with the Research of Development for Metro. Metro is compromised by 2 basic lines, line 2 Sepolia - Syntagma and line 2 Ethniki Amynta - Syntagma. From 15th of November 2000, line 2 (Sepolia - Syntagma) reaches Dafni, with 5 further kilometres and 5 stations. These two lines of the Metro, accompanied with the undergoing line of ISAP, constitute the body of an integrated urban transport system.

It is estimated that Metro is servicing over 350,000 passengers daily. After the integration of the works, it is estimated that this number will increase around 450,000, since in a posterior stage there will be an addition on the line, from Syntagma up to Monastiraki and from Sepolia to Peristeri.

The frequency of transit for the trains is every 3 minutes during peak-hours and every 5 to 10 minutes during the rest of the day. Generally it is sustained that by using Metro we save time since during peak transport hours the transit from the Ministry of National Defence to Syntagma demands

35 minutes by car, while by using Metro the same distance is covered in only 9 minutes. The most important though contribution of Metro is the protection of the atmosphere of Athens.

Like previously mentioned, it is intended to make an expansion of the subordinate Metro lines. Synoptically, we could say that these extensions include:[14]

- Extension of line 2 from Agios Antonios up to Peristeri and Petroupoli and from Dafni, up to Glyfada.
- Creation of a new branch for line 3 from the centre of Athens towards Kypseli and Galatsi
- Extension of line 3 from Monastiraki and Aigaleo
- Extension of line 3 from the Pentagon up to Stauros Agias Paraskevis and later on, up to the new Airport of Spata.
- Creation of a new branch for line 3 from Panormou station up to Paradeisos Amarousiou, across the length of Leoforos Kifissias.

These extensions aim at servicing the total of Attica's population, while an intermediate target for Metro is to correspond to the demands of the Olympic Games of 2004 and the new Athens International Airport.

Specifically, until June of 2004, it is estimated that a lot of the previously mentioned extensions will be materialised. Through these it is anticipated that 200,000 people will be serviced on a daily basis. YPEXODE and "Attiko Metro" especially, prostrate significant attempts for the integration of Stavros station, in order to make possible the boarding to urban Railtrack which will reach "Eleftherios Venizelos" airfield.

In conclusion, concerning Metro, we could say that it is one of the fastest, safest, most expensive and practical public transport means. It is not accidental the fact that a great part of Attica population prefers it for their transportation. Indicatively, it is mentioned that Metro led to the reduction of the number of cars that travel in central roads of Athens by 70,000. This number corresponds to almost 200,000 less routes daily. Therefore, it is significant its contribution to the fall of rates for atmospheric pollution.

A second attempt targeting the improvement of atmospheric quality of Athens and satisfaction of the increased transport needs which is already materialised by the Ministry of transport and communications. This attempt is related with the creation of a modern Tram Network in the greater Athens area. A part of the works is expected to finish by 2003. Olympic Games are one of the reasons for which again the creation of Tram is precipitated.

The whole works is expected to finish in 2 periods. During the first period, there will be created 2 lines, with 20.7km total length. The first line, with a length of 12.7km will include the route: Zappeio-Fix-N.Smyrni-P.Faliro-N.Faliro (ISAP station). The second line, with a length of 8km, will include the route: P.Faliro-Ag.Kosmas-Glyfada.

During the second period of the works, there will be created 3 more lines with a total length of 16.4km. The first line includes the route: Peiraias-Keratsini, while the second one: Goydi-Leof.Aleksandras-Votanikos and the third: A.Patisia-Pl.Aigyptoy.

Regarding the lines of the first period, it is estimated that the time distance between trains will be 10 minutes and 6 minutes (during peak-hours). It is also estimated that Tram has the potential to transfer 2560 passengers during peak-hours and 1140 under normal circumstances. Indicatively it is reported that the cost of the first period comes up to the amount of 107 billion drachmas.

Tram creation is expected to bring a lot and different changes to the current transport system of Athens and to improve in high rates the atmosphere of Athens.

Characterising the choice for the return of Tram, it could be vindicated that it is right, since Tram has a lot of advantages. One of the basic advantages is that it can contribute positively to the reduction of atmospheric pollution, as long as it is environmental-friendly, safe, fast, trustful, comfortable and technologically modern. Furthermore, it has the capability to avoid traffic jams, it is compatible with pedestrians and adapts in green areas, pedestrian zones, etc. it has an affordable manufacturing cost, maintenance and operational, it is capable to move underground and can function additionally to all public transport means.

Greece is not the only country that includes Tram within public transport means. Already, a lot of countries acknowledging its positive effects, and use it broadly for transportation of citizens.[16]

On top of that, it's been shaped the road network in an attempt to improve conditions in the centre of Athens. Moreover, it is foreseen the modulation and integration of road rings. Until 2004, and because of Olympic Games it is expected a great improvement to the transport scenery in Attica. The need for the easiest possible access in the areas of which Olympic Games are taking place, as well as the need for our country to show visitors a good organised transport network, guide to taking specific measures.

In particular, there are going to be sanctioned special express bus-routes which will drive the passengers to the sports locations and will commence from central points in Athens. Furthermore, most likely is the expansion of exclusive bus traffic strakes. Also, on top of the existing works will be added: [17]

- 120km of modern road network
- 90km of upgraded road network
- 40 overpasses
- 32km of Suburban Rail track network
- modern stations of ISAP and OSE
- a new super modern centre for traffic management

Summarising, somebody could say that encountering environmental problems of atmospheric pollution in Athens, originated from traffic jams, there are available 3 kinds of solutions:

- better land planning
- generalised use of public transport means
- development of peak technologies for the better management of space and traffic

In general, it is accepted that the more we use urban public transport means, the less atmospheric pollution of our environment will have, and generally the cities' living conditions. Over and above, the role of Public Transport Systems is upgraded, on the contrary with past.

6. CONCLUSIONS – PROPOSALS

There is no modern city that without coordinated attempt could succeed sustainable development and confronts the modern problem of atmospheric pollution. The cost of most of the works taking place targeting Olympic Games of 2004 in Athens is high and is expected to aggravate citizens with additional taxes. Despite that, the expected gain will be bigger and this is because the

city of Athens and generally the country will be praised abroad. On the same time, works are going to improve the much-affected atmospheric environment of the city. [18]

The problem of the environment's pollution, which comes from the exceedingly increased number of cars that circulate today in the capital of Greece, is expected to improve, since the measures taken give greater emphasis on public transport means that should service as many citizens as possible, with as little cost, either environmental or economical. [19] There have already started been attempts. A characteristic example is Metro and Tram. For the further contribution of transport and carriage to the improvement of atmospheric environment it is proposed:

- Immediate construction of an extended suburban rail track network and expansion of Tram network in Athens
- Immediate application of four traffic rings which will cover the whole basin of Attica
- Dispatch of the big road interference (Olympic ring – Attiki Odos – overpasses – suburban avenues etc)
- Immediate priority to the integration of Metro network with length of 160km
- Integrated civil development of underground parking spaces for the centre of Athens, as well as its' districts.
- Planning of a broad bus-road network, which will focus on the stations of constant orbit transport means
- Development of trustful modern technology Public Transport Means (rotary buses etc) and orientation of the public on their use, with configuration of the corresponding attitude and emphasis on persons of younger generations
- Development of ecologic transport means, like bicycle, electric car, electric motor-cycle with corresponding infrastructure

Furthermore, concerning with the preceding text, the need for expanding urban and suburban green areas in Athens emerged. In conclusion, it is underlined that urban green can positively contribute to the depollution of the atmosphere of Athens. Therefore, it's role is deemed singularly important for:

- Long-term and often pleasure
- Offering better climate conditions to the citizens. This matter for the area of Athens is regarded of a great importance especially during summer periods, for hot summer days, days of heat, where the city's climate turns into tropical or deserted. Taken as a fact the inadequacy of vegetation in space, this attempt should turn to improving vegetation
- Decoration
- Noise reduction
- Withholding atmosphere suspensions
- Land stabilisation

Parallel uses of urban green areas, like sports installations, cultural activities, and it would be ideal to coexist in the same area, provided that urban green areas have adequate size. The role of suburban green areas is also regarded very important for Athens for:

- Offering short-time or daily leisure
- Stabilisation of the grounds and flood-preventing protection of urban web
- Special forms of exercising (walking, jogging, mountaineering, climbing, etc)
- Contact with the natural environment and environmental education
- Improvement of climatic conditions
- Clearing the atmosphere's pollution

Based on the above, for urban green areas, it is proposed the transformation groves into parks. This could be long-term accomplished under the following basic interferences:

- Improvement of ground conditions
- Stirring up of ground
- Ensuring water and full irrigation systems
- Enrichment and improvement of vegetation
- Gardening techniques (passageways, squares)
- Rudimental services (seats, WC, playgrounds, small refreshment stands)
- Lighting during night operation and crime prevention
- Cleanness

In long-term, it is demanded taking statutory measures; accordingly with those, general supervision for protecting and controlling the changes of uses to remain to the Ministry of Agriculture. Ownership, use and management should be passed to municipalities. Furthermore, it is proposed to find new spaces for increasing green areas, as well as transformation into green areas, of areas of special functions that there is no reason to remain under the urban web. Of the same importance are the following interferences:

- Seedbed support, which will cover all the municipalities of the basin. Today, this does not exist. The need to rejuvenate vegetation is continuous
- Education of experts (garden technicians, agriculturists, foresters, landscape architects) which will staff the services for green areas of municipalities
- General function regulation for urban parks, trees and currents

Regarding with suburban green areas, deemed essential in a long-term level the following:

- Fire protection. Planning of fire protection with maintenance of forest road networks and fire protections zones, polling, cleaning, construction of water reservoirs and fire guardhouses-observation posts and all the classic measures and works for the fire protection of forests.
- Reforestation, by giving priority to better grounds, where there are ecological requirements and use of indigenous kinds, because the capability of ground improvements is limited, as well as the possibility of continuous irrigation in big and inclined surfaces.
- Leisure works. Passive or energetic leisure that cover a broad spectrum of activities, like distinctive works and elemental services, like for example, walking, running, up to permanent and effective interferences to the natural environment, like hunting, fishing, horse-riding, bicycling, etc.

The politics that should be followed for a long-term time interval relatively with urban green areas concern:

- General planning and expert management for suburban green areas
- Incorporation of land-planning
- Statutory delimitation of the meaning and function of suburban forests and the clear designation of the visitors as well as necessary interferences
- Clarification of duties
- Regulatory measures (protection from illegal constructions)
- Settlement of problematic construction corporations in forest spaces
- Cadastre and it's extensions

As a conclusion, we would like to underline that today, there is a denotable attempt in Athens, targetting it's total environmental upgrade. If Greece finally succeeds, the works that are been carried out, to be accomplished with attention and sensibility in order fro the Greek capital to

be relieved from pollution and the notorious “nephos”, then the benefit will be so important for the city in one hand, and for the whole country in the other, based on the fact that almost half of it’s population lives in the region of Athens.

The positive results of this attempt, could give a permanent environmental culture in Athens and help it to regain the well-known and famous in the centuries “blue Attica sky”.

BIBLIOGRAPHY

1. Mitoula R., Patargias P., Stefanou J., **“The recovery of the Physiognomy of Athens and it’s Environmental Upgrade”**, Material & Building Magazine, issue 45, October 1999, p.p. 36-47
2. Scoh Michael, **“Ecology”**, Doudoumi publications, Athens, 1996
3. Patargias P., **“Olympic Games of 2004 as staring point for the physiognomy of Athens”**, chapter in the book called “The physiognomy of a place – The Greek city’s character over the 21st century”, Urban Planning Structure Laboratory Publications of N.T.U.A., Athens 2001, p.p. 168-186
4. Ministry of Urban Planning, Housing and Environment (YPEXODE), **“The atmospheric pollution in the region of Athens”**, Technical Report, Volume 2 – Pollution Sources, Athens, March 1989, p. 361
5. Miller G.Tyler, **“Living through the Environment I”**, ION Publications, 1999
6. Gimopoulou M.A., **“Landscape Architecture, Urban areas planning”**, Volume A, ZITI Publications, p.p. 10-11
7. Mitoula R., **“Window for Green”**, HEALTH & STYLE Magazine, issue 7, Athens, 29th of June 2002, p.p. 38-39
8. Mitoula R., **“The recovery of the physiognomy of Athens through upgrading of green”**, Suggestion at the Meeting with subject “The recovery of the physiognomy of Athens and environmental upgrade”, National Institute of Research, Athens, 5th of June 2002
9. Efthimiopoulos I., Modinos M., **“The Sustainable city”**, Exploratory Institute of Environmental Research, STOHASTIS Publications, Athens 2000, p.p. 114-120
10. Kassios K., **“Olympics and green in Athens”**, KATHIMERINI newspaper, July 2001
11. Patargias P., **“Olympic Games 2004: The environment of cosmopolitan Athens is upgrading”**, chapter in the book with title “2001 – Environment, White Book of technology, products and envoronmental services”, Annual Publication for the protection of the environment, MEDEON Publications, Athens 2001, p.p. 114-120
12. www.athens2004.gr/page/default.asp?id=332&la 1
13. Three-month Publication of Working House Organisation, **“Housing and Residencies, Olympic Village the greater work of the Olympic Games ”**, issue 2, p.p. 8-15
14. www.ametro.gr/cgi-bin/showtransit1.cgi
15. www.ametro.gr/cgi-bin/showdevelopgr1.cgi
16. Patargias P., **“Climate Conditions and atmospheric environment in Athens are protected by the improvement of traffic and green upgrading”**, DEURBANISATION OF LOCAL ADMINISTRATION AND SUBURBAN DEVELOPMENT INSPECTION, issue 27, Athens 2002, p.p. 62-73
17. www.yme.gr/trans/tram/tram2.html
18. Athens 2004, Olympic News, issue 6, September 2001
19. Mitoula R., **“The consequences from European Unification to the physiognomy of the Greek city”**, PhD Thesis of Architectural School of N.T.U.A., Athens 2000
20. See 15, page 65