

DIPLOMA RESEARCH THESIS

THALIA - ANASTASIA KAKOLYRI 7019

***“PEDESTRIAN NETWORKS: MEANS OF
SUSTAINABLE URBAN REGENERATION”***

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PROLOGUE

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OBJECT OF RESEARCH THESIS

The research thesis deals with pedestrian networks as means of urban regeneration, through a comparative evaluation of implemented practices. It will be recorded and evaluated restorations and especially pedestrianization programs in Europe and Greece, in recent decades, through indicative examples. The degradation problems that characterize redeveloped areas and theories that practiced, will show off, among other things, any obstacles encountered and made it difficult to adjust similar programs in Greece.

The analysis focuses, although, on footpaths and pedestrian networks, trying to highlight their importance in urban networks, as a source of proper energy management, sustainable city's design and finally as an important component of its own regeneration.

WORKING STRUCTURE

The research thesis starts with an analysis of the modern city as it was during the last decades, throughout the era of deindustrialization.

It develops the concept of 'sustainability' and the conditions that must be satisfied by a sustainable city, such as its structure, its inputs-outputs, its open and free spaces created in the urban network, as long as the citizens' important role so as to achieve sustainability's objectives.

Analyzes the definition of "urban regeneration", with its types and problems found in areas identified as in need of redevelopment. Focuses on Greek reality and all reasons that caused degradation problems and the way they occurred in Greece.

Two concepts, "sustainability" and "regeneration", come in the subsequent chapters to coexist in order to examine how environmental factors were involved in restorations. Considers the guiding principles of regeneration in European countries, where have already been implemented such actions in a wider scale.

European programs are briefly mentioned, as long as Greek laws setting restrictions and guidelines during the last decades.

Discusses the definition of urban microclimate of an area and the physical parameters (solar radiation, wind, urban green - vegetation and water), as much as the parameters of the built environment (envelopes, land and transportation) that influence it.

As a final parameter, transportation affects the microclimate of the built environment, highlighting the significance of public means of transport. The next chapter, therefore, focuses on the problems of public transports and the main factors in a public transport network design. Such analysis for a proper operation seems clearly the importance of every road network. The regulatory role of street is examined, next, and how it emerged to play such an important role in public life, referring the design parameters and geometric characteristics of the urban road network.

The trends of our time want the pedestrians to hold the leading role towards cars, starting to open networks of footpaths, mentioned in section "FROM STREET TO PEDESTRIAN AREA". Theories and reflections are analyzed, which are related to the creation and recorded targets that urban design is called to achieve through the proposal design for pedestrian networks. The next section gives examples of urban regeneration, particularly pedestrianization, and identifies the initial problems of intervention areas, and afterwards the objectives, methods, practices, and the conclusions drawn from the implementation of such reconstructions and pedestrianization.

Two major European cities are analyzed: Delft in Netherlands and Vienna, capital of Austria. The represented examples have different background and approach, in order to obtain a comprehensive view of how urban regeneration in Europe works.

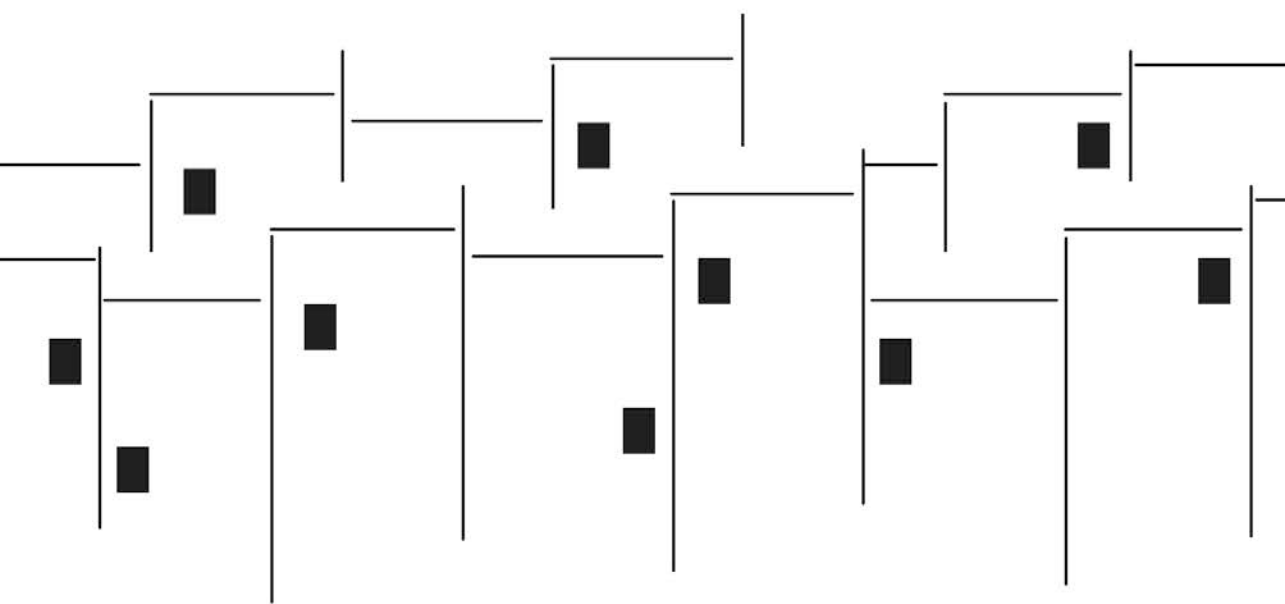
From Europe to Greece and through the Greek regeneration practices, efforts will be made to identify any different approaches, methodology and draw useful conclusions, after the analysis of the problems occurring in regeneration areas.

Three different examples are selected, in terms of scale and historical development of effective landscape:

- Athens city centre
- Larissa city centre
- Two historical districts in Veroia.

These cities were selected based on the relationship between their goals, methods, tools and perspectives of redevelopment practices used as well as the final results obtained. This research thesis concludes with the presentation of a general evaluation regarding the European and Greek regeneration programs. Furthermore, different interventions are under comparison based on methodology, effectiveness, as long as whether the original objectives were ultimately achieved.

Sustainable approach is currently a significant issue. Thus, by interpreting conclusions exported in each case, it also becomes evident whether and in what way environmental targets were set and achieved in the intervention sites.



1.1 THE CITY

Many fundamental problems such as social, financial, and environmental appear nowadays in European city centers. About 80% of European citizens live in cities, which make European Union the most urbanized region in the world. Apart from a few large urban sites, the European territory is a dense network of small and medium-sized cities. Approximately 20% of the population lives in districts with more than 250,000 inhabitants, another 20% lives in medium-sized cities from 50,000 to 250,000 residents while 40% of the population lives in smaller city centers with 10,000 to 50,000 inhabitants.

Cities concentrate the largest and most important part of economical, but also social activities of man. Following the strong urbanization trend, which started in the 18th century and the industrial revolution, the postwar European city is still characterized by an ever-increasing intensity in the use of urban land.

The first settlements were founded and shaped in order to meet human basic needs, such as safety, comfort and organization. Requirements gradually increased to satisfy complex requirements, some of which were created by the existence and growth of the city itself, like public administration, policing and provision. Since antiquity, the city included functions of secondary and tertiary sectors. In the modern city, with its large number of people, who are producers and consumers at the same time, settled large scale industrial and other productive activities. These activities are no longer feasible to harmoniously integrate into the city, although they do have the power to impose their presence and adverse environmental effects (due to the job places they create).¹

In the 20th century the projection of living standards in the city, as opposed to the difficult working conditions in rural environment and the living conditions in secluded countryside, which also provide people with only a few opportunities for entertainment and education, led residents with rural background - without urban experience but with difficulties in adaptation - in urban centers. Especially in Greece, where state care and design usually follow the evolution of facts, the increasing demand for housing (which was initially intensified with the arrival of the Greeks from Asia Minor after the Asia Minor disaster), culminated in the postwar period, in the form of speculation by the real estate sector, as combined with laws such as compensation, and managed within a few decades to convert the suburban area into building sites and trample forest or coastal land and precious habitats.²

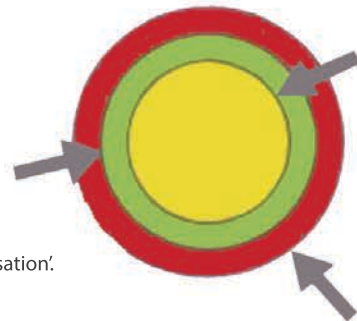


Figure 1.1.1 Display of 'urbanisation'.

¹ A.Athanasouli, A.Aravantinos, Th.Vlastos, "Design and Environmental Impact Assessment Methods" Vol 1, Publishing HOU, Greece, Patras 1999, pp.: 39

² A.Aravantinos, Th.Vlastos, E.Emmanouil, "Introduction to Natural and Human Environment", Vol B1 Publishing HOU, Greece, Patras 1999, pp.: 174-175

The city extends to its borders, intensifying its inputs (cars, people, goods, energy, water, etc.) and outputs (people and cars, infrastructure and their associated costs, litter and waste of processed products, etc.). In Western Europe, recent years represent a period of significant economic change, where some productive sectors subside, giving their place to others. One of the key elements of this new age is the development of services (up over 50% of total employment) and the contraction of the industry.

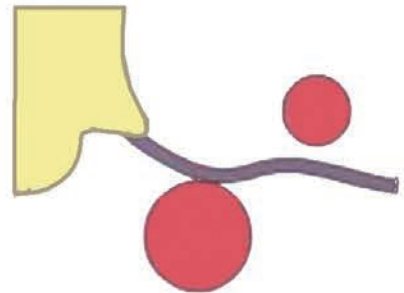
Nevertheless, the so-called “deindustrialization” is only about job losses of those employed in the industry and not about the actual industrial production, which increased in absolute terms. The technological evolution and automated production lines were the main reasons for the occurrence of the restructuring of the overall economic system.³

However, changes in producing structures are always reflected in the spatial structure of cities. In Europe, the economic growth of the 20th century has been in line with the increasing urbanization of the population. In today’s post-industrial era, this continuous, for decades, urbanization process seems to be disturbed. The new era is now marked by “suburbanization”. As it is evident from the interpretation of the term, the suburbanization is the expansion of traditional urban centers beyond the original boundaries. The expansion tendencies have been facilitated by the construction of ring roads, enhancing the car use and generally the inputs and outputs transaction to and from the center of the city.³

The suburbanization originally started by the 60's and the reasons are:

- Production rates introduced and imposed by the new technology, required new, larger and differently structured production areas.
- The rising cost of land inside urban networks of cities mostly claimed by services and trade market.
- Tendency to improve the living standards of citizens seeking more comfort and higher quality of living.

Figure 1.1.2 Display of 'suburbanization'.



These dynamics combined with poor urban planning policies have resulted in massive displacement of industrial plants on the perimeter of cities, which influenced the location of residence, and the expansion of urban network.

The changes in production structures are always reflected in the structures of cities, in which they occur. The so-called “urban crisis” has thus occurred, as a result of financial change and the implicit rise of unemployment. On the one hand service facilities, offices and shops in the city center and, on the other hand, the elimination of the traditional bourgeois to the suburbs brought the gradual depopulation of the city, especially after working hours. The natural and therefore social depreciation in certain areas and in particular the center has led, in turn, to the change in social stratification. Marginalized groups, ethnic minorities, economic migrants, etc. settled in the now deprived areas, while environmental problems have exacerbated.

³ D.Ikonomou, G.Petrakos, “The development of Greek cities - Interdisciplinary approaches of urban analysis and policy”, Publishing Guteberg, Greece, Volos 1999, pp.:13-24

As reported in surveys conducted by the EU, the suburbs of Lyon and Manchester, for example, seem to have more in common with each other than the downtown of these two cities have with their circumference. The shortcomings associated with poverty are cultural, political and social exclusion, violence, crime, drugs, and racism. Programs for social reintegration of marginalized populations pose, most often, the focus of the effort on the labor market. Employment is considered as the best way to escape poverty and phenomena involved.³

Most modern cities are divided into several areas: in commercial neighborhoods and residential areas, historical centers and suburban housing – no social activity, office zones deserted at night, shopping malls, regional campuses etc. Many suburb areas are places of actions of vandalism and crime, due to this unambiguous urban development that deprives them of the possibility of employment, social and cultural life and leads in isolation. To regain control of urban spaces two options are imposed: a better spatial planning, so that the concept of the neighborhood regains its meaning, and proper function of public and private means of transport. Neighborhood should function properly, which means that will develop in balance and diversely, developing in the meanwhile economic, social and cultural activity in the area, through these activities increasing employability.³

A city must provide its residents with a high quality environment in which one can live without danger. In order to put an end to uncontrolled exploitation of natural resources in the city (air, water, soil, noise environment, living space, etc.), the management of urban development now needs to integrate economic and ecological requirements in the logic of sustainable development. The maintenance and improvement of the environment is an area that provides new employment forms.

³ D.Ikonomou, G.Petrakos, "The development of Greek cities - Interdisciplinary approaches of urban analysis and policy", Publishing Guteberg, Greece, Volos 1999, pp.:13-24

1.2 THE CONCEPT OF SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT

The term 'sustainability' or 'sustainable development' first appeared in English and simultaneously defined a development which will vary within the limits of resistance of natural ecosystems and resources that could be maintained on the long run.

According to the definition given by the United Nations (1987) "Sustainable Development is the needs' coverage of the present, without compromising the ability of future generations to meet their own."

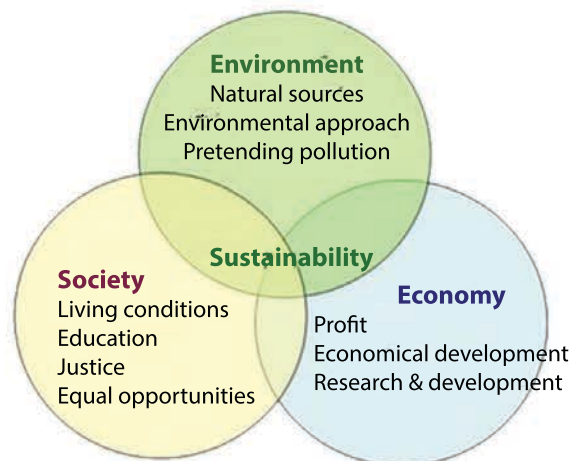
In particular, therefore, it implies:⁴

- A prudent management of resources.
- The saving of consumable resources and ensuring the rebound of the renewable ones.
- The adjustment of all human activities and the gradual change of their living standards.
- Developing technologies to respect the ecosystem and finding alternative forms of energy.
- Developing policies to mitigate the expected reactions not only of productive groups, but generally all citizens.

Integration of sustainability in urban planning is vital for improving the welfare of society and ultimately the survival of the cities themselves. In our days the concepts of environment have now incorporated, energy stocks, transportation, environmental conditions, and the impact of human activities on the environment.

The aim for the future is to create human-centered cities. According to philosopher Aristotle, the city should be designed to make citizens safe and happy.

Figure 1.2.1 Sustainability⁵



⁴ A.Athanasoulis, A.Aravantinos, Th.vlastos etc, "Desining, Environmental Impacts and their Assessment Methods", Vol. A, Publishing HOU, Greece, Patra 1999, pp.:36

⁵ www.google.com

1.3 INTERNATIONAL CONDITIONS FOR SUSTAINABLE CITY

Two texts, of different background and acceptability, indicate the direction towards the implementation of the Principles of Sustainability in the City: the Charter Aalborg (1994) and the Charter of Athens (1986).

The first Charter of Athens was elaborated and approved in Athens in 1933 by a group of enlightened architects and planners, with the decisive contribution of Le Corbusier. This treaty was abolishing the existing structure of traditional towns and encouraged the creation of new, comfortable and bright buildings, highways, many areas green and segregated land use.

In 1994, eighty local governments from Europe and 253 representatives of international organizations participated in the European Conference of Cities and Towns for sustainability in Aalborg, Denmark. They thus undertook the commitment to start drafting local programs implementing sustainability, development long-term actions, establish continuous monitoring these actions and a European campaign to spread the whole exercise.

In 1996 a group of Greek Town Planners, after two years of work, presented the New Charter of Athens, which was diametrically opposite to the first one, having a clear social orientation. It suggested mixing of uses, proper usage of resources, preservation of natural and cultural heritage and the view that the city was not determined by “experts and technocrats” but by social forces that consist it.

The pronouncements of Aalborg and the Charter of Athens may sound somewhat theoretical, but a number of applications in Europe (historic center regeneration San Diego Della Compostella in Spain, Dublin central area, historic center city of Arhus in Denmark, etc.) shows that they are feasible, even fragmentarily.⁶

The crossing point of the views included in the Aalborg Charter and Athens leads to outline the sustainable city.

⁶ A. Athanasoulis, A. Aravantinos, Th. Vlastos etc, “Desining, Environmental Impacts and their Assessment Methods”, Vol. A, Publishing HOU, Greece, Patra 1999, pp.:45-46

1.4 SUSTAINABLE CITY

1.4.1 STRUCTURE

Sustainable cities must be polycentric. Composed of cores that will include the main uses (administration, services, commerce, entertainment, etc.) and their surrounding tissue developed in walking distance to avoid motorized mobility. These uses will be mixed. The cores will connect by a network of quick means of public transport.⁶

The neighborhoods will be presenting a blend of uses, mixing types of residences and concentration of various interests, thus constituting the background of a sustainable city. Direct effect, therefore, among other things is the coexistence of different social layers in the same area to stop social racism and characterization according to social stratification. All regions will be valued equally and the design goal will be the social advance of the lower layers and providing a safe and healthy environment for citizens.

Figure 1.4.1 Polycentric cities approachable to the pedestrians.⁷

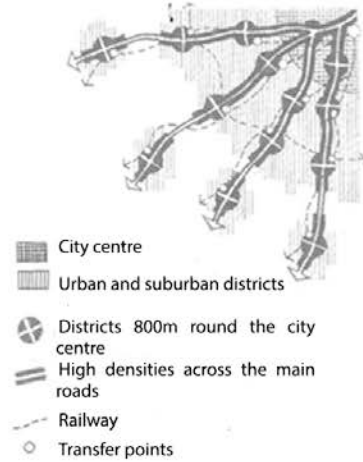
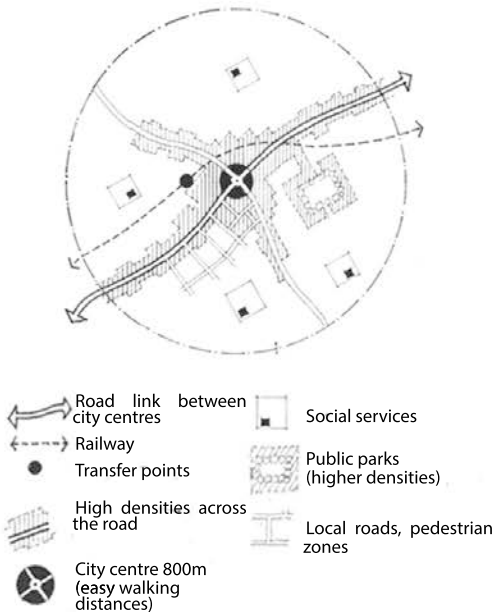


Figure 1.4.1.2 Local centre of a sustainable city.⁸



Mixing the uses will give life to every corner of the region through commercial uses, residences and passersbies in the roads. Small distances and pedestrians' opportunity to move are a key factor to create a both safe and pleasant environment, so that the inhabitants will accept the invitation and the acquaintance with every urban space and social activity.⁸

⁶ A.Athanasoulis, A.Aravantinos, Th.vlastos etc, "Desining, Environmental Impacts and their Assessment Methods", Vol. A, Publishing HOU, Greece, Patra 1999, pp.:45-46

⁷ Thomas Randall, "Sustainable Urban Design", Publishing Spon Press, Great Britain, 2003, pp.:15

⁸ Thomas Randall, "Sustainable Urban Design", Publishing Spon Press, Great Britain, 2003, pp.:16

1.4.2 INPUTS-OUTPUTS

The inputs-outputs, which can be materials (raw materials, commodities, water, fuel, waste, etc.), or human (people moving through various means of transportation) and intangible (information, knowledge, ideas, standards, etc.), will be under continuous observation and design so that their flow will no longer be linear, but circular. The new city could be equated with a circular ecosystem, which introduces limited resources and exports nothing but positive outputs.

Figure 1.4.2.1 Linear and Circular city.¹⁰

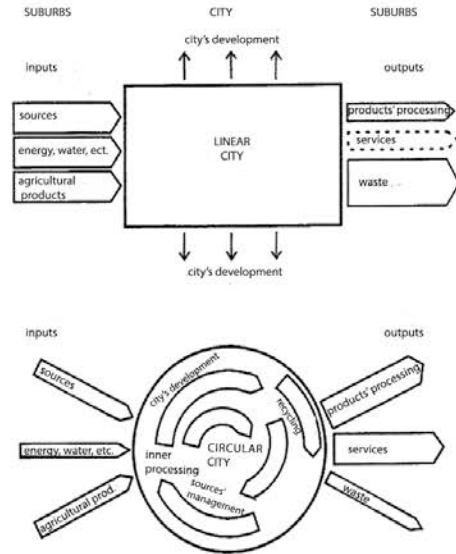
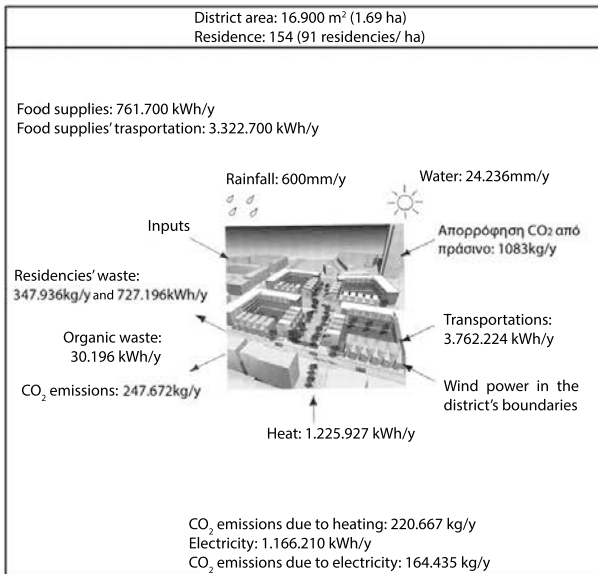


Figure 1.4.2.2 Example of urban planning – London¹¹



In figure 1.4.2.2 the neighborhood of street at Coopers Southward (London) is illustrated, as an indicative example of urban system with its energy flows and materials.

All integrated studies are made correspondingly where the entire city is examined, as a unified system / organization, where each region affects and is being affected.⁹

⁹ Thomas Randall, "Sustainable Urban Design", Publishing Spon Press, Great Britain, 2003 pp.:3

¹⁰ Th. Papagiannis, "Desining, Environmental Impacts and their Assessment Methods", Publishing HOU, Greece, Patra, 1999, pp.:42-44

¹¹ Thomas Randall, "Sustainable Urban Design", Publishing Spon Press, Great Britain, 2003 pp.:8

1.4.3 NETWORKS

Networks are the waterworks / sewerage system, waste collection networks, networks of energy supply (electricity, gas, heating), telecommunication, telematics, broadband networks, as well as the transportation networks (wheeled and pedestrian). The efficient and economical service flows requires at least part of them to be covered by underground networks (telecommunications and telematics, sanitation, waste, also transportation-subway).

On transportation, sustainable city must channel long distance traffic to isles/ routes and regional rings, ensuring seamless flow, aiming to strengthen public transport. So there must be a hierarchy of roads, giving priority to the movement of pedestrians and bikes. In particular, the hierarchy must be clear about interurban networks, as they usually entrain on urban geography. Along with the big roads, commercial activities are being attracted, which in turn drag residential complexes, extending the city beyond its limits and simultaneously attenuating the coherence of the urban web (suburbanization).

Sidewalks must have correct geometry, configuration, equipment and frequent crosswalks for pedestrian safety. There must be networks for pedestrians and cycling, as well as mild traffic streets or streets-yards.¹²

1.4.4 FREE SPACES

Open spaces (green areas or squares) are part of the wider planning but first they must be integrated into a pedestrian movement network. The motion rate of a pedestrian is much slower than that of the car, so the pictures' rotation of landscape, colors, materials and interests should be much faster in order to attract their interest during their walk. The car drivers do not come into direct contact with the surrounding space, they simply skip it, which means that they do not have any substantial aesthetic requirements. Instead, pedestrians have functional and aesthetic requirements, as they become a part of moving space, as they experience it, feel and touch it.

The consolidated so, open spaces allow passage from the suburban green to the lawns and courtyards of the building blocks which, being free of fences, are part of the total free and accessible city space, through parks, squares, pavements, archaeological sites and public building yards.¹³

¹² A.Aravantinos, Th.Vlastos, E.Emmanouil etc, "Intoduction to Natural and Human Environment", Vol. B1, Publishing HOU, Greece, Patra1999, pp.: 157-185

¹³ www.greekarchitects.gr – Prodromos L. Tzanetakos, "Architectural views – The regulatory role of the pedestrian zones in society", Greek Architects, 10/15/11

1.4.5 URBAN FREE SPACES

The city produces sites, in spite of any design, which tends to fill them with clear functions and meanings, but ultimately appear as areas lacking one clear role. These are the so-called "urban free spaces", being abandoned camps, idle production facilities, small gaps articulated in the urban network, islets between avenues, in general places that were trapped in the city limits. Their presence usually causes embarrassment. Modern city "fills" these urban "spaces" with entertainment complexes, shopping centers, parking lots or sports facilities. In sustainable city although, "free urban spaces" are treated as contribution to the landscape of the city and work in conjunction with public open spaces.¹⁴

1.4.6 ENVELOPES

In sustainable city the basic rules are maintenance, modernization and reuse of building envelopes. For this reason, status determined by high rates of construction should change, while a number of motivations should stop speculation on real estate. Renovation of the building envelope helps the regeneration of the city web, giving an opportunity for actions that would improve living conditions in the interior, and the exterior spaces, adding elements improving the relationship between closed and open space (balconies, terraces, patios, etc.) , or the use of energy saving systems or alternative forms of energy.¹⁵

1.4.7 CITIZENS' ROLE

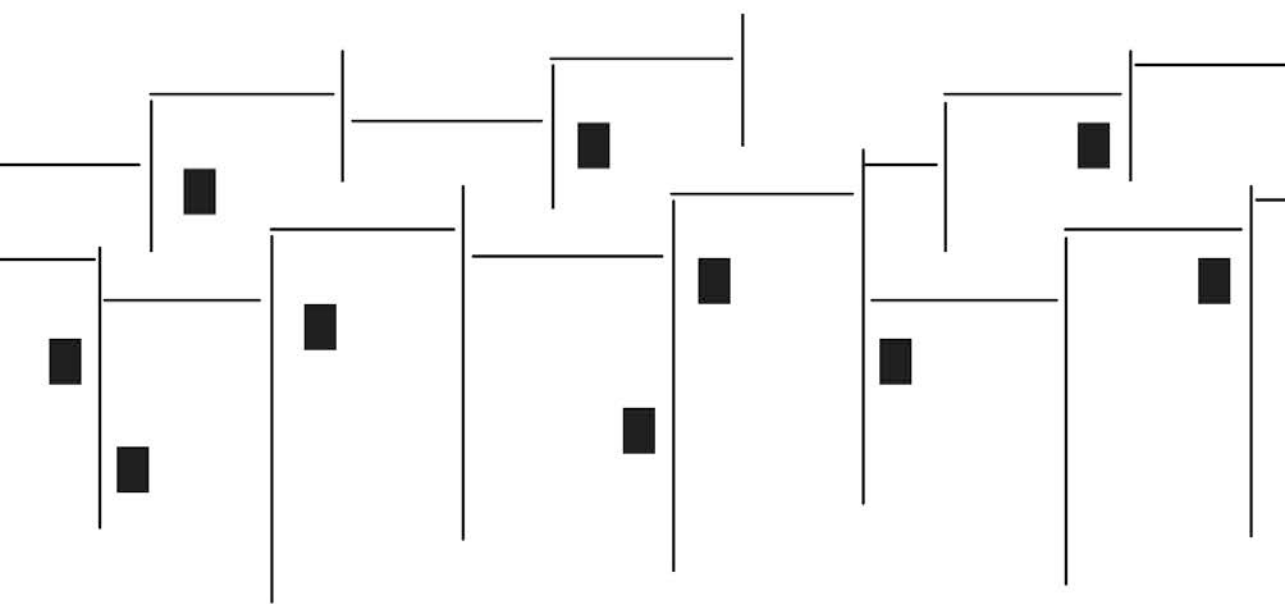
All measures proposed in the framework of an environmental design or redesign regeneration significantly have been affecting the citizens' way of living. These changes require at least two decades for people's acceptance and adaptation and certainly cannot be imposed on citizens, because then they would never succeed. Participatory processes should initiate, so that inhabitants with active participation would be informed and then contribute to design, implementation and application of each program.

Our country made an effort, though the Minister of Environment, Mr Antonis Tritsis, to implement participatory processes in 1980, as part of "Operation for Urban Reconstruction OUR". The local councils, although, did not work and the whole effort failed. The reasons of failure were not only attributed to the rotten organization of Greek civil society but to city planners themselves, who used to treat urban planning projects only as "inspirational technocrats" that would shape the city according only to their own ideas.¹⁶

¹⁴ D.Poluxronopoulos, "Urban Free Spaces", a tribute to the Magazine of SADAS-PEA «Architects», Paper 55, January-February 2006, pp.: 55-58

¹⁵ A.Athanasouli, A.Aravantinos, Th.Vlastos etc, "Desining, Environmental Impacts and their Assessment Methods", Vol. A, Publishing HOU, Greece, Patra 1999, pp.: 73

¹⁶ A.Athanasouli, A.Aravantinos, Th.Vlastos etc, "Desining, Environmental Impacts and their Assessment Methods", Vol. A, Publishing HOU, Greece, Patra 1999, pp.: 77-78



2.1 THE CONCEPT OF URBAN REGENERATION

Extensive use of the term “regeneration ” in several types of city planning and housing interventions has incurred a meaning vagueness, which is intensified either through different case laws, in which the term is used to describe interventions of any scale (ex. Building regeneration), or through several city planning practices followed now and then by public institutions.

Thus, for instance, regeneration types, applied by the Ministry of Public Works and Environment, are considered all free spaces and recreation space configurations for medium restoration and upgrade (pedestrianization, interventions on hills and former pits), as well as interventions on historical centers, through free space configuration, traffic control and preservation of landmark buildings.¹⁷

An institutional type of definition is the following:

Regeneration is interpreted the intervention on an area, which includes a number of directives, measures, interventions and procedures of city planning, social, economic, residential and special architectural nature, that view on the promotion of welfare of citizens, of the built medium and on the protection and promotion of cultural, historical, morphological and aesthetic elements of the area (Law 1337/83).¹⁸

The notion of city regeneration has gained different meanings, over the years and across different countries, cities are the subject to a permanent evolution process, depending on the current conditions, the opportunities and threats received by the exterior.¹⁷

In this context, the side goals and the thematic range of regenerations are defined by the city planning problems existing each time, and by a number of other factors relating to the social and financial conditions of the study areas, as well as to their relation with the further context.

The “regeneration programs” applied by DEPOS/ Public Service of City Planning and Housing in areas inhabited by migrants, which for instance the districts of Athens (Kaisariani, Nea Filadelfia, Tavros) are in fact an application of housing programs. However, regeneration may not suggest only the application of a housing program; neither this term is intended to refer to individual projects of free space configuration.

¹⁷ D.Loukopoulos, G.Poluzos, G.Pupotis, F.Tounta, “Possibilities and prospects of rehabilitation programs - Proposals for a new structure of organization”, Publishing NTU, Greece, Athens 1990, pp.:11-18

¹⁸ E. Karavia, Diploma thesis “Area Architectural Design, Course: Dynamics and Spatial Structures, Land Uses, Contemporary Design Practices”, Subject: “Urban Regeneration of deprived areas”, NTU, Greece, Athens 2006, pp.: 5-6

2.2 TYPES OF URBAN REGENERATION

2.2.1 RADICAL REGENERATION

It is about “daring” interventions of innovative character that bring huge change on the area in which they take place. These changes are translated in demolition and building from scratch. They may also result in modification of population and of the functions hosted in the new area. Thus, this kind of regeneration is the most drastic type of city planning intervention, viewing on the reconfiguration of a certain built, namely on restructuring the biggest part of it, which is thus leads to the development of a “new area”. This kind of interventions usually take place in extremely low profile urban centre areas. It is possible after demolition, the procedure of organized construction to be skipped, and be led to a new subdivision based on a new city layout plan with new building conditions. In this case, the city planning layout is not elaborated, unless it is about situations controlled by the State.¹⁹

It is obvious that this kind of interventions have the hardest difficulties in proprietary regime governing the area, and presumes the application of expropriation systems, urban consolidation, building coefficient modification etc. In countries of uncontrolled capitalist economy, such as Third World countries, radical intervention is usually accompanied by alienation- voluntary or obligatory, instant or gradual, of the old population of the area (obviously of those having low income) and its replacement by people with higher financial capacity.

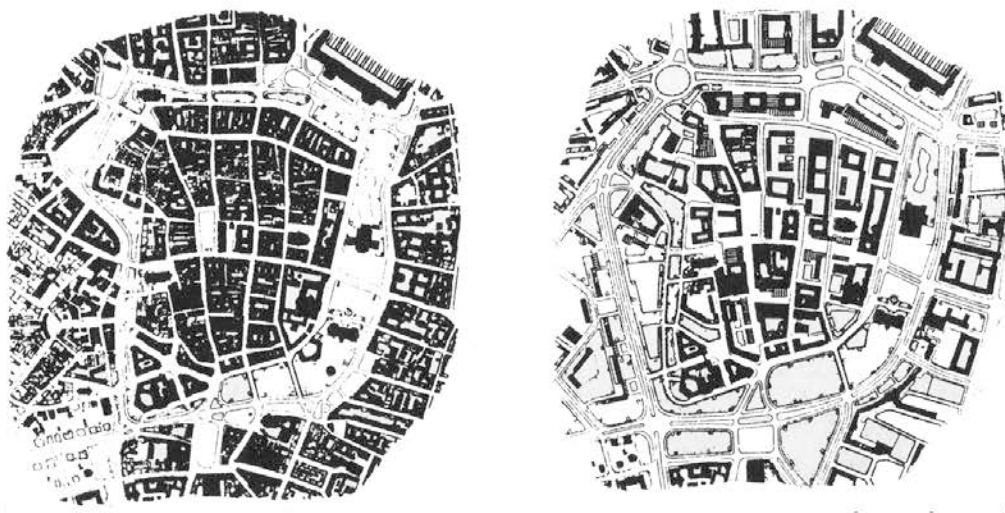
After the 2nd World War and during the 50's, radical regenerations - actually, rebuilding- have been the most common, if not the only, type of intervention in built areas, mainly in countries having suffered destructions, regardless of their socioeconomic system. Thus, even central and historical areas - with the excuse of their being seriously destroyed - were demolished and completely changed, while the existing known building system was almost pushed aside and replaced by the free layouts of the building masses. One such example is the Leipzig city centre in Germany, in which rebuilding took place after the existing known building system was abolished and replaced by free composition, after the 2nd World War (Figure 2.2.1.1).

Radical regeneration programs have taken place across Europe in the frame of state housing policy, initiated by the Public sector, municipalities or social benefit societies, and were promoted using several motives, such as favorable financing schemes, subsidies etc.¹⁹

Radical regenerations were continued under the pressure of progressive city planning thought, as combined with business speculation, since the end of the 2nd World War to the middle 60's. More precisely, the 2nd Congress of Architects took place in May 1964 in Venice, in which it is formulated that “the notion of the historical monument does not only refer to individual architectural creation, but also to the urban or rural landscape”. The importance and preservation of residential sets have been thus confirmed, representing goals that stared being implemented in the early 70's.

¹⁹ A.Aravantinos, “Sustainable Urban Development - Urban Planning”, Publishing Symmetry, Greece, Athens 1997/98, pp.:33-66

Figure 2.2.1.1 Radical regeneration in Leibzig's city centre after 2nd World War (Germany)²⁰



Radical regeneration programs had, as expected, a number of negative consequences that caused strong reactions on behalf of the citizens residing in the respective areas. The results of these city planning interventions were mainly connected to the financing system, which worked in benefit of the companies, while as the rents went high, many of the lessees belonging in low income groups were forced to abandon the area.¹⁹

Radical regeneration, by definition, refers to the total demolition and rebuilding of a whole area. As evident, any meaning of preservation and promotion of the character, identity and historical heritage of the respective area is thus overseen. As in the Leibzig example, where even the total structure of its urban web is rejected, changing thus the building system, by loosening its coherence and the print of its historic evolution. However, this used to happen not on benefit of some targeted bioclimatic factors (one of which could be the free sun and air reception of building blocks), but in favor of an elitist- let us say- designing perspective, which offered none but decomposition of its social web itself, changing thus its citizens' "status quo".

¹⁹ A.Aravantinos, "Sustainable Urban Development - Urban Planning", Publishing Symmetry, Greece, Athens 1997/98, pp.:33-66

²⁰ A. Aravantinos-P.Kosmakis, "Urban Free Spaces", Publishing NTU, Greece, Athens 1988, pp.: 98

2.2.2 MILD REGENERATION

These regenerations are mild, conservative interventions not aiming at radical changes, as previously, but at improving the buildable and common spaces. These interventions refer to the uses, facades or interior design of buildings, as well as to any additions in necessary spaces and networks, buildings, and to the configuration and upgrading of free common spaces, uncovered spaces of building blocks, creation or completion of the necessary infrastructure etc.¹⁹

The form of the city planning intervention of partial regenerations started being applied in Europe in the middle 70's on individual buildings, blocks and neighborhoods, in order to prevent negative consequences that radical regeneration s had caused in the past. This change of policy in regeneration programs, preserving the already existing city planning and building structure responded to the general policy of cost reduction and to the constructions' sector crisis. At the same time, social goals adopted by the state policy were more systematically promoted, such as participation of the already organized citizen committees and of all interested parts in the programs and to decision taking procedures, while emphasis was given on social problems faced by minorities and economically weak groups.

In the mild regeneration case, the examples of Kreuzberg, Berlin and Alma Gare, Roubaix, North France could be mentioned, where emphasis was given on participatory processes of interested citizens and on the direction of preserving a large part of the building stock, improving the existing urban web and placement of the functions that serve the citizens' needs.²¹

Despite the fact that mild regeneration programs have been much more conservative than those of radical interventions, they also had some negative results. In this case too, the situation of "willing" alienation of old lessees appeared, which once more could not afford the high rent.

From the above, it is seen that regeneration efficacy is strongly connected with a number of factors and that the dimensions that regeneration programs must cover are many and are not limited to those we are used to call "technical" ones.¹⁹

Regeneration goals and means, in Europe and in Greece, are analyzed in the following chapters.

¹⁹ A.Aravantinos, "Sustainable Urban Development - Urban Planning", Publishing Symmetry, Greece, Athens 1997/98, pp.:33-66

²¹ D.Loukopoulos, G.Poluzos, G.Pupotis, F.Tounta, "Possibilities and prospects of rehabilitation programs - Proposals for a new structure of organization", Publishing NTU, Greece, Athens 1990, pp.:11-18

2.2.3 AREAS OF REGENERATION-PROBLEMS OF DEPRIVED AREAS

Urban regeneration has multiple goals and directions, referring not only to the utilization of the space itself, the reevaluation of envelopes and their uses, but also to a high living standard for the users. Moreover, urban areas degrade issues, as well as the required regeneration types, differ consistently from one country to another and depend on the special social and residential traits of an area. Depending on the problems and its nature, emphasis is also given on side goals.

Classification of regeneration goals differs depending on the criterion examined each time, and thus it would be possible to make several classifications. In the following lines we are going to examine regeneration areas based in the problems they present and they are thus considered as deprived. The most commonly met issues and those that might cause the need for regeneration in a built area could be classified in four large categories:²²

1. Envelope issues

These refer to the age and probably to the improperness for use of the building masses of an area. It is about areas with problematic housing conditions and equipment in the buildings, or insufficient technical and social infrastructure, and are therefore characterized by increasing aesthetic - and generally quality - degrade of the build medium of the area and of the natural elements of it.

2. Human resources issues

Problems of this category are of socioeconomic nature, mainly referring to the needs of social and economic facts, which were caused by the upgrade or degrade of the area. High unemployment rates, social exclusion phenomena due to population diversity, economic migrants and low educational level of the population are some of the socioeconomic details of an area.

3. Land use issues

This category includes use degrade issues or problems appearing due to the conflict developed among existing uses, therefore leading to the need to regeneration the whole area. Unhealthy or dangerous for the environment activities placement, as already known, contributes to an area degrade. Under this category one may also find the lack of common use spaces and of spaces used for the general interest.

4. Insufficient protection and promotion of historical and cultural heritage of the area

It is about areas rich in historical and cultural heritage that have lost their identity and are characterized by an image of general degrade, having negative results on the whole area.

²² I.Stefanou-A.Hatzopoulou-S.Nikolaidou: "Conceptual Approach", of the book "Urban Regeneration", Chapter. A, Publishing TCG, Greece, Athens 1995, pp.: 23

2.2.4 GREEK REALITY

In Greece, it is easily seen that all four categories of problems can be met. More analytically, you will find hereinafter a classification of regeneration areas of the Greek urban space, based on degrade elements featuring them.²³

1. Central areas of high buildings with extremely high permitted building coefficients, that host outstanding central functions (administration, offices, commerce, cultural and entertainment installations), as well as some houses.

2. "Working" areas or mixed areas with important functions of the secondary sector and transports or other related uses (industry, small industry, storage areas, bulk commerce, port functions and other transport installations) that still exist, or have stopped their operation in the frame of de-industrialization. These problems are related mainly to the blend of conflicting uses being very close to each other.

3. Residential areas with extremely high building coefficients, high coverage rates and high density. These areas are featured by lack of technical and social infrastructure, as well as of green and free areas, resulting in the general degrade of the natural and residential medium (ex. Pagkrati, Kipseli).

4. Areas with initially illegal houses, districts or settlements, later introduced in the City Plan, but continue to have housing conditions issues.

5. Areas beyond the approved City Plan, usually including illegal or prefabricated houses that aim to cover permanent housing needs. Deprived housing conditions and poor technical and social infrastructure make residence in this area extremely problematic.

6. Holiday house areas with - now - approved plans and buildings. Housing and city planning features of these areas make their mission problematic.

7. Villages, wholly or partially. Here, situations of functional, technical, housing, city planning and social disadvantages may appears, that make residence in this area extremely problematic.

High density and high building coefficients problems, mainly in the central districts of Athens, today depend on the typical Athenian apartment building. The antiparochi system (giving a parcel of land/ house so that a block of flats can be built on the site and then, the owner of the house/land gets in exchange some flats to rent out) that had worked, for a period of time, as a housing reassurance method for all social groups of postwar Greece, has contributed to the quick expansion of building and limitation of free spaces.

²³ D.Loukopoulos, G.Poluzos, G.Pupotis, F.Tounta, "Possibilities and prospects of rehabilitation programs - Proposals for a new structure of organization", Publishing NTU, Greece, Athens 1990, pp.:18-21

2.3 SUSTAINABLE APPROACH OF REGENERATION PROGRAMS

Sustainable or viable regeneration is an intervention, according to the terms of sustainable planning, as per the morphology of a certain area which has suffered alterations, destructions or damages. All factors and design elements are governed by the discipline of good sun and air reception of the urban space, saving energy, vegetation, shading of walking paths, strong presence of water element and the creation of pleasant living conditions for the inhabitants.

It is a fact that modern cities face a number of new challenges, but also new opportunities, which come from a continuously changing medium that needs to be understood in order for them to be faced and exploited as efficiently as possible, so that they contribute to their upgrade and improvement of living conditions for the inhabitants.

The following text is based on the book "Sustainable city development in Europe and in Greece", edited by the Assistant Professor of the Metsovio Technological Institute, M. Aggelidis.

Since the late 80's and early 90's the first attempts to evaluate the city problems had started, while ideas and politics suggestions begin to be expressed on city sustainable development. At the same time the metropolis role is now reconsidered, as a place of important financial activities placement, and as necessary elements of international competitiveness. It is prominent that many European cities either adhere to new types of regeneration, traffic reforming etc, or they put more emphasis on "green & open space" networks, on urban policies "ecological dimension"- financing most of the times the respective interventions on private or, sometimes, on community funds. Therefore we have a new packet of "new urban intervention" ideas, which is closer to the sustainable development directions.

Hereinafter some policy and action directives are suggested, mainly from the "EU Expert Group Report" on "city sustainable development" (1996). According to these suggestions, urban regeneration should be used for the implementation of sustainable development objectives in several directions. Indicatively, it may be used in order to:

1. Strengthen social cohesion by involving residents of deprived residential areas in the regeneration process;
2. Ensure the restoration of ecological links and the strengthening and conservation of ecological values, as part of an integrated ecosystem;
3. Improve accessibility of existing areas. New infrastructure should be designed to complete the fabric of footpaths, cycle lanes and bus lanes, and public transport provision should be encouraged in order to provide opportunities for more sustainable transport patterns; urban regeneration sites near railway stations should be used for high density developments which concentrate activities.
4. Promote urban cultural heritage
5. Upgrade and exploit, in order to be sustainable, the abandoned or polluted areas.

From the above, it results that urban area quality has been promoted to the first place of the agenda concerning city policies. City planning gives extra emphasis on the promotion/ protection of natural/ cultural resources, the improvement of infrastructure and strengthening of public transport, as well as on citizens' information on environment issues through collective procedures in regeneration programs. Space may not only be treated as an area for housing development, but an important factor for social and economic development of urban space and upgrade of life quality. Seeking sustainable development, which is to balance the social, economic and environmental objectives, is linked with the special features of each city and is therefore different from one place to another.

2.3.1 REGENERATION IN EUROPE

Should one study European space, they would note that despite the possible political, economic or administrative differences, urban web regeneration in all European countries adheres to the same laws, seeking similar objectives and following parallel evolution.

It is commonly known that, after the end of the 2nd World War, most European cities had suffered massive destructions. Those destructions, however, have been the starting point to renew the urban web of these cities, as well as to regenerate the destroyed areas, which in this case was a radical regeneration of the built area in certain positions. However, the whole process of urban regeneration does not stop here, but it is continued, until nowadays, under constant pressure faced by big cities to respond to the changes of the socio-economic standards. It is understood that destructions caused by the War have been only the occasion to start urban regeneration of big industrially developed cities of Western Europe that also followed a modern city planning practice. Especially under the current conditions of state intervention systemization as per space organization, modernization of these cities is also a condition to survive.

After the radical renovation works of the period 1950-1970, with the extensive and large scale interventions, and after the widely organized operations of regeneration, rebuilding and maintenance works of the 70's- 80's, the policy followed today is that of "small steps". Within the limited climax of neighborhood or district, there is a strict selection of what should be maintained, renovated or rebuilt, as well as all those new necessary features. Moreover, there is a selection of installations that urge, and of those which, due to the conditions, should start sooner. Some freedom in programs and time-plans makes companies more flexible, while state intervention gives its place to new types of collaborative actions among public and private sector.²⁴

Regeneration of deprived areas and historical centers in Europe is in its third phase today. The applied policy is a "careful, step-by-step" revitalization. As third generation regenerations may be considered those regenerations, taking place either in city historical centers, or in deprived areas that were upgraded after planning and adoption of the careful intervention philosophy.²⁵

In this case one may find Docklands (London), partially Halles (Paris), Merchant City (Glasgow), Chiado (Lisbon), Bickersland, New Market and Jordaan (Amsterdam), Temple Bar (Dublin), Kreuzberg (Berlin), Plaka (Athens), Ano Poli -Thessaloniki old city, and the old city of Rhodes. Some of the cases being parts of a city and not the city itself are Venice, Florence, Barh, Winchester etc, which are cities- museums, whose maintenance and renewal of building stock is governed by strict rules, due to their having being considered as ultimate protection landmarks.²⁵

²⁴ E. Karavia, Diploma thesis "Area Architectural Design, Course: Dynamics and Spatial Structures, Land Uses, Contemporary Design Practices", Subject: "Urban Regeneration of deprived areas", NTU, Greece, Athens 2006, pp.: 18

²⁵ I.Stefanou-A.Hatzopoulou-S.Nikolaidou: "Urban Renewal", of the book "Urban Regeneration", Chapter. A', Publishing TCG, Greece, Athens 1995, pp.: 70-121

Indicatively, in three European countries (France, England, Germany) one can meet the following regeneration examples:²⁵

In France, all regeneration works are realised according to the legislative frame of the ZAC's (Integrated Development Zone), which is summarised in equal participation of private and public sector, respect for the built traditional and historical heritage, reuse of the existing envelopes, completion of urban spaces and design flexibility. The intervention means which are employed in "Program Plan", summarising with its disciplines all modern French philosophy for regenerations, permitting changes, improvements and completions, depending on conditions and parameters appearing during a specific operation. Moreover, ZAC's do not strictly limit an area in which regeneration is addressed to, but favour additional interventions to the surrounding space, while importance is also given to positive unexploited possibilities of the region.

In England, sooner than in the other European cities, the little interventions' value was seen, in order to reuse the old envelope. Already, in the middle 60's, integrated interventions are abandoned after harsh criticism, and give their place to limited interventions, on a neighbourhood climax. Housing actions areas seek to improve the existing envelope and to replace only the useless buildings. This perception is featured by the time goals for the duration of renovated envelopes, reaching a lifespan of fifteen years, even thirty years in some cases. After this period, capacity and use of the building is reconsidered. The same approach of limited and controlled subject also refers to space. Small regeneration cores with small intervention steps. This realistic treatment did not prevent the English from conceiving and implementing possibly the most extensive regeneration operation of the century, namely that of rebuilding DOCKS (which is examined hereinafter).

In Germany, even much later than in the other European cities, one can easily see a turn to reuse the envelope of historical cities. On the other side of urban renewal with "heavy" interventions through important demolitions, today a revitalization policy of deprived districts is, here too, promoted, which is based in "little steps". Despite the success of regeneration operation of the "International Exhibition of Public Institute Architecture" in the centre of Berlin, it was continued by a private company. Collaboration of private investors is considered in Germany as the suggested solution for the regeneration problem, of course in the fame of regeneration objectives.

It is, thus, seen and is now common belief that regeneration, regardless of its objectives, is not possible to be exclusively assumed by the State. Therefore, part of its operations is seized to municipalities, which work with the private sector or assign projects to them.

However, even third generation mild interventions, and what is more those that had the privilege to have been designed on free land, has serious inefficiencies concerning natural urban planning, namely, on the one hand concerning the way the public spaces web is being articulated in the further web of open public spaces, and on the other, concerning the way of construction of the web itself within the intervention areas frame (civil morphology). Usually, the suggested web lacks articulation with the further public space, which lead to the isolation of the area, creation of the negative effect of "city in the city" or "village in the village", appearance of artificial borders, loss of historical and cultural identity as well as lack of coherence. Within the intervention area, we have loss of orientation, inexistence of a central point, vagueness and lack of urbanity conditions.²⁵

²⁵ I.Stefanou-A.Hatzopoulou-S.Nikolaidou: "Urban Renewal", of the book "Urban Regeneration", Chapter. A, Publishing TCG, Greece, Athens 1995, pp.: 70-121

For example, the Docklands case, in England, was based on the city extension, namely the centre of London. However the philosophy of land use blending dominated, the bank- financial services, which were from the very first beginning set as the predominant ones, as well as increase of land value, literally pushed all low income citizens away. In use blending, on intervention areas, of course there is the dominant use, which defines the intervention character. Thus, apart from the houses and the Docklands rowing centre, the dominant use is commercial and financial activity.

Should there be a possibility to reduce this pushing the population off the area, this would be through their participation in the planning, designing and implementation process, as well as the creation of new vacancies, on which regeneration brought about impressive results, during the 80's.

Moreover, Docklands' architectural heritage was highly ignored, during the 60's and 70's, and a large number of buildings did not survive demolition.²⁶

Figure 2.3.1.1 Uel University in Docklands²⁷



Figure 2.3.1.3 Canary Wharf from the south side of River Thames²⁹



Thus, social coherence is completely out of plan, while a large part of the cultural heritage is lost, these two being among the basic elements of sustainable regeneration.

²⁶ www.en.wikipedia.org/wiki/London_Docklands

²⁷ www.uelunion.org

²⁸ www.google.com

²⁹ www.jollygreenjustin.deviantart.com

2.3.2 EUROPEAN PROGRAMS FOR THE PROBLEMS OF URBAN SPACE

The first EU approach on urban space issues, in the frame of environmental policy, started in 1973-1976, with the First Environment Program. Other programs followed until 1990, in the frame of the fourth Program, the “Green Paper for Urban Space” was presented, defining basic directions on urban space. Later, with the Maastricht Treaty, EU role was seriously extended concerning interventions on environment issues, seeking to preserve and protect its quality by the protection of human health, the moderate and proper use of its resources and the promotion of measures on global environment issues. The Fifth Action Plan, bearing the title “To Sustainability” (1994-2000) officially recognises the need to put more emphasis on city problems.



Ever since, the EU has issued a wide range of legislative actions, referring to combating noise pollution, air pollution, water resources protection, waste administration etc.

What is more, through a series of initiatives and programs, more specific objectives are being sought. Such programs are URBAN and URBAN PILOT PROJECT for urban space and socio-economic cohesion in cities, the program LIFE, SAVE II, ALTENER, THERMIE and EFFECT, in the frame of Energy Policy, as well as financing of 59 programs with objective the information and motivation of wide public. Once more, the EU encourages collaboration among European urban centres and promotes the establishment of City Networks.³⁰

³⁰ D.Ikonomou, G.Petrakos, “The development of Greek cities - Interdisciplinary Approaches of Urban Analysis and Policy”, Publishing Gutersberg, Greece, Volos 1999, pp.:554-576

2.3.3 INSTITUTIONAL FRAME FOR REGENERATION IN GREECE

In city planning legislation, “regeneration” was first mentioned in the 70’s, when the foundations were set for institutionalization of space and urban planning, and some attempts were made to upgrade housing policy.³¹

The legislation of that period is mainly adapted to the regeneration methodology that had been applied to west-European countries, after the 2nd World War damages. The features of these regulations are the large intervention scale, active participation of the public sector in planning and implementation of programs, and establishment, to this end, of public services.

Regeneration was legally established for the first time, as a meaning, by the Legal Regulation 1003/71 “for active city planning”, which is defined as the partial or total urban revitalization and modernization of a settlement. In the spirit of state intervention, in 1973 the National Land Bank and EKTENEPOL (Active Urban Planning Society) were founded, whilst in 1976 we have the establishment of the Public Service of City Planning and Housing (DEPOS). These institutions although used to work on private economy rules, were 100% a property of State or of State Banks.

After the Institution of 1975 was voted, this legal regulation was abrogated and replaced by the Law 947/1979 “for urban areas”. At the same time, this law also introduced the Urban Consolidation Areas (as property contribution for the creation of common spaces, and redistribution of equal value land to the owners, after all land taxes had been reduced). This law was inactive for more than 10 years.

In 1978 the President’s Decree 4/19/1978 was published, which refers to the application of regeneration studies, free common spaces, settlements or areas, and to the establishment of obligations on behalf of the owners with property next to roads. Regeneration in this decree mainly sought configuration of common spaces for city planning interests, with possible and limited intervention on buildings.

In 1983, the new housing law 1337/83 was voted, for “Extension of urban plans, residential development and related regulations”. This law regulates the introduction of areas in the city plan or plan extensions, as well as important modifications within the plan, when it is about problematic areas or urban complexes of the city that need to be restructured. Moreover, this law addressed intervention areas, such as Special Consolidation Areas, Special Motivation Areas, seeking regeneration of the city cores or their buildings.

In 1985, the Law 1577/85 that establishes the active building block, defining that: “the building block characterization as active seeks, among others, regeneration of the city block, mainly unifying the uncovered spaces...”³¹

At the same time, consent of the interested area population is also sought, establishing mechanisms for their participation to the procedures of decision taking, such as the Neighbourhood City Planning Committee and the Active Building Block General Assembly.

³¹ I.Stefanou-A.Hatzopoulou-S.Nikolaidou: “Urban Renewal”, of the book “Urban Regeneration”, Chapter. A, Publishing TCG, Greece, Athens 1995, pp.: 151-155

In practice, it was shown that application of the regulations foreseeing interventional regeneration, even limited ones, was out of plan. This is proven by the fact that the elaborate studies completely ignored the regeneration philosophy and were limited to conventional mapping of street layout lines, arrangements, validations and definition of common, social utility and private spaces, putting in application only the new regulations for contribution in money and land.³¹

The current legislative frame³²

The new residential Law 2508/97, titled "Sustainable Housing Development for Cities and Settlements of the country and other regulations", continues and completes the Law 1337/883, with the ambition to make up a new and flexible tool for extension, regeneration and general upgrade and protection of cities and settlements of Greece.

According to the article 8, chapter B: regeneration areas are those areas included in approved city plans or in delimited settlements facing degrade or vitiation that cannot be addressed with the common processes of reconsideration of city plan and building conditions. The regeneration area might include one or more cadastral units or parts of city planning units.

Regeneration areas are defined in the General Urban Plan, the Open City Land and Housing Organizations or Regulation Plans, either defined by decision of the Ministry of Environment, when special issues of housing degrade are present and which cannot be addressed with the usual city planning means. However, these plans are featured by lack of regulations for the economic and social sustainability of the interventions.

The regeneration process in an area is made on the initiative of:

- The related first degree Local Administration Authority
- The related Local Council of the area, if it is subject among two or more first degree Local Administration Authorities
- The related prefectural administration
- The Ministry of Environment and Public Works
- DEPOS
- The Building association, for its size

³¹ I.Stefanou-A.Hatzopoulou-S.Nikolaidou: "Urban Renewal", of the book "Urban Regeneration", Chapter. A; Publishing TCG, Greece, Athens 1995, pp.: 151-155

³² D.Ikonomou, G.Petrakos, "The development of Greek cities - Interdisciplinary approaches of urban analysis and policy", Publishing Guteberg, Greece, Volos 1999, pp.: 25-30

What is innovative about this law is that it creates the first in Greece legislative frame for in-plan regenerations and reshaping of deprived areas. Moreover, it is the first time that emphasis in a settlement has moved from city plan extensions to the design administration, for in-plan areas, seeking their city planning and environmental upgrade, as in the case of Analipsi square, Vrilissia, Athens.

Figure 2.3.3.2 Analipseos Square after the sustainable renovation³³



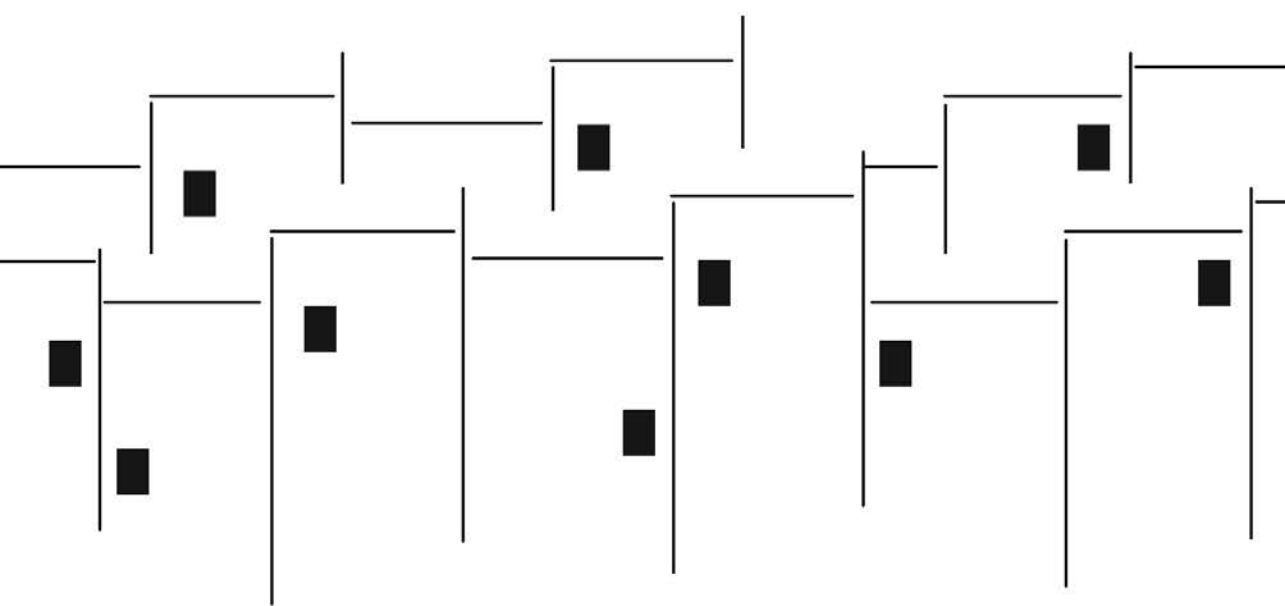
Figure 2.3.3.1 Image of the square before the sustainable renovation³³



Figure 2.3.3.3 'Analipseos Square after the sustainable renovation³³



It is thus understood that, once more, Greece loses time designing laws and distributing responsibilities, while the slow and bureaucratic public sector has the basic role, caging and stopping any activity.



Cities are the areas in which the largest consumption of energy, waste and pollution is produced. Increasing urbanization, same as suburbanization, cause several serious changes on the climate of an area (urban microclimate). Temperature difference between cities and the countryside is about 5-8 Celsius grades in big cities.

The urban microclimate differentiation, as well as comfort conditions (heat, noise, visual) it affects depend on morphological - natural factors, but also on those of the built environment.

Bioclimatic planning of open urban spaces seeks to analyse and exploit the special parameters of the further city area, or of one specific part of it. Their objective is to encourage, through planning, the use of space all the year round, thus exploiting the positive climate elements and reducing thus any possible microclimate particularities. In climates like the one of Greece, we have two seasons with intense weather features: summer, with extended sunshine and high temperatures, and winter, with low temperatures and periodically heavy winds.

MICROCLIMATE

Microclimate is the prominent configuration of climatic factors in a small area and it is caused by the buildings, the natural or artificial obstacles, the general structure of the area, as well as by planting and shading.³⁴

The natural microclimate elements are solar radiation, temperature, air movement and humidity. However, apart from these natural factors affecting microclimate and comfort conditions of an area, also the elements of the built context are basic, such as ENVELOPES, land uses and transportations- displacements.

³⁴ K.Axarli, S.Gianna, E.Evangelinos etc, "Sustainable Design for Buildings and their Surrounding Space", Vol. A, Publishing HOU, Greece, Patra 1999, pp.: 34

3.1 NATURAL ELEMENTS MICROCLIMATE

3.1.1 SUNLIGHT – SUN PROTECTION

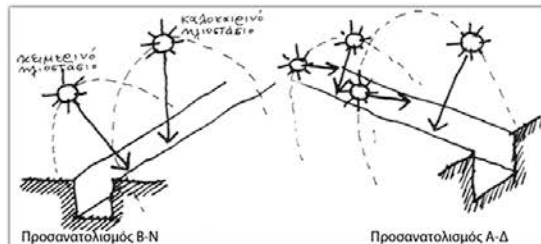
Sun reception is the selective exposure to the sun, while sun protection is its intentional avoidance. When or at which level the one or the other option is preferred depend on the use of the space, the season of the year, orientation and the microclimatic conditions of the area.³⁵

In Greek cities, the role of the sun is completely different to that in European cities. Our need for contact with sun light is evident not only on buildings, but also on our urban planning. Buildings are full of large terraces and in open spaces many parts remain uncovered, so that heating and light of the sun be able to reach the people. During spring and summers months, however, we look for shaded areas in order to be protected from high solar radiation and to enjoy chillness.

City planning factors affecting the sun reception of an open space are orientation, ground inclination and inter-shading of surfaces surrounding them. Given the latitude and atmospheric conditions, orientation of city streets and their intersections is the main factor of sun reception. (Figure 3.1.1.1)

Streets with orientation from east to west has symmetrical access to sun, while in street from north to south sun reception is non-symmetrical, as only the south part of the street is seen by the sun. However, in both cases, the sun view from the street depends on the height - width relation.

Figure 3.1.1.1 The sunlight according to the orientation³⁷



Among the several methods applied for the improvement of urban street microclimate, dominates the one that had been used, in a related study, by Ali-Toudert Fazia, in which thermal comfort is affected by several possible combinations of the analogy building height-street width, the orientation of streets and vegetation. (Figures 3.1.1.2, 3.1.1.3, 3.1.1.4).³⁶

³⁵ S.Giannas, "Sustainable Design for Buildings and their Surrounding Space", Vol. B, Publishing HOU, Greece, Patra 1999, pp.: 187-196

³⁶ Fazia, Ali-Toudert, «Dependence of outdoor thermal comfort on street design in hot and dry climate», Dissertation Berichte des Meteorologischen Institutes der Universität Freiburg, Freiburg, 2005, pp.:180-182

³⁷ S. Amourgis, S. Giannas etc., "Sustainable Design for Buildings and their Surrounding Space", Vol. A, Publishing-HOU, Greece, Patra 1999, pp.:12

According to this method, thus, we have the depiction of urban streets of different width with,

- Different heights of the close-by buildings (Figure 3.1.1.2),
- Different street orientations (Figure 3.1.1.3),
- Combined building height and use or non use of vegetation (Figure 3.1.1.4).³⁸

Figure 3.1.1.2 The ratio height/width to streets with orientation E-W.³⁸

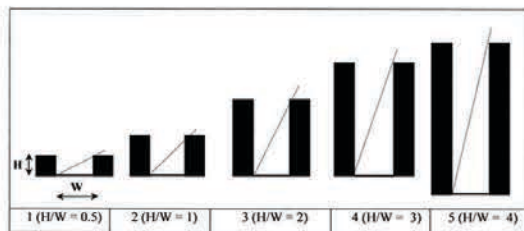


Figure 3.1.1.3 Orientation of the blocks.³⁸

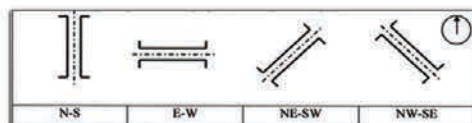
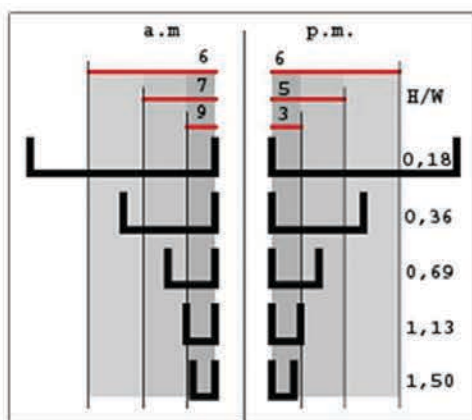
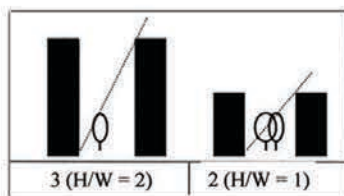


Figure 3.1.1.5 Shade diagram to streets oriented S-N.³⁹



- During summer months, in wide streets with low buildings, the wind is moving higher and is therefore cooler.

Figure 3.1.1.4 The ratio height/width to 'green' streets.³⁸



From the figures provided, the following remarks could be made:³⁸

- Narrow streets with East to West orientation, intervened by high buildings, present better conditions of comfort, than do wide streets with low buildings and to both orientations (E-W and N-S).
- Wide streets with low buildings are cooler during summer nights, as the sun during the summer months is higher in the sky.
- The lower the buildings in the streets, the more effective the use of vegetation can be (more protective).
- Streets with N-S orientation are preferred during summer period, rather than those with E-W orientation, which are extremely unpleasant during the first evening hours, 14:00-16:00.

³⁸ Julia N. Tzortzi, Sofia Sarikou, Project: "Integration and Planning Small Urban Spaces with Bioclimatic Conditions", pp.:3

³⁹ KAPE, "Urban Design with Bioclimatic Criteria", pp.: 12

The need for sun in winter and for shade at summer is more intense in big cities, and therefore shading options should be able to change. Deciduous trees and portable shutters are the best options for the Greek climate (Figures 3.1.1.6, 3.1.1.7, 3.1.1.8). At the same time, the building materials, as well as of the whole urban equipment, as long as their colour, should be carefully examined, so that they do not absorb heating, contributing in that way to the upgrade of urban microclimate.⁴⁰

Figure 3.1.1.6 Deciduous trees/winter.⁴¹



Figure 3.1.1.7 Deciduous trees/summer.²⁸



Figure 3.1.1.8 Contribution of deciduous trees to the microclimate's improvement.⁴⁰

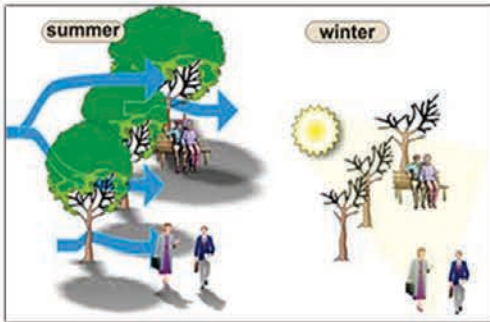
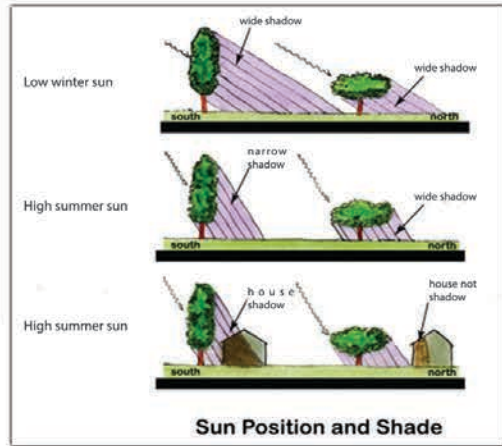


Figure 3.1.1.9 Shading by deciduous trees.⁴²



A deciduous tree will start shading the windows of a house once it is 2-2,5 meters high and has 2 meters leafage diameter (Figure 3.1.1.9).

- Depending on the type and the house, it will shade the roof in 5-10 years
- If there is air-conditioning system, shading of the machine would increase its performance by 10%.⁴⁰

⁴⁰ KAPE, "Urban Design of Free Spaces with Bioclimatic Criteria", pp.: 37

⁴¹ A.Paipai, "Sustainable Urban Design of Open Spaces", magazine "BUILDING", Paper 10, November-December 2010, pp:121

²⁸ www.google.com

⁴² www.library.tee.gr/ T. Tzortzi, "The contribution of green spaces to the enhancement of the microclimate", pp.: 12

3.1.2 AIR FLOW

Abstracts of S. Yiannas' text "Airing and Wind-Protection" (chapter 4, pp. 197), of the book "City and Open Space Environmental Planning", Hellenic Open University, Patra 2001

"Buildings work as wind obstacles and therefore wind speed in cities is lower than that in the country. This fact reduces thermal surplus diffusion intensifying the urban thermal zone. Moreover, it also affects the pollution dissemination and the air quality.

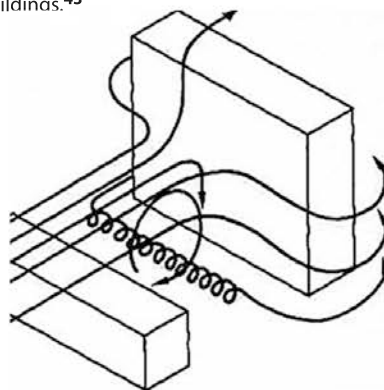
This environmental planning has the objective to facilitate wind movement within the city. It refers to orientation and function of streets, the height, form and placement of buildings, as well as to their openings to internal open spaces of the blocks.

Where streets are parallel or have little deviations from the wind direction, air movement is easier. When the wind direction is vertical to the street, air movement is divided in two, only one of which follows the street direction."

In dense areas of urban centres, bad airing conditions, high coverage degree and intense activities lead to the reduction of wind speed and to remarkable temperature differences, as compared to the suburbs, that may reach even 7-8 degrees (urban thermal zone). Wind movement through high buildings and narrow paths of the streets creates complex movements, with whirls and swirls. Therefore, great importance is given on OT gaps, that make air movement easier, and proving thus some connection possibilities among the internal open spaces with the streets.

Especially when it comes to waterfront cities, there is an additional sea aura movement. Afternoon temperature increase makes the warm air go up, attracting thus the sea breeze to the centre, where it appears as "cooling zone", causing a temperature fall and microclimate balance. According to measurements, the cooling zone mainly appears after noon, during summer months.

Figure 3.1.2.1 Air flow around bigger and smaller buildings.⁴³



⁴³ KAPE, "Designing of Urban Free Spaces", pp.: 11

Vegetation could direct or limit the wind movements, as desired. Its caging by the trees makes green areas much cooler. (Figures 3.1.2.2, 3.1.2.3, 3.1.2.4).⁴³

Figure 3.1.2.2 Trees used for wind protection.⁴³



Figure 3.1.2.3 Change in the wind direction due to the long 'green wall'.⁴⁴

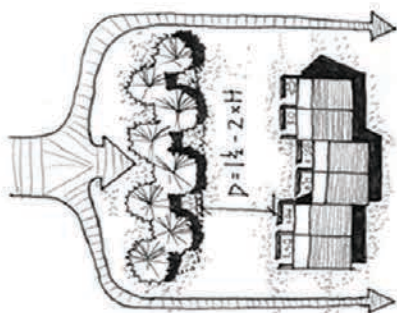


Figure 3.1.2.4 Change in the wind directions due to the small 'green wall'.⁴⁴

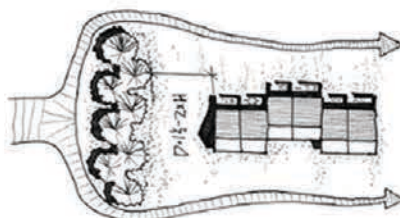
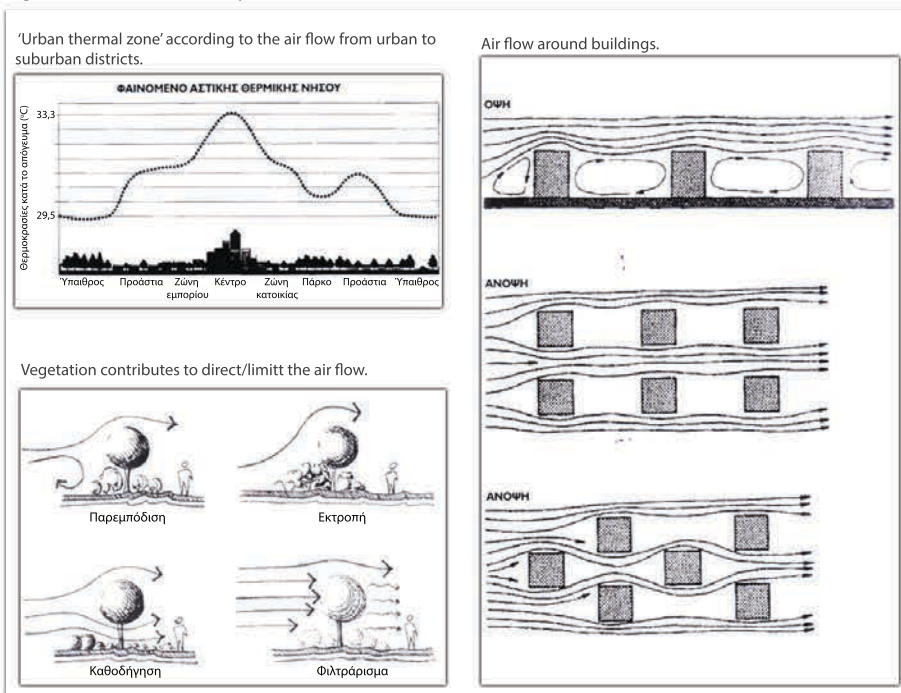


Figure 3.1.2.5 Air flow analysis in the urban environment.⁴⁵



Temperature and humidity are also important elements for the configuration of an area and of the comfort conditions they provide, or not. For the configuration of temperature and humidity, green areas and presence of water element are crucial.

⁴³ ΚΑΠΕ, "Designing of Urban Free Spaces", pp.: 11

⁴⁴ www.library.tee.gr/T.Tzortzi/, "The contribution of green spaces to the enhancement of the microclimate", pp.: 16

⁴⁵ Α. Παπαι, "Sustainable Urban Design of Open Spaces", magazine "BUILDING", Paper 10, November-December 2010, pp.:120

3.1.3 SOIL – VEGETATION

Nowadays, natural ground is limited, as most surfaces are hard, waterproof and randomly shaped, while planting types are usually selected according to their decorative and not their functional value. Equipment is seldom featured by aesthetic coherence and quality. Urban landscape reorganization offers the opportunity to increase and redesign the natural elements in public open spaces.

Natural ground preservation or restoration refers to its declination, surface configuration and planting elements. Reassurance of biodiversity refers to the shaping and protection of natural open spaces and elements that are able to survive and help animals live in them. One part of their surface could continue being natural ground, while their layers should permit the ground watering and the development of surface vegetation in the gaps (Figure 3.1.3.3). In this way, the water table would be enriched, while aimless leakages and flood risk would be minimised. Streets and pavements could have rows of trees or vegetation and water surfaces, connected with seating or playing elements, making a pleasant and peaceful context for users. (Figures 3.1.3.1, 3.1.3.2).⁴⁵

Figure 3.1.3.1⁴⁵



Figure 3.1.3.2²⁸



Planting in pots cannot substitute ground planting. Therefore, it is considered wise to be used only in special cases, such as, when tree planting is not possible due to underground networks or piping systems, or to prevent cars from entering in a street, combined with seating elements of the same morphology (for shading).

Figure 3.1.3.3 Combination of natural and artificial terrains.⁴⁶



⁴⁵ A.Paipai, "Sustainable Urban Design of Open Spaces", magazine "BUILDING", Paper 10, November-December 2010, pp:124

⁴⁶ Personal record

²⁸ www.google.com

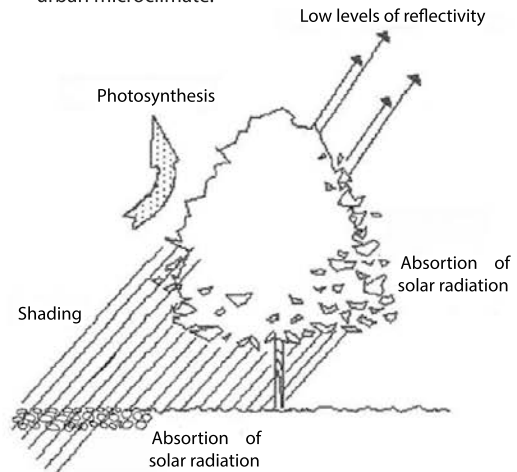
The main and most important contribution of vegetation is that it improves microclimatic conditions of cities, and, as a consequence they help the climate to improve. Vegetation contribution to bioclimatic planning is shown in the following factors:⁴⁷

- Regulation of sun radiation: Proper use of planting could achieve optimal shading conditions, reducing sun radiation by 40-80%. Temperature measurements have shown even difference of 2,8 degrees between the ground and the built centre and the open spaces.
- Air temperature reduction during summer period. This is caused not only by the area shading, abut also through heat loss due to the plant functions (photosynthesis, respiration and evaporation).
- Reduction of the cooling loads of buildings situated close to vegetation. Increasing green areas of cities, we have an important saving of energy for cooling in urban space.
- Wind speed reduction close to the ground. Planning efficacy depends on the plant type and its features. Vegetation can be used either to constrain the air, or to accelerate it, in view of airing and cooling.
- Air pollution reduction, with dust and polluting elements caging.
- Noise protection. Sound absorption, reflection and refraction by the plants leafage reduces noise levels even by 10 dB.

More specifically, vegetation improves urban climate in the following ways:⁴⁸

- With respiration, plants create high humidity conditions in the atmosphere, especially during summer months when it may reach a level of 5-8%, making a pleasant context.
- Due to refraction of sun radiation by the trees' leafage, the light situation of the area is being improved.
 - It permanently renews the atmosphere oxygen
 - It protects from wind and reduces icing risk in an area. Plants can be used in order to stop, filter and lead the air flow, affecting thus the airing process.
 - It has low heat capacity and thermal conductivity and it absorbs much fewer heat during summer months
 - It keeps ground stable
 - It fights dust
 - It retains the water table

Figure 3.1.3.3 Vegetation – improvement of urban microclimate.⁴⁹



⁴⁷ A.Paipai, "Sustainable Urban Design of Open Spaces", magazine "BUILDING", Paper 10, November-December 2010, pp:125

⁴⁸ A. Aravantinos, P.Kosmaki, «Free Spaces in the City», Publishing NTU, Greece, Athens 1988, pp.: 14-18

⁴⁹ www.library.tee.gr/ T. Tzortzi, "The contribution of green spaces to the enhancement of the microclimate", pp.: 20

3.1.4 URBAN GREEN AREAS

Tradition of urban green areas goes back to the early 20th century, when Schmidt suggested, in 1912, the land planning design of cities, recognising thus the value of networks in the urban areas.

Green areas must interfere in cities like green fingers, and dominate free spaces and open surfaces, and not work separately and partially.

Tree rows, streams, rivers, parks and gardens should unify and work in combination, as an integrated network, with the suburban green areas and the surrounding natural ecosystem.⁵⁰

Creation of green areas can offer:

1. Connection of several functions of the city
2. Leisure opportunities
3. Possibility to plan walking paths and encouragement of citizens to move on foot
4. Possibility to enhance biodiversity of cities and facilitate the installation of new habitats
5. Improvement of thermal comfort and of the urban microclimate



Figures 3.1.4.1 "Green Fingers".⁵⁰



Figures 3.1.4.2 Sustainable intervention - Create environmental / cultural park Anavra (Magnesia).⁵²

"Urban gaps" that cities cage in their interior in the expansion process are usually transformed into dumps, or illegal activities zones. Nature, with or without human intervention, is working and it settles in this deprived space.

⁵⁰ www.library.tee.gr/ T. Tzortzi, "The contribution of green spaces to the enhancement of the microclimate", pp.: 10

⁵¹ www.library.tee.gr/ T. Tzortzi, "The contribution of green spaces to the enhancement of the microclimate", pp.: 11

⁵² www.artist.gr

In larger areas, such as until recently suburban zones having been trapped by Attiki Odos ring road, installation of more demanding kinds is required, such as bushes and trees. Space coming from abandonment or house demolition, as well as abandoned areas ignored by the city, are spaces that could inspire creative planning.

These spaces, as well as parks, squares and uncovered spaces among apartment buildings, combined with road arteries and pavements could be green unified areas. Proper selection of planting types is necessary. Depending on the case, planting in urban areas presumes not demanding in nutrition plants, resistant to lack of water and extreme sun exposure, high adaptability and with minimum care and handling demands. Irrigation, even for plants not needing much water, is requisite in Greece, at least during the first two years. Then, depending on the annual rain drop level, the presence of water and the depth of water table, growth and nutrition of plants is decided. Urban green areas administration planning requires control of expansion and limitation of the competitive plants, in order to avoid the predomination of one population. What is more, methods to enrich the already existing green areas are required, as well as to preserve biodiversity. Finally, for the unification of open spaces, one should take into consideration the criteria and disciplines of bioclimatic planning, in order to achieve the microclimate improvement.⁵³

Environmental planning of open spaces seeks to reduce consumption on natural resources and to enhance natural function (energy flow, recycling) in the city. Winds, ground, surface and underground currents, sun, planting and vegetation are not individual factors, but basic elements of a further natural ecosystem, which should be restored and work.

3.1.5 WATER

The existence of a water element in any scale influences the urban microclimate, especially the absorption of solar radiation and the energy conservation. The water has a large thermal capacity and consequently absorbs all the incident radiation and it supplies sun protection to the influenced area. At night, the stored heat is diffused in the atmosphere reinforcing in this way the phenomenon of evaporative cooling.⁵⁴

Great significance is given in the formation of natural spaces in modern regenerations with emphasis on water element. Canals, artificial lakes or natural cavities that concentrate water, smooth the microclimate of the area, give potentials for creation of vegetation and also facilitate the effusion of rainwater.⁵⁵

The same formations in the street and the pedestrian zone for water flow constitute an element of enrichment. We can find them in the traditional pathway and in modern formations. (Figures 3.1.5.1, 3.1.5.2). The effusion gutters and the man-holes are some elements that they must participate in the total form of the pedestrianization. In combination with the fountains and the planting they give a different dimension in the environment and the landscape aesthetics.

The water is an element that regulates the microclimate and improves the conditions of thermal comfort that exist in the urban open spaces during the warm, summer period. This fact is due to the procedure of evaporation which absorbs heat from the environment in order to be conducted and therefore contributes to the reduction of air temperature (evaporative cooling).

Figure 3.1.5.1 Jets on surfaces of water (fountains). Liberty Square (Koumoundourou), Athens.⁵⁶



Figure 3.1.5.2 Effusion gutters in contemporary urban design projects.²⁸



⁵⁴ A.Paipai, "Sustainable Urban Design of Open Spaces", magazine "BUILDING", Paper 10, November-December 2010, pp:126

⁵⁵ A.Amourgis, S.Giannas, E.Evangelinos etc., «Environmental Planning and Free Urban Spaces», Vol. A, Publishing HOU, Greece, Patra 1999, pp.:206

⁵⁶ A.Ikonomou, F. Bougatioti, Article :«Water in the cities: An environmental and bioclimatic approach», Magazine "Monumenta", Paper 02: "The power of water"

²⁸ www.google.com

Introduction of water elements in open spaces includes:⁵⁶

- Free water surfaces
- Water surfaces with wells
- Microspraying on vegetation elements
- Free artificial fog systems
- Passive Dwindraught Evaporative Cooling/PDEC Towers)
- Vertical Water surfaces
- Wells incorporated on urban ground

According to some studies, a black impermeable surface does not absorb falling rain, creating thus water stocking and dangerous, for floods, effusions, making pedestrian movement harder, while absorbing about 90% of solar radiation. On the contrary, a rich in vegetation pavement, such as a park, absorb about all the rain quantity and of solar radiation. For instance, in park, the largest part of rainwater is absorbed by the plants and ends in the atmosphere, cooling thus the area and creating a sense of comfort and wellness to the passers-by. The same happens with water in smaller or larger lakes, and in springs/ fountains.

Figure 3.1.5.5 Vertical water surface of marble, Syntagma Square, Athens.⁵⁶



Figure 3.1.5.4 Fountain-water presence in the urban landscape.⁵⁸



⁵⁶ A.Ikonomou, F. Bougatioti, Article :«Water in the cities: An environmental and bioclimatic approach», Magazine "Monumenta", Paper 02: "The power of water"

⁵⁷ Thomas Randall, «Sustainable Urban Design», Publishing Spon Press, Great Britain, 2003, pp.:96

⁵⁸ www.minenv.gr/5/53/bikes/kef1.pdf

3.2 DETAILS OF BUILT ENVIRONMENT INVOLVING THE CONFIGURATION OF URBAN MICROCLIMATE

3.2.1 ENVELOPES

Built space is characterized by its density and geometry. The factors that influence the sun exposure, the incidence and the absorption of the solar radiation, the visibility of the celestial concave, the movement of the air, the direction and the speed of the wind, the increase of pollutants and the heat exchanges between the internal and the open-air space. It is obvious that the built environment influences and defines all the natural factors of the microclimate.⁵⁸

The sparse construction allows better circumstances of sun exposure and ventilation and more space for grass. But on the other side, the sparse construction has also negative aspects, like the increase in the exposed surfaces of the buildings which means also a relevant increase of the thermal losses or the increase in the distances between the land uses which means also larger time duration and functioning cost of movements in the city.

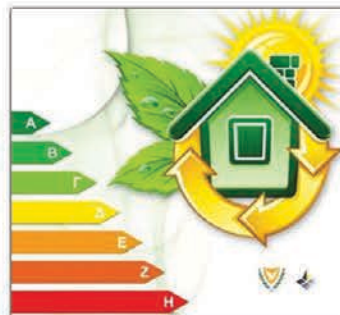
The building principles relevant with the microclimate formation:⁵⁸

- The geometric form of the buildings, with scaled frontages for the best sun exposure and plots in the ground floor for the best ventilation.
- The intermediate and transitional spaces, with the creation of balconies, porches and semi-sheltered spaces with galleries in the ground floors, to the commercial streets for the sun protection.
- The opening of the vacant sites offers better circumstances of ventilation, sun exposure and cooling and also the installation of functional and recreational uses.
- The right properties of the construction materials, for the thermal resistance in the heat exchanges of the external walls, the openings and the rooms, the light colors and the addition of green.

However, building envelopes being already formed, the efforts are restricted to the last category trying to succeed the better heat insulation of the buildings, with internal or external additional heat insulations, with the use of materials that succeed small reflection of the external surfaces, the implementation of rooms and the simultaneous use of alternative energy forms (solar water heaters, photovoltaics, etc.).

The state of Greece after a delay of some years has legislated KENAK (Regulation of the Energy Performance of Buildings) and has defined as necessary the Certificate of Energy Performance (CEP) and also with financing from allocations of European Union subsidizes programs of energy saving that also foreseeing improvement in the building envelope, like the program of "Energy Saving for Private Houses".

Figure 3.2.1.1 Building energy-efficiency⁵⁸



⁵⁸ A.Amourgis, S.Giannas, E.Evangelinos etc., «Environmental Planning and Free Urban Spaces», Vol. A, Publishing HOU, Greece, Patra 1999, pp.: 212-216

⁵⁹ http://portal.tee.gr/portal/page/portal/SCIENTIFIC_WORK/GR_ENERGEIAS/kenak

3.2.2 LAND USES

After the industrial revolution some strong, for that period, uses, like industry, trade as long as services claimed and overtook a significant space mainly in the large urban centers. The mixture of all these uses with the sheltering spaces made the cities non-functional and with conditions that you can barely suffer.

Since the beginning of the 20th century almost any effort of the space organization has as aim to separate the uses. However, the dilemma of separation of the mixture of the land uses has become, from the beginning of these efforts, a subject of discussions and arguments between the technocrats and politicians.

Blending or not of the uses is relevant to the peculiarities of each place, the economy, the politics and the social process of the residents. The drawing of the space uses some studying “tools” in order to study, legislate and finally apply their program. ⁶⁰

In Greece these tools are:

- The Regulatory Plans of metropolitan areas.
- The General Urban Development Plan that concern the study of specific cities.
- The Urban Planning Studies for specific part of the cities.

The initial Regulatory Plans (RP) were legislated for Athens and Thessaloniki and then for Patra, Larisa, Volo, Kavala, Heraklion and Ioannina, when Antonis Tritsis was the minister.

The suggestions that were finalized were:

- Interception of the residential sprawl.
- Improvement of the built areas and reorganization of the neighborhoods.
- Enhancement of the city centers and creation of multicenter construction.
- Use and density control.
- Organization of the single transport system and emphasis in the Public Transport Means.
- Large scale qualitative interventions.

The General Urban Development Plans (GUDP) were drafted for many settlements and cities and they referred to: ⁶⁰

- The land uses.
- The areas of productive activities.
- The urban centers, the density and the building coefficients.
- The network traffic.
- The building and use prohibition in the areas of special protection.
- The potential zones that need reformation and to the zones of special reinforcement.

The modern residential law that is valid since 1977 demands a variety of analytical data, for example, natural elements, population data, economy, inferior uses, etc.

The Urban Planning Studies should be conformed to the plan directions of the above scales (GUDP and RP).

⁶⁰ A.Aravantinos, Th.Vlastos, E.Emmanouil etc, “Intoduction to Natural and Human Environment”, Vol. B1, Publishing HOU, Greece, Patra1999, pp.: 139-148

The main elements that are presented in these studies are:⁶⁰

- Pedestrianizations.
- Land uses and relevant restrictions, prohibitions, obligations.
- Network infrastructure diagram.
- Foreseen public facilities and public benefit spaces.
- Building spaces, building system, building terms and restrictions.

The implementation of the Urban Planning Study in the soil will be done with the elaboration of the Implementation Act.

Other “tools” are the Urban Planning Studies for Active City Planning where the mass organized building is applied. Also, the Urban Reallocation that concerns the conjunction of properties in order to create the necessary public facilities by granting to the owners land equal in value with the land that they gave. Also, the Urban Control Zones (UCZ) having as goal the preservation of the periurban and sensitive areas from the un-programmed construction.

We should also mention that for non urban spaces there is the Open City Spatial and Housing Organization Plan Designs (OCSHOPD), which is referred to settlements with population up to 2000 residents. This, according to the development of the region elaborates an organization plan of land uses a sum of measures, targets, directions and programs.⁶⁰

⁶⁰ A.Aravantinos, Th.Vlastos, E.Emmanouil etc, “Introduction to Natural and Human Environment”, Vol. B1, Publishing HOU, Greece, Patra1999, pp.: 139-148

3.2.3 TRANSPORTATION - TRANSFER

Transportation in Europe produces 60% of CO₂ and 25% of CO₂ that also contributes to the greenhouse effect. Also, they produce 50% of NOX related to the photochemical smog and the acid rain while they emit a large percentage of hydrocarbons that are characterized by its cancerous properties. It is also the large source of noise in the cities.

Energy consumption in the transportation sector is relevant to 39% of the total consumption or 59% of the fluid fuel consumption. The growth rate in the energy consumption from the transportations is so large from any other field of economy, like industry, trade and domestic consumption.⁶¹

Greece although has one of the less developed road networks in comparison with the European average, it has the higher percentage of road transports of merchandises among all European cities. This extraordinary fact is due to the fact that the road transports are based on private initiatives and investments (private transport companies, KTEL, etc.), while the state programming, concern and the state resources for the public transports, especially the trains that serve almost all the trade transports in whole Europe, are absent.

The factors that contribute to the increased pollutant emissions by vehicles are:

- Low speed of vehicles
- Interrupted course and
- Traffic congestion

Vehicles are classified according to the fuel that they consume the cubism and their use. In Greece, the main vehicle category is the passenger cars. The different vehicle categories do not emit the same pollutants neither the same quantities of pollutants. Huge efforts of finding and promoting new technologies of fuels and vehicles that are friendly to the environment and the people's health are being made.



Figure 3.2.3.1 Bicycle Parking in the University of Groningen.²⁸

⁶¹ A.Andreadakis, A.Z.Varfi, G.Giannakourou etc, "Intoduction to Natural and Human Environment", Vol. B2, Publishing HOU, Greece, Patra 1999, pp.:27-33

²⁸ www.google.com

The efforts that are being made on a global scale in order for the pollutants to be reduced are focused on:⁶¹

- Fuel improvement,
- Promotion of new technologies in vehicle production
- Intense control of the pollutant emissions
- Extension, the modernization and the promotion of the Public Transport Means
- The development of policies for the use of bicycles and hiking with the creation of relevant infrastructure (cyclists, low leasing of bicycles from the Municipality, pedestrianization networks, and others), in order to supply the motive and mainly the easy and secure transfer of the citizens.

⁶¹ A.Andreadakis, A.Z.Varfi, G.Giannakourou etc, "Intoduction to Natural and Human Environment", Vol. B2, Publishing HOU, Greeca, Patra 1999, pp.:27-33