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Research paper



Landscape Design of the Urban Environment: Ecological Aspects

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Abstract

This article is aimed to consider some aspects of the landscape design of the urban environment, oriented to recreate its natural ecological balance and provide esthetically attractive and healthy living environment. The authors emphasize the importance of creation of a harmonious environmentally friendly urban environment for vital activity of its habitants basing on the proper collaboration of natural and anthropogenic constituents. Approaches and methods, that formed the basis of algorithm of this research and facilitated the careful analysis of the available historiography material, urban environment world analogues, their project design are represented. The authors gave a conceptual framework, that consists of the terms related to this research by content. Aspects of landscape design of urban environment are outlined. The authors focused their particular attention to the educed ways of solutions of the ecological problems of the urban environment by means of landscape design - by forming the ecological framework of a city; creation of the environmental architecture; recourse of the verdured roofs and walls; by ecologization of transport arteries, introduction of bike paths, application of eco-grades, parklets; by creation of walking paths, sites and small architectural forms, without impact on natural form of earth and areas of the existent planting. It is to be noted that the proper approach to the landscape design of an urban environment is the powerful motivator for improvement of ecological situation, creating accents wherein they have been set by nature. It is highlighted that only the all-round consideration of features of natural urban environment can assist creation of a perfect ecological landscape at the urban framework, its layout structures and infrastructures as a whole.

Keywords: *Urbanization, ecology, ecological design, landscape design, ecological framework, organic architecture, parklet, eco-parking.*

1. Introduction

Interrelation between mankind and nature is intrinsic. Despite the human drive to progress, it returns however to natural sources. Nature is the initiation wherefrom during centuries the human beings draw inspiration, forming their environment, creating new architectural objects, implementing their own tastes as to the harmonious vital environment. Undoubtedly, both the achievement of scientific and technical progress and spiritual values are represented therein.

In connection with the intensive development of scientific and technical progress on the way of human civilization the problems of maintenance of friendly living environment, of the influence of rapid urbanization processes at the urban ecosystems become more acute, arises question of invention of possible ways for the natural environment enhancement. It is known that city over the entire history of its existence was considered as the cradle of civilization, that attracted the progressive moments, from one side, - by electrification, intensification of transport networks, by industrialization, high level of communications, service and residence of people. But on the other hand, it always was the store of the ecological negativity. Let us remember descriptions of cities of Old Rome, medieval Europe, which are well-known from historical sources that certify the quite unattractive state of their urban environment [1, p. 70].

These negative phenomena increase with every century. Unfortunately, the modern urbanized city is in a heavy ecological situation because of technogenic pollution of atmosphere, waters and soil, drinking-water, transport intensity and noise impacts, increase pressure on natural environment, and consequently resulted in a threat to the health of population, ecological safety and economic stability of the country. Domination of people caused extermination of environment, depletion of natural resources. In the end, filling of natural space with modern architecture, with the expressed structural elements which are dynamic and active, conduces to destruction of nature as a single entity.

Therefore in course of forming of human space, it is very important to take into account interests of the environment in order to obtain the harmonious result of cooperation of environment and people. Whatever is necessary for life a man gets from nature – energy, foodstuffs, materials, emotional and aesthetic inspiration. Over years and centuries scientists and specialists-practices accumulated a ponderable experience as for mitigation of the situation and making of various means for improvement of ecological balance of the urban environment, including architectural-planning and landscaping.

The issues of improvement of sanitary-hygenic terms of the urbanized environment and increase of the aesthetic value of urban and

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suburban landscapes always are on the agenda of scientists. They are outlined including national level - in legislation of the nature protection, scientific programs of various countries. The issues of the day have a global importance, that is why they are under permanent discussions by the specialists of various countries within the framework of the International program the UNO "Man and biosphere", at symposiums and scientific conferences of the international level. Ecology at the present stage of the mankind development is examined in the widest sense – from the technogenic issues and nature protection problems, chemical and biological processes till the social, philosophical and spiritual ones.

2. Approaches and research methods

Research of ecological aspects of landscape design of the urban environment by the authors is carried out on two levels - empiric and theoretical ones, that constantly are interlacing. Processing of the unknown and little-known source base related to this theme, its systematization is the first step in the process of collection and accumulation of the necessary information. Analysis of historiography materials, scientific works of previous researchers, architectural-project materials has been carried out. The data were systematized after the basic constituents by content. The scientists constantly highlight results of their researches in numerous scientific works. Town-planners, architects, landscape architects and designers, that deal with the outlined problems, give their suggestions in relation to the improvement of situation at the level of town-planning in the whole and landscape design, in particular.

Materials related to combination of the anthropogenic and natural environment in cities are taken from the available data base. Aspects of forming and perception of urban environment are in the heart of works of the following authors: K. Sitte [2], M. Barkhina [3], E. Belyaeva, A. Bunina [4], B. Glazicheva, A. Ikonnikova [5], A. Krashennikova, I. Lezhavi, Y. Medvedkova, L. Pavlova, S. Smolenskaya, A. Rappoport, L. Sokolova. The aspects of development of city and ways of transformation of its landscape as for the system-ecological positions are investigated by: I. Barsova, V.Baulina, V. Belousov, Y. Bocharov, A. Vergunov [6], V. Vladimirov [7], A. Grigoyan, A. Guseinov, N. Krasnoshekova, V. Krasilnikov, L. Mashinsky, Y. Medvedkov, S. Mityahin, V. Nefedov, N. Raymers, V. Sidorenko, A. Sycheva, Y. Khromov, S. Chistyakova, V. Shimko, X. Yargina [8]. Substantial contribution in the solution of problems of compositional relationship between architecture and landscape was brought in by such Polish specialists architects, as B. Zauphal and Z. Gondek, who investigated natural landscapes and methods of integration of artificial forms therein.

There are of interest the researches, devoted directly to the problems of composition-spatial interrelations of the artificially created and natural landscapes, their interdependence with architectural structures. So, the well-known works of Paul Faye and Michel Tournaire examine the problem of improvement and protection of landscapes, they contain the structural analysis of form, color, texture and scale of landscape, use of these conformities to law at integrating of architectural structures into a landscape. Careful researches of the landscape organization of an urban environment as the whole are found the scientific works by J. Simonds [9], L. Zalesskaya [10], I. Rodochkin [11], L. Vergunov, V. Kucheryavy [12], O. Mikulina, A. Belkin et al. The architectural-composition and aesthetic descriptions of particular structural component of cities (including objects under this research) are found in works by A. Vergunov, K. Sitte, M. Belov, D. Brookes [13], V. Petrov, A. Bunina, B. Vipper, G. Zemger, Z. Gideon, L. Naimov, V. Kandinsky, T. Savarenskaya, Z. Yargina et al. These works give an opportunity to trace the scientific search of forming methods of landscape objects in order to create the integral harmonious environment.

Works by such authors as G. Gellicoe, B. Colvin, J. Simonds, G. Eckbo, N. Barrett, A. Sychova , N. Titova [14], N. Kryzhanovska [15] and other are dedicated to the issues of landscape design of the urban environment. From the point of view of realization of the ecological methods in the objects of landscape design the analysis of practical experience of a number of the talented specialists is invaluable. Works of Roberto Burleux Marx (Brazil) [16], Piet Oudolf (Holland) [17] are among them, wherein the authentic vegetation is maximally protected and feeling of untouched nature is conveyed.

Actuality of the outlined problem is constantly illuminated in the magazines oriented to the broad public. The world-wide ecological movement activated work towards the urban ecology and combined efforts of scientists, environmentalists, landscape architects and designers, hydrologists, the urban engineers. The scientific developments focused on the newest approaches in creation of the urban system of planting of greenery, on the searches of alternative solutions in the field of landscape design both home and foreign are well-timed [18]. Processing of the existent materials, accessible historical, architectural and literary sources, scientific works and architectural-project materials of previous scientists assisted the selection of certain evident-based material for further detailed analysis.

The visual field inspection of the existent (implemented) objects of the urban landscape design allows to confirm validity of results of scientific search and rightness of the applied empiric and theoretical methods. Moreover, being the inalienable part of the process of factual material accumulation, the field inspection of landscape objects gives the real visual description of objects, allows to feel the magic action of natural environment. In order to fix the existent state of objects of landscape design pictures or watercolours are executed. They give an approximate idea about the object. The most exact documentary image of object is provided by photos.

The further processing of materials is based on the historical - factual approach, monographic and topographical methods whereby the urban environment of different levels of urbanization and its landscape constituent are the objects under research. The historical - factual method allows to investigate the historical basis of forming of the urban environment, its landscape structural elements. The authors implemented the monographic method that allowed them to succeed the detailed investigation of the certain objects of landscape design in the urban structure. To substantiate the regional specific of landscape-plans and composition developments of the urban environment the comparative-historical method of research is used. It is based on comparing of home objects with their world analogues.

The system method gives an opportunity to consider the objects under research as a single complex with the concerted functioning of all its component parts, to define conformities to law of layout, spatial and composition constructions of the urban environment and landscape objects therein. No less interesting and actual is determination of dominating stylish trends and tendencies in the objects of the urban landscape design. In this context the authors followed the stylistic method of research. It affords ground to distinguish the most characteristic stylish trends of landscape design of the urban environment.

The process of scientific cognition of landscape design of the urban environment is aimed not only to refine the historical and architectural knowledge, to investigate its evolution but also to provide the theoretical bases for practical solution of ecological problems at the level of a city. Especially relevant are the questions of maintenance of the nature's framework of the urban environment, organic integration of natural landscape elements into the modern town-planning structure. Therefore based on the obtained all-round scientific data, development of the graphic project suggestions as for improvement of the urban environment by means of landscape design, also for maintenance of the authentic natural fragments in the structure of city is expedient. The practical side of research shows a decisive ground of complex scientific-creative process.

3. Research conceptual framework

In the course of scientific research the authors set forth concepts and terminology that is a base for exposure of ecological aspects of landscape design of the urban environment.

The ecological design is the direction of the artificial environment morphogeny based on principles of careful attitude toward nature and to the individual as its inalienable part.

Eco-parking is the territory for parking of vehicles, sown by lawn mixture and fixed by a lawn grate (concrete, plastic and others like that). Such parking allows to park a vehicle and, at the same time, to save the green lawn cover of the area and its aesthetics.

The landscape design is the "creative activity directed to form the artificial architectural environment using the decorative planting of greenery, geoplastics, small architectural forms, decorative coverage, visual communication" [15, p. 6]

The urban design is the complex of forming of in-spatial environment of a city and products of this activity [19, p. 84] (small architectural forms, urban structures, elements of visual information, illumination and others like that).

The urban environment is a complex of certain basic terms created by people and nature within the city limits, that directly exert influence on quality and living standard of its habitants.

Organic architecture is the harmonious placing of objects in relation to the surrounding space and natural landscape, that determines the task of creation of architectural forms and constructions, using properties of natural materials. The process of forming of an object takes place under the influence of its specific content taking into account features and unicity of natural surroundings. Borrowing of natural forms and their use during development of structural elements helps to attain the architectural expressiveness. Thus, "organic" character of architecture is used for denotation of its three aspects - ecologically safe materials, natural landscapes and life-forms.

Parklet is the urban public mini-space for acquaintance, communication and rest of people, created at the place of 1-2 parking spaces.

Natural environment is natural uncoined surroundings free from cardinal impact of people and consequently retained its natural properties.

The universal design is strategy of planning and design of products to create the society of the general ownership ("for all and each"), that will provide to all its citizens complete equality and possibility of participating in its life.

Urbanization is a "socio-economic and materially-spatial process that consists in increase of cities and urban population and distribution of the urban way of life for whole society" [19, p. 293].

4. Ecological aspects of landscape design of the urban environment

As already mentioned, the urbanization processes bared an ecological problem that threatens to not only the health of urban population, but also on occasion - to its existence. Environmentalists, hydrologists and landscape architects of the whole world are seriously concerned with rapid growth of negative technogenic influence on the urban natural environment. Still in the middle of XX century a term "nature garden" (naturalistic garden), which designated the ecological direction in forming of the urban landscape objects, appeared in world landscape architecture. The scientists offered basic methods for implementation of naturalistic gardens, these methods were oriented to form the restrained and quiet landscape compositions of natural forms of plants, field and forest flowers, grasses. Absence of exotic plants, bright colours, capricious whimsical forms facilitated creation of a number of the verdured objects as for a theme of the existent natural landscapes. The research revealed that succession of the ecological culture has been emerged from the established traditions as for forming of environment of existence of a family - in ancient estates and manors. While preaching the generally accepted canons of pleasance building on the parade areas, gardeners glorified the local beauty and cleanness of natural surrounding of other territory. The main keynotes of that time were the important ecological aspects as follows:

- arranging of ponds (or cleaning, expansion of the existing one) including provision of proper microclimate;
- maintenance of the existent dendrology composition of vegetation (basis of landscape of estates - local cultures);
    - creation on the territory of acclimatization centers (with hothouses, green-houses and others like that) for growing of the own "exotic" vegetable material;
    - maximal underlining of beauty of the existent landscape, that gave the individuality and local colour to estates.

The concept "ecological design" appeared at the turn of XXI century, that implicates planning of the landscape design objects, taking into account the ecological parameters of existent environment. The ecological design allows to find necessary ways for cooperation with nature, that facilitate renewal and considerable improvement of natural ecological balance, allow qualitatively to change the urban environment, decrease power charges, not ignoring the social and cultural necessities of the inhabitants. Careful analysis of the subbase (structural composition of soil, subsoil waters, aborigine plants of this territory, inclination and orientation of area and others like that), its aesthetic description (advantages and defects, future perspectives and others like that) serve as the assured base of professional project suggestions that answer the high aesthetic requirements and satisfy the architectural-artistic and emotional-psychological requirements of a society. The ecological design necessarily takes into account the most fine details:

- orientation of area in relation to cardinal directions;
- plants-predecessors which had been on the territory;
- inclination of soil relating to the line of horizon;
- structural composition of soil and groundwater of the territory;
- perspective background of area (subbase), its defects and advantages, and others like that.

World experience in this field is presented by works of the theoretical–and-practical direction, that embrace the basic ecological problems of the urbanized environment such as adjusting of the urban hydrological system, careful attitude toward the existent vegetation and new planting, reduction of concrete and asphaltic surfaces and their replacement with more ecological materials and others like that.

The new elements of the urban landscape design, which do not violate natural hydrological and ecological processes, but inversely facilitate the creation of the resistant urban ecosystems are developed. Change of climatic conditions, floodwaters increase gave an impetus to specialists to develop alternative directions in the existent urban practice concerning layout, building and maintenance. The American scientists suggested the cluster approach in the town-planning system, that provides the more compact housing instead of previous arrangement using the large plots of land with considerable transformation of their areas [18, p. 20], that resulted in compression of soil and rainfall removal, violation of course of nature.

The basic measures of specialists are directed to renovation of course of nature and its regulation. Such activity is assisted by ecological movements, public organizations, natural scientists, public persons, whose basic sphere of activity is directed to escape impairment to the nature, to save maximally the ecological urban framework. For example, one of the important tasks of American ecological movement of Low Impact Development (LID) is remediation of natural hydrology of the urban reservoirs [18, p. 21]. For that purpose the special small bogs of various configuration are created like the waterish natural ecosystems connected with ponds, allow to retain all contaminations and create natural drainage. Moreover environmentalists offer to deploy in cities the wa-

ter extraction cisterns and pools for collection the rain-waters, then such water shall be used for watering of plants and for washing off in lavatories.

In our country the ecological movement is the activity of citizens and public organizations, aimed to environment protection, prevention of degradation of nature, increase of ecological risks, decline of quality of life, impairment of natural environment in the whole [20].

Research of the modern urban environment by the authors urged on the exposure of agrotechnical and designer methods, targeted towards preservation of the valuable one-off greenery objects, protection of the urban landscape systems. Because forming of harmonious comfort spaces in the structure of the modern urbanized cities, conditioning for public rest of their habitants is the important task of present time for all consumers of environment – starting from specialists to the ordinary habitants. "The further a man departs from the harmonic connection with nature, the more our surrounding becomes pernicious " (R. Neutra [9, p. 9]). Each of the invented ways is targeted towards harmonization of the environment, solution of its ecological problems by means of the landscape design and deserve separate attention from the side of scientists and, especially, practical specialists.

4.1. Forming of the ecological city framework based on maintenance of natural authentic landscapes (Fig. 1)

Basis of the ecological city framework is presented by the continuous system of its planted territories - parks, public gardens, urban gardens, embankments, boulevards, streets. Forming of such system in cities provides balance in its town-planning structure, satisfactory sanitary-hygenic indexes and aesthetic constituent. More meaningful objects are the base blocks of the framework. Linear landscape component of a city bind these base blocks with continuous green corridors, forming the green belts of the city. Such continuous system of the planted territories is responsible for even distribution of intercity landscape open-space. Such comfort and attractive space based on the authentic natural landscape must not only provide the ecological parameters of environment but also capacity for self-regeneration and accordingly withstandability of the natural system.

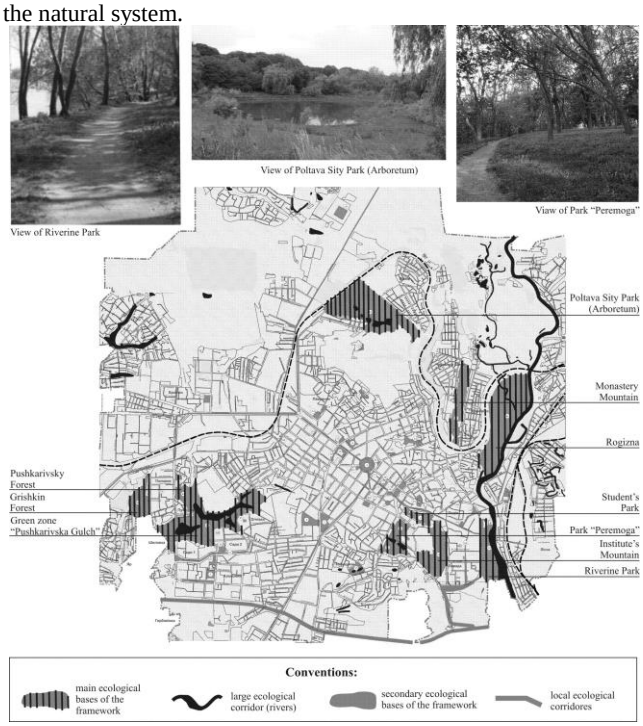


Fig. 1: Forming of the ecological city framework based on maintenance of natural authentic landscapes (on example of Poltava, Ukraine)

4.2. Creation of the eco-architecture (Fig. 2)

Firstly, in his day the well-known architect F.L. Wright noticed: "Let us therefore to build such structures which return to the man elements of nature, giving life, increasing its tone. Hereunder the architecture that is begun from the nature of area is kept in view" [9, p. 17]. Such cooperation of architectural spaces and natural surroundings is brightly presented in House above the waterfall in Pennsylvania, where materials and forms chosen by F.L.Wright converted the object and environment into a "harmonious unity" [9, p. 99]. Secondly, association of architecture and landscape resulted in deployment of organic architecture, when forming of the harmonious space takes place in such a way that elements avoid to occupy dominant positions, but on the contrary were closely associated, complementing each other. Thereat the architecture, keeping constructiveness of an image is continuation of natural environment, like evolutional form of natural organisms. The reflection of nature images is traced whilst forming of architectural styles from XX century. Living lines, continuity and fluidity of forms, became basic principles of the Art Nouveau, architecture of expressionism represents natural forms in the works, mostly causing in memory the natural landscapes: mountains, rocks, caves, stalactites. The architectural objects integrated in a terrene are the inalienable constituent of such process. They give an opportunity to save authenticity of surface natural space and, at the same time, enrich it with a new function. The spelaean houses (dwellings, temples), ecological underground houses and eco-settlements are the prime examples of such approach. For example, OUTrial House (Ksiozhenitse, Poland), Villa in Vals (Graubunden, Switzerland), Extension of a Barn (Lespon, France). Thirdly, today, thanking to the progressive innovative processes and re-thinking of values buildings made from the processed materials (secondary raw material) appeared. Such approach allows to minimize harm to the natural environment, also because of utilization of industrial and domestic wastes (crushed glass, ceramics, plastics, paper, domestic and transport containers). This is confirmed by the pavilion in Henderson (USA), cafe in the suburb Seattle (USA), dwelling-house in Rotterdam (Holland).

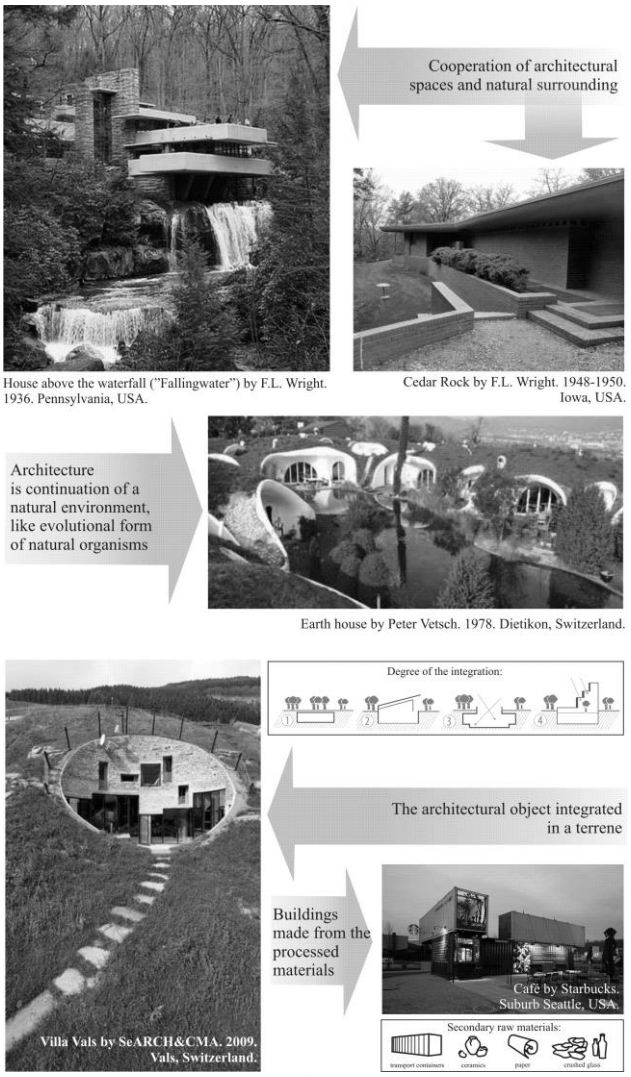


Fig. 2: Creation of the eco-architecture

4.3. Use of roofs and walls of buildings under planting of greenery, providing of functional isolation by creation of palisade, vertical gardens, green wallpapers and other types of the vertical planting of greenery (Fig. 3)

The sources of the intensive planting of greenery of roofs go along with the most ancient times, from creation of hanging gardens of tsarina Semiramis, one of seven wonders of the world. The new round of arrangement of the building roofs with greenery began in XX century and was supported by the well-known architects, including Le Corbusier, who considered the operated roof as the fifth facade of a building. The scientists of Western Europe for years use the ecological attics as natural filter and special sponge on the way of rain precipitations, that are the important place of existence of the urban fauna. The extensive use of roofs with the insignificant ground cover provides rainwater disposal both from sloping roofs and from a roll (green roof sucks in up to 90% of rain precipitations). Intensive exploitation of the last ones allows to land in deep soil the bush and small wood plants, recreating the lost oases and creating ecological areas esthetically suitable for rest. In the most of European states and in North America various ecological movements and the state take care about creation of "green roofs". Exploitation of roofs under planting of greenery is actual and at the same time esthetical by the attractive method of decision of ecological problems in modern cities. Cities with high housing density and catastrophic shortage of natural greenery shall prefer the greenery of facades, or "vertical gardens", than surfaces made from building materials. Together with the classic planting of greenery of facades by clambering plants, in the second half of XX century the French botanist Patrick Blanc offered the new approach based on ability of plants to exist on vertical surface. This was his own conception of modern vertical gardens made from tropical plants. A hi-tech equipment and automatic control for fertilizer application allow to supply simultaneously water and nutritives to the plants. Adaptation of this system in a number of countries demonstrates two variants of aesthetic solution. The first, based on the use of cover-ground plants, including drought resistant Sedum L., forms even carpet coverage on a wall. Second, "ornamental" (vertical boards, green pictures and others like that), creates the bright visual effects due to magnificent vertical gardens and use of corresponding perennials and, even, undersized bushes.

4.4. Ecologization of traffic arteries, introduction of bicycle paths, application of eco-grids, parklets, geoplastic means for differentiation of the transport, bicycle and pedestrian ways (Fig. 4)

Plant materials (wood-shrub vegetation, ground-covering plants, lawn) represent one of the effective ways to increase the ecological parameters of transport arteries and, at the same time, their architectural-artistic setting. It is not forming of recreational territories. But they allow to improve the microclimate of trafic arteries and to promote information for drivers, directing them, warning or accenting their attention by means of the formed relevant groups of plants. Use of new ecological coverage - the ecological grates became a ponderable achievement for road interchanges and parking sites. This innovative technology allows to equip parking sites, grounds, trafic ways with a green lawn, it allows to fasten the parking subbase with the special grates (concrete, plastic, metallic). The eco-parking system retains the ecological safety of such areas and provides them with the aesthetic attractiveness in the urban environment.

Replacement method of the vehicles parking site for the public mini-space, parklets, intended for the a city inhabitants and executed by means of landscape design is interesting from the authors' standpoints. The wave of creation of parklets began its expansion with 2005 from San Francisco (USA), where the planted urban territories were catastrophically missed. Nice that within the period of the ecological urbanism evolution and modern tendencies of conceptions such as "Cities for pedestrians", "City oriented to the man", and particular concepts such as "pedestrian spaces" and "walkability city" parklets were accepted by the habitants of the Ukrainian cities, as confirmed by Ivano-Frankivsk, Chernihiv.

A number of specialists considers that over the long term the ideal city shall be absolutely free of cars, as means of individual transport. They shall give place to small individual transport vehicles - bicycles, push-bicycles, scooters and others like that [21, p. 23]. The architectural-landscape space of the bicycle paths is the public recreational space for a comfort movement, rest and communication. It is not by coincidence the term "bicycle architecture" exists in foreign practice. In the modern understanding the bicycle path appears not only as a part of a transport network but also as a qualitative urban environment, a site for introduction of the technical progress results - various forms of illumination, "green" technologies and others like that.

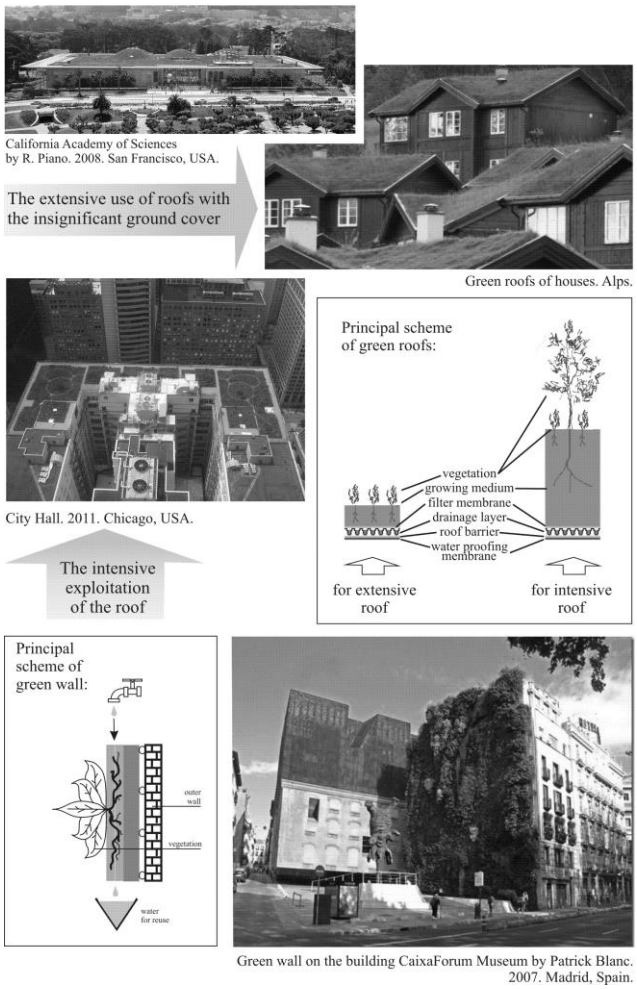


Fig. 3: Use of roofs and walls of buildings under planting of greenery

4.5. Creation of promenade roads, sites and small architectural forms, without impact on the natural form of earth, areas of the existent planting, including their exotic species

In his day the well-known landscape architect J. Simonds noticed: "The most permanent and the most beautiful in the world highways and roads are the ones that, as a rule, follow lineaments of the mountain uplifts and bottom of valleys that rise or go down the lateral slopes wherein a crossfall naturally is mostly suitable. Maybe such roads are pleasant exactly because they are in complete harmony with the natural forms of earth" [9, p. 87]. The very nature "prompts" to the specialists place of laying communication ways, sites for disclosing the picturesque views, location of accents and dominants. Large natural landscapes, forest areas, ravines and small flat-bottom valleys, as a result of difficulties of mastering remain unchanging in the urban structure. A bit more complicated with the small areas of vegetation, it is difficult to save them in the intricate urbanized environment (Fig. 5). During research the authors found a number of practicing ways of landscape design, that are directed to the improvement of ecological situation:

- maximal maintenance of germination of plants;
- use of elevated pedestrian ways for protection of existent grass canopy and natural drainage in the urban landscape objects with the authentic areas of greenery;
- use of kerb-stones flush with the plate surface of paving for the natural flow of rain-waters towards the adjacent planted areas;
- maintenance of the authentic cover near trees in order to provide drainage and natural flow of water into root system;
- use only the local vegetation in the urban landscape compositions for the achievement of maximal effect of the "untouched nature".

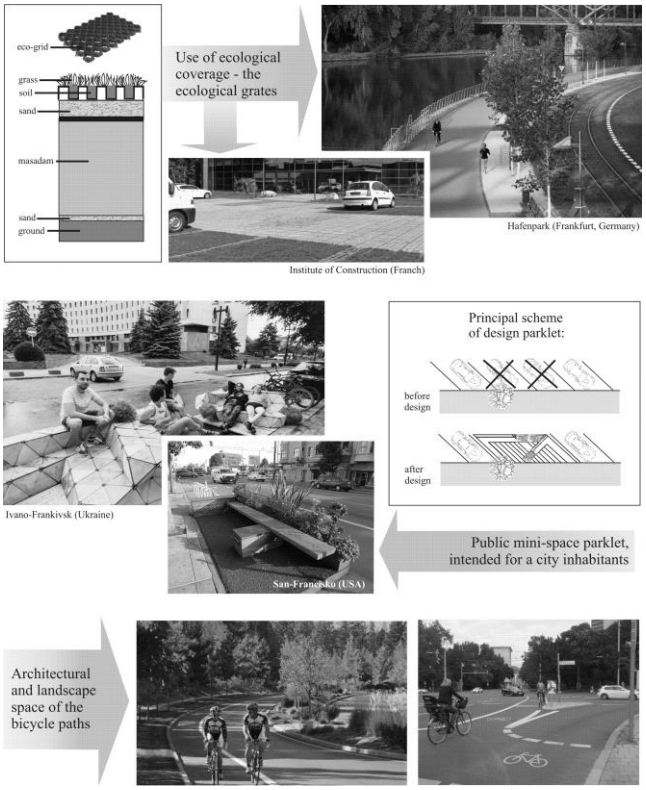


Fig. 4: Ecologization of traffic arteries, introduction of bicycle paths, application of eco-grids and parklets

5. Conclusions

It is to be noted while summing up the above stated that the exposed problem is very actual. The reasonable use of the urban landscape systems is able to provide partial renewal of the lost ecological balance of a city. Further alternative variants will allow the world community to achieve the qualitatively new level of decision of problem of ecological design in the urbanized environment of a city. The harmonious urban environment open and friendly to the man shall be result of improvement of the architectural-landscape environment of a city. The relevant landscape design of the urban environment is a powerful motivator for the improvement of ecological situation, creating accents wherein they have been set by nature. Not a single solution on forming of ecological landscape of the urban framework, its layout structure and infrastructure in the whole will not be perfect without mainstreaming of features of its natural environment.

Research of ecological aspects of landscape design of the urban environment carried out by the authors bared the vital problems and, at the same time, showed the real possibilities for implementation of "natural laws" into the modern urbanized environment on various hierarchical levels:

- at the town-planning level – formation of ecological urban framework; maximal inclusion of water (if available) into the layout urban structure; harmonious collaboration of architectural and natural surroundings; ecologization of the urban transport network, bicycle paths and pedestrian zones;
- at objective level - creation of architectural objects of organic and ecological features; use ecologically clean materials and technological devices; introduction of new

building material - secondary raw material (stone. brick, plastic).

For a long time the architectural-landscape environment of survival of mankind is the one of important elements of its life, source of positive emotions, pledge of reliability and stability. Harmonious organization of this environment is the important factor for creation of the ecologically favourable vital space. Realities of present time as for costliness of plots of land, high housing density of the urbanized cities and general negative ecological situation need the effective use of every piece of earth. The accumulated world historical experience of creation and use of these territories is the example of forming of the architectural-landscape harmonious environment, wherein a man will feel himself ecologically protected in city of XXI century.

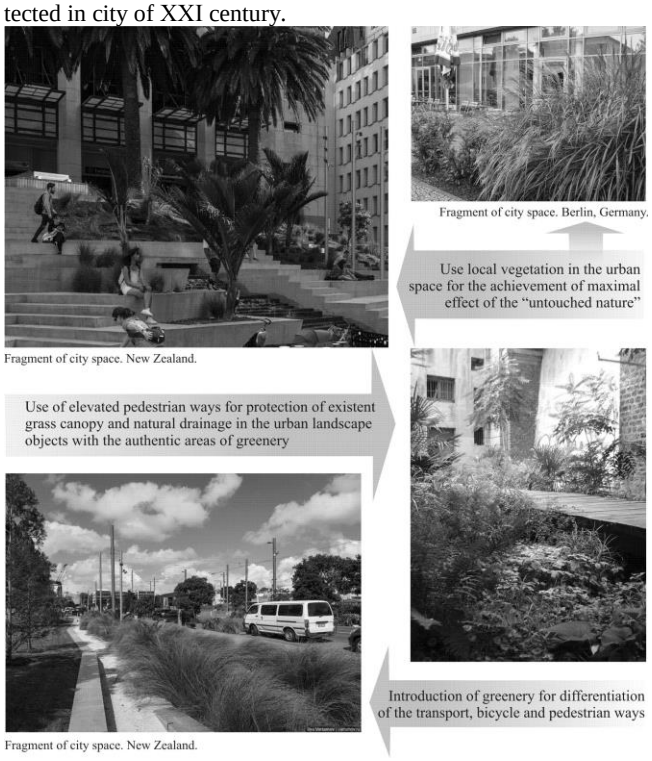


Fig. 5: Creation of promenade roads and sites without impact on the natural form of earth, areas of the existent planting, including their exotic species

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