First International Conference "Horticulture and Landscape Architecture in Transylvania"
Agriculture and Environment Supplement (2011) 298-309

The Evolution of Open Spaces and Green Surfaces on High-Density Developments Since 1950

Eszter BAKAY, Dóra HUTTER, Kinga SZILÁGYI

Department of Landscape and Open Space Design
Faculty of Landscape Architecture
Corvinus University, Budapest

Manuscript received April 2011; revised October 2011, accepted October 2011

Abstract: Although the first housing estates appeared in Europe around the beginning of the 19th century, the concept of housing estates is closely connected to urban developments after World War II. Within this timeframe, it is most significant in the residential developments of former Socialist countries. In this region the housing estates can be considered as the symbols of Socialist urban planning. Within in the history of housing estate developments certain periods can be distinguished according to architectural composition, applied building technology and planning principles, and their urban structural situation. The main types of housing estates are similar in the various Eastern Bloc countries.

The development pattern of the housing estates built in the 1950s is different from those of the 1960s – when block technology was applied – and from the housing estates with the system-building technology of the 1970s. Due to these differences, the amount and quality of green surfaces and open spaces also vary dramatically in housing estates built in different decades. Housing estates built in the 80's and 90's are more ambitious regarding applied open space planning solutions, in order to balance the declining prestige of the block- flats. The big housing estates developments ended after the change of regime, but the construction of planned high- density developments has survived in the form of gated community developments. The gated community developments of the last 15 years fulfill the new needs of a social class quite different from population of the older housing estates. These new requirements affect the green surface and open space development in these new residential areas, as well.

During these 60 years, many new public functions have appeared in housing estates, and a variety of different planning styles and fashions have come and gone. There were significant changes in material use, and many new products appeared on the market.

In our research, the sizes and proportions of green surfaces and applied open space design solutions are analyzed on different testing sites. The evaluation of this data includes taking into consideration the relevant related building codes for residential developments effective in each period. Original physical plans, landscape development plans, aerial and spatial photos help to evaluate plant-coverage, proportion of impervious (paved) to green surfaces, composition of vegetation, and the amount and proportion of recreational open spaces.

Keywords: housing estates, green surface normative, parking, residential common gardens, urban ecology, tree canopy

1. Introduction

Although the first housing estates appeared in Europe around the beginning of the 19th century, the concept of housing estates is closely connected to post- World War II urban developments. Within this timeframe, it is most significant in residential developments of former Eastern Bloc countries. In this region the housing estates can be considered as the symbols of Socialist urban planning. Within the history of housing estate developments certain periods can be defined according to building composition, applied building technology and planning principles and their location within the urban structure. The main types of housing estates are similar in the various countries of the Eastern Bloc.

The development pattern of the housing estates built in the 1950s differs from those of 1960s housing estates – when block technology was applied – and from the housing estates constructed with system-building technology in the 1970s. Due to these differences, the amount and quality of green surfaces and open spaces vary dramatically among housing estates built in different decades. Housing estates built in the 1980s and 1990s are more ambitious as regards their applied open space planning solutions, in order to balance the declining prestige of the blocks of flats. The big housing estates developments ended after the changes of 1989, but high-density large-scale planned developments have survived in the form of gated community developments. The gated community developments of the last 15 years fulfill the new needs of a social class quite different from population of the older housing estates. These new requirements affect the green surface and open space development in these new residential areas, as well.

2. Materials and methods

Within the 60 years of analysis many new public functions appeared on housing estates, planning styles and fashions followed each other, there were major changes in the usage of materials, many new ready-made products appeared on public open spaces. By learning the then valid regulation and planning methods of green surfaces and by analyzing certain sample- territories, we reveal the size, quantity, proportion of the green surfaces in housing estates and the typical open space design solutions. In addition, we determine some theoretical and practical values, which can have some effect on recent green surface design and open space design as well. Number of flats in certain housing estates and the number of residents were determined according to statistical data. The plant coverage, the proportion of pavements, composition of plants, the proportion and quantity of open space units with recreational functions in different eras were evaluated with the help of original built-in plans, open space design plans, aerial photos and satellite images**.**

In order to study the planning principles of housing estates of the period from 1950 to 1990, we chose the construction plans of two housing estates planed in each decade and analyzed them according to certain aspects. These same aspects were used to analyze the construction plans of two housing estates built after 2000. The comparison of green surfaces and green areas of different housing estates can be tracked by the changes of the following attributes:

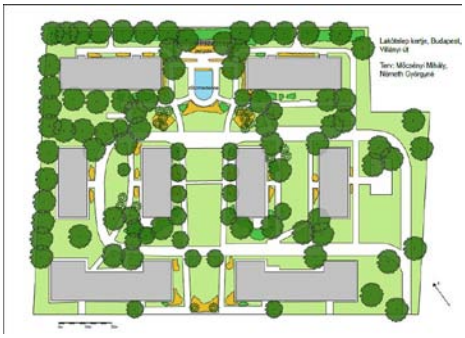
Character of development:

- The placement and usability of common gardens
- The relation of pedestrian to car traffic
- The means of parking and the number of parking places
- Specific proportion of green areas by type
- Proportion of green surface
- Coverage (tree canopy)

We evaluate the **present** coverage of housing estates built in different decades by the help of aerial and satellite photos, and we draw conclusions regarding the changes in green surface proportion.

3. Results and discussion

The typical systems of housing estates built in the first half of the 1950s are framed and open-framed. According to the superblock planning principle the courtyards in certain cases were enlarges to a size that would permit primary public facilities (such as day-care for children) to be placed here. We don't see any sign of parking lots in the plans of this period. At certain housing estates, the placement of buildings is in axial symmetry, and the symmetry axis is emphasized by decorative pools, statues and trees (for example, Budapest's District XI. Villányi Street housing estate). The green areas of housing estates are ornamented with by lavish flowerbeds. Although compulsory regulation had not yet determined the minimum proportion of green surface, an extremely high proportion of green was typical in these housing estates.



Villányi út	Size/Quantity	%
total area ($m^{2)}$	14902,6	**100**
built-in area (m^2)	3102,5	**20,82**
pavements (m^2)	3944,9	**26,47**
water surface (m^2)	69	**0,46**
decidious trees (db)	92	
flower surface (m^2)	429,7	**2,88**
parking lots (m^2, db)	0	
canopy (30m2/tree)	2760	**18,52**
green area	**7786,2**	**52,25**
number of residents	561	
green area per resident	**13,9**	**m2/fő**

In the case of the housing estates built in the 1960s, the parallel detached layout – more practical from a building-technology standpoint – seems to displace the framed one. But among the buildings, there are still semi-enclosed, large-scale „semi-courtyards", in accordance with the superblock principle. Car traffic is only outside the block, with only pedestrian traffic permitted in the courtyard. In these housing estates, the number of parking places is insignificant.

In some of the housing estates of the 1960s, the buildings are arranged in clusters, around cul-de-sacs. This method was successfully applied at housing estates that were built in one phase. (E.g. Budapest District XVIII. Lakatos Street Housing Estate) Very dense tree plantation (perhaps even too dense by today's standards) and huge flower surfaces are typical in the green areas.

At housing estates built at the beginning of 960s the size of green surface per resident is relatively high. We can find lavish flowerbeds in the green areas between the buildings. A large portion of the pavements are gravel-covered, which absorbs rainwater.

Lakatos u.ltp.5. egység	méret/menny.	%
teljes terület	59080	100
épület	8960	15,2
szilárd burkolat	22983	38,9
szórt burkolat	1526	2,583
vízfelület	0	0
fák (db.)	297	
virág felület	1525,9	2,6
parkoló	0	
borítottság(30 m2/fa)	8910	15,1
zöldfelület (m2)	**27136,8**	**45,9**
lakosszám	1785	
1 főre jutó zf.	**15**	**m2/fő**

The 1970s is the decade of the so-called big-panel technology. The 33-meter high, several hundred meter-long giant houses are typical products of this period. The simplest layout method from the construction technology standpoint – the parallel detached arrangement of buildings – was applied. The houses were arranged parallel with each other and the courtyard character of the space between the buildings totally disappeared. There were some high prestige housing estates that were built by system-building technology, but still had some semi-framed placement. (E.g. Budapest District XIII., Újlipótvárosi Housing Estate).

The first normative regulation regarding the specific green area index of housing estates was introduced in this decade, which determined a standard of least 5 m^2 per resident of common garden space. (OÉSZ 1970)

A more detailed central regulation appeared in 1977 regarding the minimum specific green area on block parcel residential developments within the confines of mass-housing. According to this, for each resident of the new housing estates three times 7/m^2 – within the territory of the housing estate two times 7m^2 – green area must be provided. (11/1977ÉVM-OTSH joint decree) 7m^2 of green should be provided next to the building as a common garden area. The second 7 m^2 is to be classified as a local public park (E.g.: Bikás park in Budapest's District XI. Kelenföldi housing estates, or Óhegyi Park in Budapest District X. Óhegyi Housing Estate, but in many cases these required residential-level public parks

were never built. The third 7m^2 green area was designated to be provided in the form of metropolitan-level public parks).

The specific playground need for each age group, and the specific recreational and leisure areas for each resident were also determined by decrees. The public gardens with playgrounds, leisure areas and sport fields were placed in the narrow, often extremely windy yards between buildings.

The relation between pedestrian and car traffic is variable. However, at certain housing estates car and pedestrian traffic were divided (e.g.: Budapest District XIII., Újlipótvárosi Hosing Estate), in most of the cases they aren't. (e.g.: Budapest District X., Újhegyi Housing Estate). In this decade the required number of parking places was already centrally regulated. (approximately 1 place/flat), but according to the decree only 50% of the necessary parking place was to be placed next to the buildings and the other 50% was theoretically provided on parking palettes built at a distant point of the housing estate. In reality, these palettes were never built.

Budapest XIII. kerület Újlipótvárosi lakótelep II. B ütem
1972

Újlipótvárosi ltp. II/B üt.	Size/Quantity	%
total area (m$^{2)}$	208236,2	**100**
built-in area (m^2)	27503,6	**13,2**
pavements (m^2)	106760,5	**51,3**
water surface (m^2)	0	**0**
decidious trees (db)	633	
flower surface (m^2)	0	
parking lots (m^2, db)	27946	**13,42**
canopy (30m2/tree)	18990	**9,1**
green area	**73972,1**	**35,5**
number of residents	5487	
green area per resident	**13,5**	**m2/fő**

In the 1980s the renaissance of traditional "streets" can be observed. The primary public facilities are lined up on the main street of the housing estate with mixed traffic, which runs along the axis. (e.g.: Budapest District XX., Kispest Városközpont Housing Estate) The characteristic separation of car and pedestrian traffic so typical in earlier built-in plans seems to disappear, and traditional streets show up again. Parking places are arranged along the streets, with a sizing 1 place/flat. The buildings are organized on the street, but the building lines are recessed from the street line. However, even though the parallel detached construction layout is still dominant, the layouts of the buildings tend to be more versatile, with some buildings creating open or closed courtyards. The floor number is also more versatile; in one housing estate, there are 4-5 story high buildings besides the 11-story ones. (E.g. Budapest District

III. Pók Street Housing Estate) The playgrounds and leisure areas are located in the "bays" of the buildings.

Pók utcai ltp.	Size/Quantity	%
total area ($m^{2)}$	127178,5409	**100**
built-in area (m^2)	16560,4	**13,0**
pavements (m^2)	54920,6	**43,2**
water surface (m^2)	0	**0**
decidious trees (db)	988	
flower surface (m^2)	0	**0**
parking lots (m^2, db)	545	
canopy (30m2/tree)	16350	**12,9**
green area	**55697,5**	**43,8**
number of residents	12393	
green area per resident	**4,5**	**m2/fő**

The multi-story gated community developments of the 2000s can be considered as the descendants of housing estates. Beginning in the 1990s, the central regulation regarding green areas and surfaces of new block-size residential developments disappeared – only the provision of the zoning plan is normative. In addition, while housing estate developments between 1950-1990 were funded by the state and social considerations (for example, family size) were also respected, the gated community investments of the 2000s are market-based, and privately financed by investors seeking a quick return.

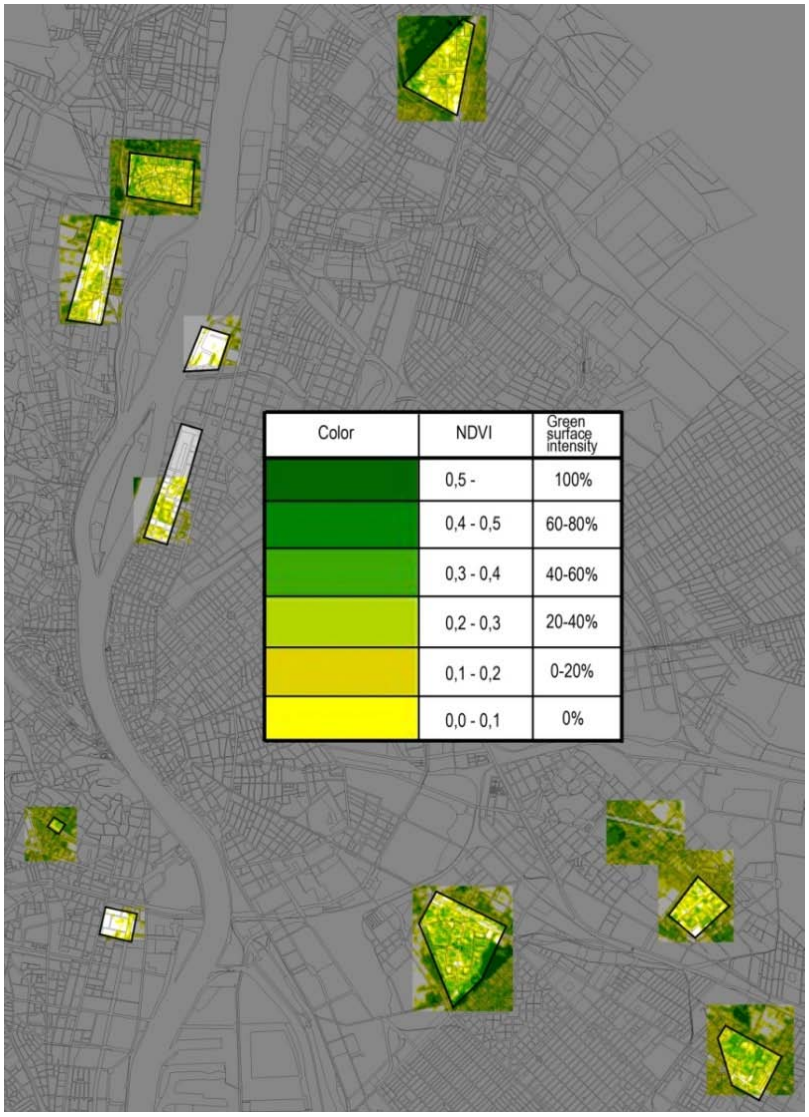
Marina lakópark	Size/Quantity	%
total area ($m^{2)}$	23160	**100**
built-in area (m^2)	11222	**48**
pavements (m^2)	6383	**27**
water surface (m^2)	0	**0**
decidious trees (db)	26	
flower surface (m^2)	0	**0**
parking lots (m^2, db)	0	**0**
canopy (30m2/tree)	780	**3**
green area	**5555**	**24,0**
number of residents	881	
green area per resident	**6,31**	**m2/fő**

Extremely intensive construction with high-rise buildings is typical. There are relatively small, but very intensively-created green surfaces between the buildings. As a great proportion of them are roof gardens with variable thickness of soil layer, there are only a few places that permit the plantation of trees. The proportion of tree canopy coverage is extremely low. In some new "housing estates", the congestion is eased only by adjacent big open spaces. (e.g. the Danube shore next to Marina Park).

Last but not least we studied the Vegetation Index. By monitoring the changes of the past 20 years and the recent figures of the housing estates mentioned above, we were able to get numerical data of the urban ecological effects of the block-like construction.

The NDVI (Normalized Difference Vegetation Index) is a simple numerical indicator. It is calculated from the reflection of the light intensity in different wavelength ranges. Chlorophyll in plants is also responsible for the light absorption and reflection in the visible (red) and near-infrared regions. (Eredics, 2007) Therefore the quantity and quality (heat, levels, foliage) of the plants are also responsible for the Vegetation Index. They take on values between -1.0 and +1.0. The vegetation is very low near the 0.0 values, between -1.0 and 0.0 there is no plant life (only impervious surfaces: buildings, pavement or naked surface). Above 0.5 the vegetation is perfect (complex, prolific and rich).

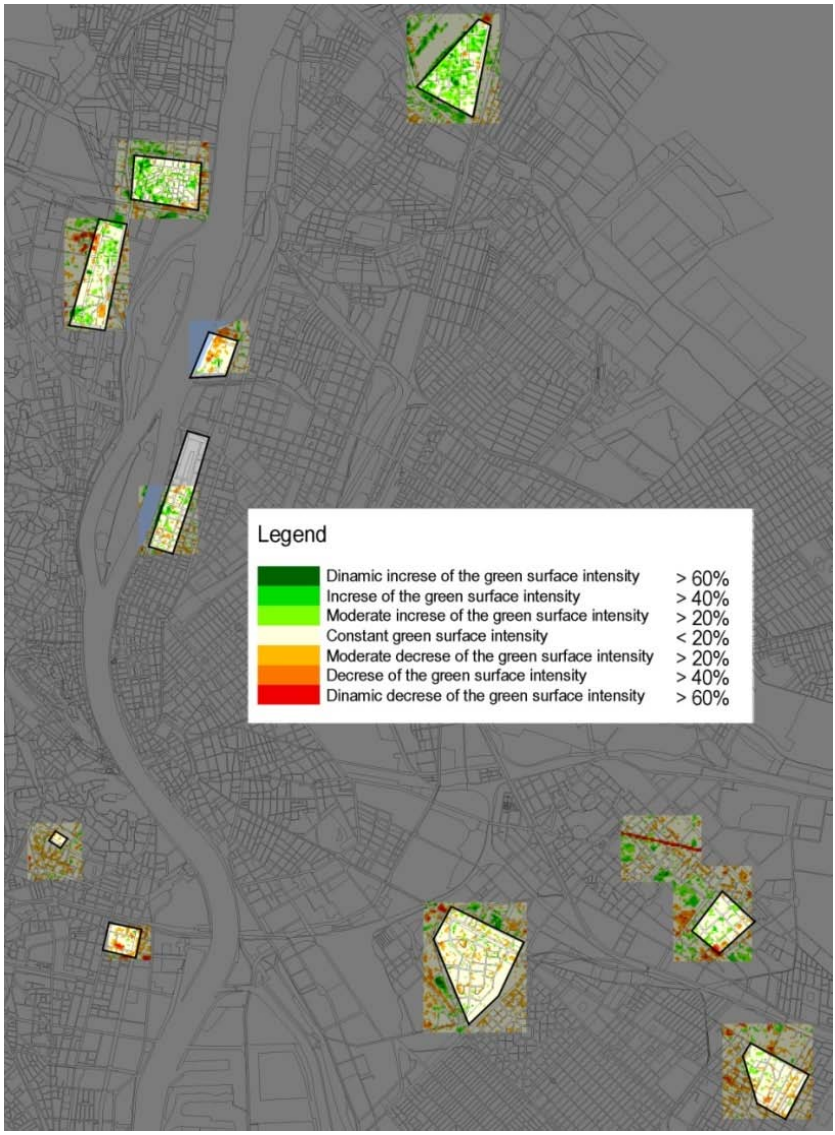
The first map (figure) shows the vegetation status of the year 2005. The intensity of the green colour represents better vegetation. (Gábor, Jombach, Ongjerth, 2006) In this map, the green colour is dominant. These housing estates were built over 20 years ago, a by now, a complex green area has been developed. Three housing estates are in especially good condition: the József Attila housing estate located in the middle of the city, the Pók Street estate in Óbuda and the centre zone of the Lakatos Street state. There is no green colour in the modern housing park areas, as the vegetation has not yet been developed around the new building investments.



The next map (figure) shows the changes in the Vegetation Indexes between 1990 and 2005. The green pixel represents an increase while the red shows a decrease of green surface intensity. (Gábor, Jombach, Ongjerth, 2007) Generally the values seen to be constant; the vegetation index has not changed in most cases.

The housing estates in the southern areas were built in the 1950s or 1960s;

therefore a complex, multileveled vegetation had developed by the 1990s. There is a sign of construction marked by the red colour on our maps. We presume that new parking areas or other facilities (for example a sport field, shop or playground) were created. The housing estates in the northern districts were built in the 1980s; therefore we can see dynamic growth in the green surface intensity because the vegetation developed considerably between 1990 and 2005.



4. Conclusion

One of the greatest values of the housing estates that were built earlier is their well-established wooded vegetation, thanks to an open-space proportion provided by a detailed and high level green surface normative system that was more or less observed. The edification of our research is that these housing estates – so often criticized and viewed in a negative light – have developed an extremely high vegetation index by the present day. They can even bear minor new developments and expansion of functions. Thanks to their large open spaces, proper supply of green surfaces, and significant index of tree canopy coverage, 20, 30, 50 years after plantation these housing estates have a good *urban ecological* effect. The regulations, revised in the 1990s for market-based, privately-funded urban development, brought to an end a significant number of planning principles and norms that had served the public interest and improved quality of life. So, nowadays profit-oriented, extremely-intensive housing developments are built with little green surface and even less usable green surface. It is worth considering what environmental quality the housing developments of today will have in 30-40 years, how much they will be able to reduce the urban heat-island effect, how much they will be able to contribute to the conditional green surface system, and whether they will remain livable at all.

Acknowledgements

This conference paper was made possible by the help of TÁMOP-4.2.1.B-09/1/KMR-2010-0005. The analyzed plans were provided by FŐKERT Zrt, by the Department of Garden Art, Corvinus University, Budapest. The areal photos were provided by Department of Landscape Planning and Regional Development, Corvinus University, Budapest.

References

[1] Körner, Zs. – Nagy, M.: Az európai és a magyar telepszerű lakásépítés története 1945-től napjainkig. TERC,2006
[2] Ormos, I.:– A kertépítés története és gyakorlata, Mezőgazd. Kiadó, Bp., 1967
[3] Eredics Attila, Vegetációs Indexméter (NDVI) tervezése és fejlesztése (2007.) 3-4. old.
[4] Gábor Péter, Jombach Sándor, Ongjerth Richárd, Budapest zöldfelületi állapotfelmérése űrfelvételek feldolgozásával, 4D Tájépítészeti és Kertművészeti Folyóirat 4.szám (2006.) 15-22. old. (www.tagszem.hu)
[5] Gábor Péter, Jombach Sándor, Ongjerth Richárd, Budapest zöldfelületi állapotfelmérése űrfelvételek feldolgozásával, 4D Tájépítészeti és Kertművészeti Folyóirat 5. szám (2007.) 21-28. old. (www.tagszem.hu)