Some contemporary aspects of master planning, design and development for suburban territories of large cities

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Abstract. The article discusses the modern state of affairs in the field of master planning of suburban territories. It is noted, that for the time being such a problem is becoming urgent and actual, due to enormous rise of urban territories, which occupy not only small satellite towns around megapolises, but also the original and traditional suburban areas, and even the countryside territories with small settlements. That’s why a new challenge emerged, which required a high-quality design approach, based on contemporary scientific achievements. A number of recommendations are being given in the article and some conclusions are being made, based on modern practice of urban planning, design and development. The main idea of the article is that urbanization can not be banned and thus it should be scientifically organized and controlled.

1 Introduction

The modern state of cities’ growths in the whole world leads to a number of problems and challenges, caused, in majority of cases, by the lack of control and scientifically-based approach of the entire process of an urbanization. The main aim of controlled and scientific approach to a wide spread of urbanization is to provide suburban population with high and healthy living standards, i.e. to combine all advantages of living in a city with all advantages of suburban life, with respect to a nature’ saving in connection with well-known set of urban ecological problems.

This can be done on the basis of a proper procedure of master planning of a site. Master planning is a broad term, which includes the following:
- selection of a site;
- location of buildings in functional relation to each other, to the shape and topography of the site and to the environment;
- provision of suitable circulation routes within the site;
- determination of land use, such as private yards, parking space, recreational areas, etc.

As far, as a masterplan is a complex document, any underestimation of it’s importance, risks the success of a project [1-6, 10-13].

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2 Desk study. Contemporary masterplan’ design considerations and site analysis

2.1 Preface

The physical site characteristics fall into five groups:
- natural characteristics, i.e. grades, soils, water;
- orientation (insolation and ventilation);
- circulation (trend towards heavier reliance);
- parking of the private cars;
- utilities (placement of equipment and lines).

Initial site selection involves many factors, an important one being the location with respect to the immediate neighborhood.

Also topography and climate play an important part in determining the appropriateness of the location and design of a site. Buildable qualities of a site mainly include three major concerns: soils, slopes and vegetation. These factors are being identified by natural and engineering surveys [10-13, 15].

2.2 Topography considerations

Topography is an important element in determining the acceptability of a site’ value. It generally affects the layout of buildings and the cost of houses and utility lines. The proper layout of buildings in respect with different topographical cases is shown on Figures 1 and 2.

Fig. 1. An examples of proper buildings’ layout on slopy sites (a schematic plans).

![Fig. 1. An examples of proper buildings’ layout on slopy sites (a schematic plans).](image1)

Fig. 2. Changes in structures of buildings, expected on a sloppy site: (A) short side of a building perpendicular to a slope; (B) long side of a building perpendicular to a slope.

![Fig. 2. Changes in structures of buildings, expected on a sloppy site.](image2)

According to these examples, expensive cuts and fills are minimized because of choosing buildings position adaptable to the existing slopes.
The best type of topography for housing is generally considered to be lever or gently rolling terrain with slopes less than 15%. However, a site should not be discarded because of the rugged contours. Such features may, by careful study and design, be turned into advantage and add features, that may not be available on the level site.

2.3 Circulation

On housing sites it is important to plan for easy and direct movement of pedestrians and vehicles. Convenience of circulation and safety must be considered and planned together. There are some basic requirements for pedestrian and vehicular circulation. The first set of requirements is as follows:

Access to dwellings and circulation between buildings must be comfortable and convenient;

Walking distance from a building to a street must not exceed 75 m, and the most convenient distance is considered as 25 m;

Width and gradient of footwalks must provide safety, convenience and appearance, suited for pedestrian traffic;

Steps and stepped ramps should be preferred;

An open and unobstructed passageway must be provided at ground level to each inner court.

A classification of footwalks is used to provide uniform terminology and is shown on Figure 3.

![Fig. 3.](image)

The following is the second set of requirements:

Access and circulation for either fire-fighting equipment, furniture moving vans, fuel trucks garbage collectors, deliveries, etc, must be planned for efficient operation;

The street pattern should discourage unnecessary through traffic;

“Cul-de-sacs” must be provided with adequate paved turning space at least 25m diameter;

Proper street alignment and gradients are necessary. Streets must be adapted to the topography, preserving to the extend possible, the natural landscape and site features;

Well-designed street intersections are essential. They must be generally at right angles. Intersections of more then two streets should be avoided;

Vehicles should be able to approach residential buildings, but need not remain there and conflict with pedestrian movement;
Streets and driveways must be provided on a site where necessary for convenient access to dwelling units, community facilities or other important buildings.

As for parking area, it should not be more than 75 m from the dwellings it serves. Parking areas must be of two general types: on-street parking and off-street parking (see Figure 4) [7-9, 14-15].

2.4 Road network, road hierarchy and access

Road network in a residential area is usually represented by arterial roads (or streets), local distributor roads, major access roads and minor access roads. The hierarchy of roads is shown on Figures 5 and 6. Minor access road use to have a vehicular/pedestrian court, from which a net of footpaths lead to residences. All the roads, but the access ones are “through” or “straight”. Major access roads accommodate service vehicles, cars and visitor parkings. Minor access roads are designed to allow slow street vehicle’ penetration to pedestrian area. Minor access roads might be either “loop” roads, “Cul-de-sac” roads or be in a form of a “Roundabout”.
Access to dwellings might be of 4 main systems (see Figure 7):

A road with houses and footpaths along it. No on-street parking, except service vehicles is provided;

Road and footpath on opposite sides of dwellings. Access either site is permitted.

Vehicular access stopped short of houses. Maximum access distance is 50 m.

Primarily pedestrian access to small groups of houses shared with private cars and light delivery vehicles’ access.

Arterial streets should be from 30 to 40 m width. Distributors are from 20 to 30 m width with pavements of minimum 10 m width. Major access roads should be from 15 to 20 m width with pavements of 8-10 m. Minor accesses are from 8 to 15 m with pavements of 6-8 m. Loops have the same geometry, as minor accesses. Cul-de-sacs should be 250-300 m length.
Fig. 7. Vehicular and pedestrian access to dwellings: (A) a road with houses and footpaths along it; (B) Roads and footpaths on opposite sides of dwellings; (C) vehicular access stopped short of houses; (D) primarily pedestrian access to houses, shared temporary vehicular access.

3 Desk study - II. Subdivisions and land planning

3.1 Preface

Good subdivision is significant in creating functional, well-balanced and aesthetically-pleasant neighborhoods, communities and city districts. The general determinants of subdivision’s design include the following: the guide-lines for new development, the influence of existing peripheral development and the effect of the physical characteristics of a site.

Say, typical subdivision pattern, which is “regular grid”, though of fewer building plots, provides additional amenities, preservation of nature and additional community’ open space [16, 17, 18].

3.2 Cluster development

In most conventional subdivision designs, the entire site is split-up into several house plots. A large amount of roadway is required for access to the plots and single houses are dispersed, utility installation and maintenance costs are high. Lack of open space requires mixing of pedestrian and vehicular traffic, creating safety problems. Privacy is limited and landscape is often visually monotonous [1, 12, 14, 15, 19, 20].

In cluster development, individual plot’ size is reduced in favour of common open space’ areas. Clustering allows for utilization of the best building sites, while preserving environmentally sensitive areas. Concentration of buildings lowers installation costs for utilities and reduces road-building costs. Pedestrian and vehicular traffic can be separated;
safety is increased by locating public recreational areas away from roads. Careful layout of open space can provide increased privacy and will help to maintain the natural character of a site. Clustering of single-family houses of private plots, enables the benefits of private land ownership to be maintained. The alternative, which provides large open space areas and higher housing density is the construction of townhouses or apartment blocks instead of individual houses. This type of development also allows for the most efficient layout of roads and utilities.

Still another term, associated with the open-space approach is so-called “planned-unit development” (P.U.D.). This term means a relatively large-scale development, that includes commercial and public facilities, housing and sometimes industrial development in the overall design. The main idea of a cluster development is illustrated on Figures 8 and 9.

![Fig. 8. The schemes, showing process of clustering in a certain suburban locality.](image-url)
3.3 Land subdivision analysis

The preliminary plan is a schematic drawing showing organization of all the major components of the development, according to the design criteria and land criteria. The size and relationship of all buildings and open spaces are set and vehicular and pedestrian access routes are realized. Side criteria are as follows: sun (i.e. solar radiation and insolation lasting), wind, drainage, soils, vegetation, topography and sound (i.e. undesired noise). Design criteria cover basic principles of buildings’ organization and access into a coherent system or pattern for a site. These criteria are based on movement pattern and development pattern, which require the actions, listed below. A preliminary plan of a site, with all the basic requirement, taken into account is shown on Figure 10.

Movement patten requires the following actions:
- Create a hierarchy of roads, each with clearly defined function;
- Avoid through traffic in residential neighborhoods by correct selection of street’ pattern;
- Separate vehicular and pedestrian movements;
- Separate the functional uses of roads and paths;
  Roads and walkways should follow natural features and patterns and man-made forms edges or linear elements.
  Development pattern requires the following actions:
- Create and organize pattern of roads, open space, paths, land use and activities;
- Distribute activities according to proximity location and linkage;
- Avoid a mixture of activities, that are not compatible;
- Create residential developments with identifiable neighbourhoods with a good relationship to the other activities.

4 Conclusions

Residential and other uses should be clustered to preserve natural features and to create a harmonious living and working environment.

The most important recommendation for initial site selection should consider land-use compatibility and availability of communal facilities.

Sufficient parking area should be provided for the residential site. In general, several moderate-sized parking areas are preferable to one or two large ones.

A clustering leads to the reducing a number of individual plots, which are frequent used for private gardening. Hence, the rights of land-owners might be an obstacle in the process of upgrading old stock within the suburban historically-created locality.

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