

# ECOLOGICAL URBANIZATION AND THE INVESTIGATION OF THE ECOLOGICAL PLANNING APPROACH IN PUBLIC HOUSING: THE CASE OF ISTANBUL-BASAKSEHIR

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## Abstract

*Cities' abilities to meet not only the needs of today but also the needs of future generations depend on sustainable urban functions. The planning of dwellings, the basic living units of the society, should also be done by using an ecological approach and in this way their sustainability should be maintained. Public housing areas, which have emerged as a solution to the increasing need for housing in today's cities, should be planned with a sustainable and ecological approach in order to create eco-friendly urban areas within the city. In this paper, the ecological planning approach was examined and the reflections of this approach on the concept of housing were discussed. The necessary criteria for sustainable ecological planning of public housing areas, based on the analyzed successful international ecological planning and ecological public housing practices, were determined. Within the framework of the determined criteria - the predefined ecological planning criteria, Istanbul Basaksehir Public Housing Area was analyzed and evaluated.*

**Keywords:** ecological planning, sustainability, ecological housing, public housing, basaksehir

## 1. Introduction

Urbanization, which gained momentum with the industrial revolution, has brought with it a wide range of environmental issues. Migration from rural to urban centers caused a growing need for housing in cities and public housing areas were created to meet this need in a healthy way. Planning that considers only the socio-economic needs and benefits to society has very high negative ecological costs in long term. The relationship between human and nature is shaped by the land-use decisions of the planning processes. Planning needs to have an ecological approach in order to provide a healthy and sustainable human life and on the other hand to prevent

damage to nature and to transfer resources to future generations (Therborn, 2000).

Today, a planning approach, which protects the ecological balance & natural resources and evaluates the natural potential, is widely accepted. Sustainable development can be performed only with the understanding of ecological planning. In order to prevent the growing environmental problems and protect our natural resources in Turkey, an ecological planning approach needs to be adopted and implemented in all scales. Starting with upper-scale regional plans, urban growth should be directed correctly by the detection of areas that are ecologically inappropriate for settlement and with the

protection of natural resources. Sub-scale plans should also ensure the best of human-nature interaction in line with the upper-scale plans (Erçoşkun & Karaaslan 2009).

It is inevitable that the planning of public housing areas is also carried out in accordance with ecological criteria within the ecological urban planning approach. Firstly, in the stage of site-selection for public housing, an ecologic threshold analysis should be done and the correct location should be determined, afterwards all the planning and construction processes should ensure compliance with ecological criteria. Thus, healthy and sustainable living spaces, which are consistent with the city and the ecosystem, can be created.

Basaksehir District consists of nine neighbourhoods and one village. The total area of the Basaksehir District is 10433.6 ha. The industrial sector has an important place in the economic structure of the district. The Ikitelli Small Industrial Area, which is one of the two organized industrial zones of the Istanbul Metropolitan Area, is located on the north of the TEM highway, occupying an area of 700 hectares. This industrial area makes the industrial sector dominant among the other sectors of the district. Also, located within the boundaries of the Basaksehir District, various industrial plants are continuing their activities on individual parcels in the outskirts of Kayabasi. Residential areas of the Basaksehir District have been developing largely in the form of public housing.

### 1.1. Research objectives and scope

Basaksehir 4.Etap Public Housing Settlement was chosen as the study area in

order to get a better understanding to what extent ecological planning approach has been implemented in public housing areas in the 2000s in Turkey.

The aim of the research is to examine the 'Basaksehir Settlement' in the light of the ecological planning criteria. Within the research, the 'Basaksehir Settlement' (figure 1) has been examined, necessary analyses of natural and built environment have been done and the area's compliance with ecological planning criteria has been



questioned.

Figure 1: Basaksehir Settlement

#### 1.1.1. Material and method

The research, observations and analysis carried out provided a lot of data related with the study area. The GIS analyses have been executed in two groups: natural structure analyses and physical& social structure analyses.

Basaksehir 4. Etap Public Housing Settlement has been examined on-site and necessary field observations have been made. Natural and built environment

analyses have been prepared for the field via GIS: Elevation Analysis, Slope Analysis, Orientation Analysis, Hydrological Structure Analysis, Wind Analysis, Land Suitability Analysis, Built-Unbuilt Analysis, Building Heights Analysis, Infrastructure Analysis, Transportation Infrastructure Analysis, Population Density Analysis have been prepared.

## 1.2. General information of the study area

The settlement areas in Basaksehir District have been developing largely in the form of public housing. Basaksehir 4. Etap Public Housing Settlement has been designed and implemented on 150 hectares of land and in two sections. The I. Section contains 159 blocks with 5080 flats and 358 single houses on a total of 114 hectares of land. It is a residential area with a population of 27,000 designed to appeal to different income groups. The II. Section, with an area of 36 hectares, contains 52 blocks with 2142 flats and 126 single houses besides social facilities and has a population of approximately 10,000 people (Adil, 2010).

Figure 2 displays the 1/5000 Scale Master



Plan of the study area and its environs. It is seen that low density residential areas are

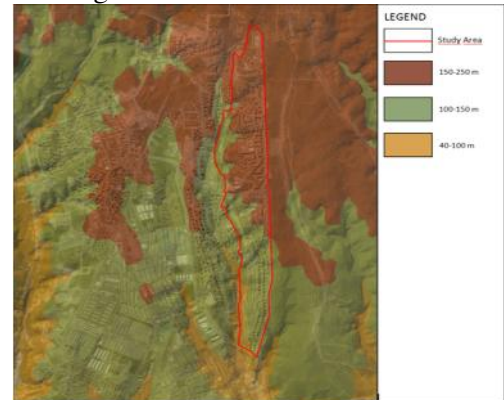
located near the base of the valley and higher density residential areas are located on the upper elevations of the valley.

## 2. Natural structure analysis of the study area

### 2.1. Height analysis

The study area consists of a valley on the west and a hillside overlooking the valley.

The highest elevation is 170 meters and



goes down to 20 meters on the base of the valley, Fig.3.

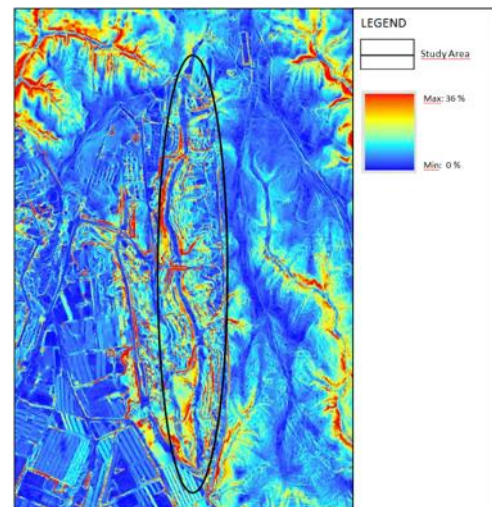


Figure 3. The elevation analysis of the study area.

Figure 4. The slope analysis of the study area.

## 2.2. Slope analysis

The study area has a hillside topography with slope values that vary widely, fig.4.

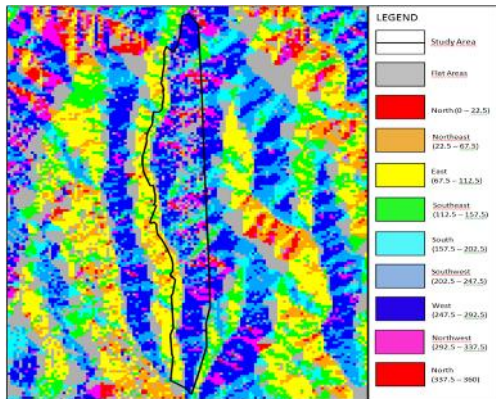
0-10% Slope: Flat and low slope areas

11-20% Slope: Moderate slope areas

21 to 36 % Slope: High-slope areas

## 2.3. Orientation analysis

The study area consists mainly of a west-oriented hillside. Water catchment areas create some south, south-west and south-east oriented areas. There are also north-west oriented areas within the boundaries



of the study area. North-oriented areas are very limited. There are east-oriented areas on the west of the study area, fig 5.

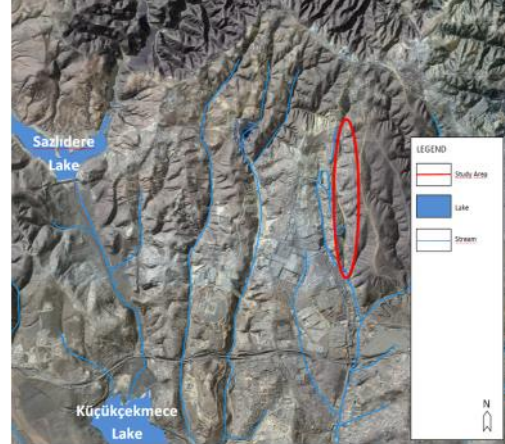
Figure 5: The orientation analysis of the study area.

## 2.4. Hydrologic structure Analysis

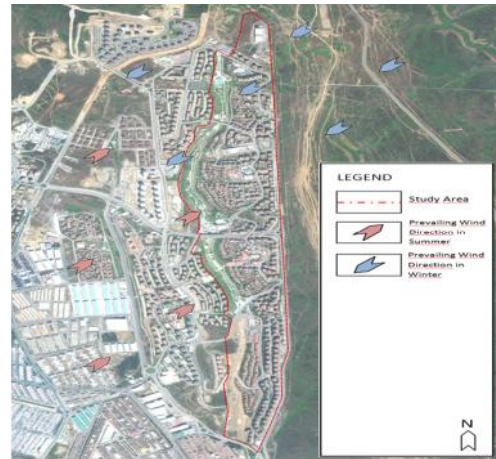
A small area in the northern part of the study area is located within Kucukcekmece Lake Watershed Boundary, fig.6. The Sazlidere Dam Lake is located on the west of the study area.

## 2.5. Wind analysis

The prevailing wind directions of the study area are northeast and southwest. As shown in Figure 7, in summer, winds



blowing from southwest and in winter, winds blowing from northeast, are the



prevailing winds.

Figure 6: The hydrologic analysis of the study area.

Figure 7: The wind analysis of the study area.

## 2.6. Land suitability analysis

A large part of the study area, as shown in figure 8, has a ground quality that is geologically suitable for settlement. The ground structure of the valley base is inappropriate for settlement. In addition,





on sections near the base of the valley, especially in the south of the study area, settlement can be established by only fulfilling all precautions.

Figure 8: The Land Suitability Analysis of the study area.

### 3. Physical and social structure analyses of study area

#### 3.1. Built-unbuilt analysis

Buildings within the study area, which are mostly in the form of detached blocks, are located in accordance with the topography. The unbuilt sections of the study area consist of green areas, open spaces and parking lots.

#### 3.2. Building heights analysis

2-storey buildings are located in regions close to the base of the valley, the heights of the buildings increase on higher elevations. There are different types of buildings within the study area, which vary from 2 to 13 floor buildings.

#### 3.3. Transportation infrastructure analysis

The transportation infrastructure of the study area consists of roads and pedestrian routes. The transfer center on the west of the study area will link the area with the rest of the city when the construction of the metro lines will be finished. Currently, public transport is provided by bus lines reaching up into the region.

#### 3.4. Population density analysis

The average population density of the area used to be under 50 persons / ha. But with the rapid construction of public housing projects, today the population density has reached much higher values. The average population density of the study area is 250 people / ha.

### 4. Results

Basaksehir 4.Etap Public Housing Settlement was chosen as the study area to be examined in order to better understand to what extent ecological planning approach has been implemented in the public housing areas during the 2000s in our country. Many data related with the study area have been obtained as a result of the research, observations and analyses which have been carried out. The analyses are discussed in two groups: natural structure and physical & social structure analyses. Basaksehir 4. Etap Public Housing Settlement has been designed and implemented on 150 hectares of land and in two sections. A population of about 37,000 people has been foreseen for the region, so that a density of about 250 people/ha will be obtained. Although the study area has been planned with respect to ecological values, at many points it is insufficient to fulfil the requirements of the ecological planning approach. The

location of buildings, away from the base of the valley on areas suitable for settlement in accordance with the topography and low-rise buildings near the base of the valley, seem to be the right planning decisions. Taking necessary precautions against flooding and planning water catchment areas as green space, are other correct planning decisions.

But in issues such as;

- Reducing and managing waste,
- Less energy consumption,
- Use of renewable energy resources,
- The protection and improvement of air quality,
- Use of ecological building materials,

It has been identified that the requirements could not be ensured.

It was determined that open car parks were preferred in the entire study area. However, by underground parking, more open and green space could have been provided.

The absence of rain water collection and reuse systems within the study area is another lack of ecological planning approach.

## **5. Discussion**

In today's increasingly competitive environment, economic interests often come before social, cultural and ecological interests. Planning decisions that only

consider the socio-economic needs and ignore the ecological structure can create high negative ecological costs in long term (Botkin & Beveridge, 1997).

Compensation of such losses also requires very long and costly efforts. Settlements began to be formed, which are compatible with their ecosystems, with the gradual strengthening of ecological awareness in planning (Hourihan, 2000).

Although the initial investment costs of such type of settlements are perceived to be higher than others, it is clear how much these investments are required considering the returns to be obtained from these investments. Ecological planning efforts, which started in the 19th century today, began to be addressed not only on the basis of projects, but also to encompass the entire city. Cities started to compete with each other also in this area, with "zero carbon" targets (Jim, 2004). For this purpose, measures are taken such as reducing the use of fossil fuels, making environmentally friendly improvements in transportation systems, protecting and enhancing green spaces, protecting water resources (Flavin, 2008).

Given the population pressure on cities still continues today and according to a report of United Nations Department of Economic and Social Affairs, urban population of the world will reach 70 percent in 2050, which is around 50% today, it is seen as inevitable that growth of cities will continue and many new cities will be established (International Standard Industrial Classification of All Economic Activities). Establishment of new public housing sites will come up as a consequence to meet the need for housing

in these cities. In this case, in order to ensure a sustainable development, public housing needs to be addressed with an ecological consciousness.

Public housing areas can be examined in three stages, namely:

- The planning stage
- Construction stage
- Stage of life and sustainability.

An ecological housing project must meet all the requirements in these three stages. No doubt that decisions made in the planning stage, which is the first and most important stage, will directly affect the other stages. The most critical decision at this stage is the site selection decision. At this point, in order to make a correct decision, an ecological threshold analysis, which thoroughly analyses the geological structure, flora and fauna and other all natural qualities of the site, should be made. Threshold analysis technique is a method developed by Boleslaw Malisz in 1963. Threshold analysis is actually related with making physical environment planning studies quantifiable (Kosłowski & Hughes, 1972).

A population density, in line with the carrying capacity of the region, must be assigned to areas suitable for settlement, obtained from the analysis (Niemela, 1999).

Factors related with buildings, which are at a later stage, must be fulfilled in accordance with the region's characteristics and the ecological planning approach. At this point, building designs to be made in accordance with the criteria

specified by international green building rating agencies are considered to be the most appropriate solution.

Ecological building materials should be preferred. Accordance with ecological criteria during all phases of construction including the excavation phase must be provided. The fertile top layer of soil, that is suitable for life, should be evaluated in other areas. Measures should be taken to avoid environmental contamination caused by wastes that will arise during construction. Recyclable materials should be preferred. By using recyclable or reusable materials, savings of raw material needed for the production of new construction materials will be provided (Gao, Ariyama, Ojiyama & Meier, 2001).

All kinds of insulation measures should be taken in buildings, necessary arrangements must be made on issues such as natural ventilation and solar energy utilization (Göksal & Özbalta, 2002). Another important point of ecological planning is open space planning and landscape planning.

A landscape approach that is in line with the region's climate and existing vegetation should be adopted. Landscaping should be used to help climate control. Storage and irrigation systems should be established to make use of rainwater for irrigation of green areas. An additional resource of water will be obtained with the establishment of a rainwater collection system. Water collected in this way could be used as drinking water, irrigation water or for various purposes.

Utilization of solar energy should be provided in the illumination of open

spaces. Materials which fulfil ecological standards should be used in floor covering. Materials derived from natural and renewable sources require far less operation during their manufacturing processes than artificial materials; because of this they provide energy efficiency.

Plant-derived materials such as wood, bamboo, reed, straw, rye stalk, sunflower stalk and mushroom used as construction materials are natural materials which are obtained from rapidly renewable sources.

Waste reduction and management in public housing are other important issues. Renewable energy sources, which can be used by all living beings of the world, are accepted as inexhaustible energy sources (solar, wind and geothermal energy, etc.) (Yalçinkaya, 1995).

Household waste recycling can be achieved by waste separation in every housing unit. In order to decrease energy consumption in public areas and residential units, electrical systems should be set at most efficient level, natural and efficient lighting should be preferred, efficient kitchen and bathroom equipment to reduce water consumption should be preferred.

Basaksehir 4. Etap Public Housing Settlement has been examined in the light of the identified ecological criteria. The study area covers Basaksehir 4. Etap Public Housing Settlement and the Valley of Waters, which is located on the west of the study area.4

Open car parks are preferred in the entire study area. However, by underground parking more open and green space could be provided. The absence of rain water collection and reuse systems within the

study area is another lack of ecological planning approach. In Table 1, a comparison of an ideal ecological public housing area with Basaksehir 4. Etap Public Housing Settlement is made on the basis of ecological planning criteria.

As a result, in the Basaksehir 4.Etap Public Housing; it has been observed that compliance with the ecological criteria such as waste minimization and management, lower energy consumption, make use of renewable energy sources, protection and improvement of air quality, use of ecological building materials have not been achieved.

Besides these negative results, Basaksehir 4.Etap Public Housing Settlement can be assumed as a proper settlement area with its planning criteria such as settling generally on suitable land away from the valley base, locating buildings according to the topography, locating low-rise buildings near the base of the valley, planning water catchment areas as green space and having adequate green space and recreation areas.



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| <b>Criteria</b>   | <b>Ecological Public Housing</b>  | <b>Basaksehir 4.Etap Public Housing</b>   |
|---|---|---|
| <b>Site Selection</b>   | Areas suitable for settlement shall be determined as a result of an ecological threshold analysis.  | It is located within an area that is identified as a residential region in upper-scale plans. Generally areas suitable for settlement have been preferred and water catchment areas have been planned as green space.   |
| <b>Orientation</b>  | The buildings have the most appropriate orientations so that they will benefit from the sun in the most effective way, and located on areas with proper slopes. South-east hillsides with a slope of 7% are mostly preferred.   | Because the study area is a west oriented hillside, the most appropriate orientations could not be obtained. Orientations in accordance with the topography have been obtained.   |
| <b>Building Design In Accordance With The Climatic Conditions</b> | Designs are developed in accordance with the climatic conditions of the region. Units are planned as a system in which, minimum-energy consuming natural heating and cooling systems are used, space organization is done according to winter and summer conditions, optimal circulation needs are provided, infrastructure systems are monitored in terms of structural biology and physiological relationship between home-garden is established. | Natural heating and cooling systems have not been used. In order to reduce reflection of external temperature to the interior, exterior insulation has been done, double glazed PVC windows have been applied and in the row houses the physiological home-garden relationship has been successfully established, but in multi-storey blocks the relationship has been tried to be established through balconies. |

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|--|--|---|
| <p><b>Energy Efficient Building Design</b></p>         | <p>The main design parameters that affect the energy performance of the building as a passive system are;</p> <ul style="list-style-type: none"> <li>• Location of the building,</li> <li>• The distance between buildings and the position of the building according to the other buildings,</li> <li>• The building orientation,</li> <li>• The building form,</li> <li>• The physical properties related with heat transfer of the shell elements that surround the building</li> <li>• The correct values of solar control and natural ventilation systems for energy saving are determined</li> </ul> | <p>Square and rectangular forms were used in building designs. The buildings located with a 45 degree angle to the wind direction, reduce wind speed by half. The location of buildings and the distance between them were planned in order to minimize shades and interrupt their views as little as possible.</p> |
| <p><b>Use of Ecological Construction Materials</b></p> | <p>Local, non- toxic organic materials are preferred in the design of buildings and landscape.</p>   | <p>Ready-mixed concrete was used in buildings. The coating and paint of the facades have an insulating feature. Local and ecological construction materials were not used. Natural materials are used in some places of the landscape design.</p>   |
| <p><b>Landscape</b></p>                                | <p>Renewable landscape approach is adopted. A landscape planning which is in accordance with the local climate and vegetation, and which contributes to the natural climatizing is done. Rainwater storage and irrigation systems necessary for irrigation are established.</p>  | <p>Grass and climate-appropriate plant species are preferred in the green areas. Necessary systems to make use of rainwater for irrigation were not established.</p>  |
| <p><b>Waste reduction and management</b></p>           | <p>Heating systems which do not cause air pollution are preferred. Treated grey water is provided to be used in toilets and for irrigation. Recycling is provided by separation of domestic waste.</p>   | <p>Natural gas is being used for heating . Systems required for re-use of grey water and recycling of wastes are not established. Household wastes are not being separated.</p>   |

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Table 1: The comparison of Basaksehir 4.Etap public housing with an ideal ecological public housing project.

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