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Comparison between Turkish & Scandinavian housing and key strategies for eco-tech design

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Abstract:
This study aims to query the current trendy luxurious housing sites in Turkey from the point of ecologically sustainable principles and make comparative analysis between Turkish and Scandinavian ecological-technological (eco-tech) solutions in this manner. For this, the study investigated how eco-tech principles contribute to the urban design, for instance, features of sustainable community development such as sustainable transport, compact settlements, alternative energy, ecological protection, eco-technologies, local economy and 3 'R' s policy etc. Afterwards, four projects from İstanbul and Ankara are evaluated according to the eco-tech principles and Scandinavian solutions are served as good examples, four different best practices from Finland and Sweden. As a result of site survey, spatial studies and interpretations, a comparison is made between case studies in this context. Considering that urban design is part of the planning process, the ecological sustainability principles should be considered together, key strategies and specific recommendations are put as techniques, in a dynamic interrelationship. These key strategies are developed under 4 headings: human ecology in a community and neighborhood scale, energy, land-resource and water conservation. Each strategy is defined separately seeking to embed design, policy making and implementation at sustainable housing development process.

Keywords: *Urban sustainability, housing environment, Scandinavian ecological housing, Turkish new housing trends, eco-tech urban*

1. Introduction and background

Economic restructuring and the emergence of global market have had overwhelming impact on cities. Globalization and flexibility, translated into urban form, are signified by more highways, high-rise buildings, hotels and science parks. Within this diversified and discontinuous terrain, residential areas are also diffuse in suburbs as gated communities supporting the urban sprawl. In the new metropolis, dense networks of infrastructure facilitate a limitless sprawl, while information and communication technologies reduce the need for physical proximity.

Moreover, environmental conditions within each city vary dramatically. Lack of infrastructure of hygiene, water shortage, atmospheric and water pollution

are some environmental conditions of urban poor. In the same city, upper class may contribute more to local and global environmental problems through more wasteful lifestyles and longer airplane and automobile journeys. There are a series of urban and environmental processes negatively affect some social groups while benefiting others.

Based on global warming consisting of 1 to 3 Celsius degrees by the year 2100, the Intergovernmental Panel on Climate Change (IPCC, 2007) concludes that such change will put the most stress on ecosystems, already affected by pollution, thus increasing resource demands and unsustainable management practices. Forests and green areas supply numerous benefits for society such as carbon sequestration, conservation and biodiversity as well as recreation and relaxation. Cities are key sites for the implementation of policies on climate change. They highly concentrate human activities in production and consumption and thus act exceedingly as drivers of global change processes (e.g. ecological footprint of many EU cities such as Berlin exceeds 200 times as its administration area (Saumel, Kowarik, 2007). According to Wackernagel and Rees (1996) the current level of consumption of the human beings seems to reach the maximum level of Earth's support capacity, already exceeding in 30% of the ecologically productive area available). Urban climate conditions such as urban heat islands should be prevented by balancing the pervious and impervious surfaces. Climate change issues are still insufficiently integrated into local urban planning applications for urban ecology.

Urban ecology is the subfield of ecology which deals with the interaction of plants, animals and humans with their environment in urban area. Analysis of urban area can result in healthier, better managed communities. Studying the factors which allow living beings to survive in built environments can also create more livable spaces. It allows people to adapt to the changing environment while preserving the resources. Urban ecology also involves the study of the effects of urban development patterns on ecological conditions. Emphasis is also placed on planning communities with environmentally sustainable methods via urban design in order to promote a healthy and biodiverse urban ecosystem by building eco-cities (Register, 1987).

In local urban design applications, there is a general tendency to maintain standard forms of design due to lack of ecological knowledge. The entrepreneur does not consider environmental impacts. He hesitates from high installation costs of eco-solutions and seeks to accelerate the building process in a short term for economical reasons.

This paper aims to make a comparative analysis of Turkish current housing development trends and Scandinavian eco-tech solutions. It puts the realities of current housing sites sold about million dollars in metropolitan cities in Turkey like İstanbul and Ankara. These kinds of sites were studied in the urban sociology literature as gated communities and some structural analysis of these housing patterns in the process of urbanization and globalization were made (Yıldız, 2004). However, they were not analyzed from ecological point of view which is a must in this century. Ecological footprint measurements cannot be made in İstanbul or Ankara because of lack of consumption statistics, although it seems to be very high due to the population and land consumption in so-called cities. Climate change has great effects in recent years in these cities and in whole Turkey, hot weather,

urban heat island effect, water shortage and decrease of ecologically productive areas are the main problems to be solved. The modern and sustainable projects are selected from Scandinavia as best practices and Turkish and Scandinavian solutions will be compared under the headings of ecological and technological principles and in the last part, some key strategies will be generated for increasing ecological & technological awareness for our country.

2. Methodology

The research was undertaken from June 2006 to October 2007 and was particularly derived from a research project and a doctorate dissertation whose goal was the identification of the impact of ecology and technology on urban design, finding eco-tech city examples and investigation of its applicability on Turkey (Karaaslan, Ercoskun, 2006, Ercoşkun, 2007).

This paper is centered on a literature and site survey and aimed to examine a futuristic combination of ecological principles and green technologies in urban design in the small cities and neighborhood scale and to derive some strategies for the designers. Accordingly, site survey was held in Scandinavia in June 2007. Having in-depth interviews with the authorities in Hammarby and Bo01 in the municipalities and in the experimental educational eco-buildings, the descriptive data was collected locally. Observation of the eco-tech models, monitoring, dialogues between the residents and taking photographs were the other techniques used in the selected sites in this study.

Today, garden cities with a lot of preserved natural open space or energy efficient cities which use alternative energy and reduce commuting or any other eco-city models which promote urban sustainability should stay not only as green or compact but also be smart in 21st century. The solution is eco-tech city planning to contribute to the better sustainability of the cities (Bogunovich, 2002). This concept is very new in the world urban planning and design literature and source of inspiration in this study.

By means of technology, four kinds of technology can be useful in eco-tech cities: Environmental Technologies (ET), Information Technologies (IT), Geographic Information Technologies (GIS) (Bandyopadhyay, 2001) and “Communication Technologies (CT)”.

Eco-tech city is a *local solution*- locally shaped model in a small scale, for raising awareness by *design with nature,* created by *economic planning* with energy saving, implemented in a short time with a plan promoting local climate, local culture and landscape, supported by *eco-technologies* which bring adaptation, flexibility, multi-use and reduce distance. It is designed by *proactive planning* approach which is participatory, sharing and considering local information (Van der Ryn, 1999).

The principles of eco-tech city can be explained as the following (Karaaslan, Ercoskun, 2006):

Eco-tech city aims to *reduce waste* by technology and promotes *renewable energy*. It improves the *quality of life.* Eco-tech city changes the *current planning understanding* by sustaining environmental values and natural resources with the use of nature friendly technologies. It is *self-sufficient* that it produces its own energy and food. A settlement planned with eco-tech

approach, will be developed *economically* as well. It promotes *sustainable transport and reduces emissions* for urban health using environmental technologies. Eco-tech city is planned in natural habitat for human comfort by selecting better spaces for urban functions with the help of *geographic information technologies.* Solutions for living-working and leisure facilities are close to each other in an eco-tech city facilitating *fuel saving.* Also, eco-tech city increases *social integration*. Mixed use decisions in this city create more *alive, safe and equal urban environment.* Lastly, eco-tech city which is planned nature-friendly is *disaster-resistant* as well.

This study is based on this eco-tech concept seen as the solution for the cities of tomorrow (Figure 1). The author decided to discover the exemplary practices in the world. The Scandinavian practices given in this paper were selected which cover the features of eco-tech cities defined above and their basic components listed in Table 1. This comparative table was created after a survey of general eco-tech design principles (see the ref. in Table 1). Table 1 is a kind of compatibility/conflict matrix used as a technique (Atalık, 1996) for determining the general level of compatibility and conflict of a given set of elements of eco-tech urban design. This table is beginning to be systematically applied to decision making problems in planning/design. The subject of this table is the sets of principles and tools given as urban techniques. It is a simple graphical display technique and is used to show where some compromise is necessary. Incompatible elements can be modified and compatible elements strengthened. The Scandinavian examples in this study will bring a new vision to the developing countries and raise awareness in the housing development sector regarding sustainable development against global warming.

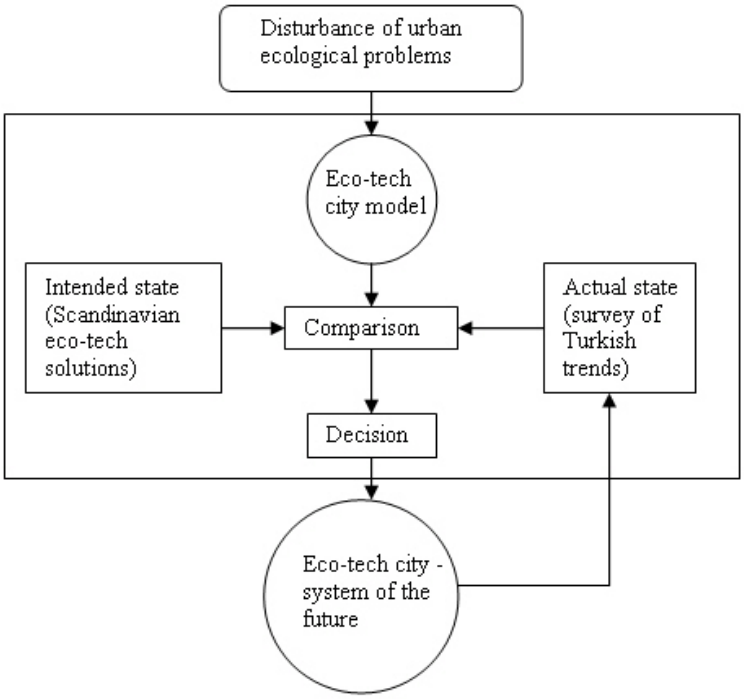

Figure 1. *The summary of the study*

Table 1. *Comparison between case studies (Choguill, 2008, Andrade, Romero, 2007, Bogunovich, 2002, Clark, 2001, Van der Ryn, Cowan, 1996, Punter, 2007, Register, 1987, Todd, 1993, White, 2002, Yılmaz, 2005, Oral, Manioğlu, 2005, Ercoşkun, 2007, Modernist web site and catalogue, Pelican Hill web site, ParkVadi web site, BeysuPark web site, Viikki , 2002, 2004, Arabianranta web site and catalogue, Hammarby catalogue, City of Malmö Ekostaden web site, Hancock, 2001)*

Sustainability Principles	Urban Design Techniques	Modernist	Pelican Hill	ParkVadi	BeysuPark	Arabianranta	EcoViikki	Hammarby	Bo01
Sustainable transport	Bike lanes	●	○	○	○	●	●	●	●
	Alternative cars	○	○	○	○	○	○	●	●
	Public transport	○	○	○	○	●	●	●	●
	Car pooling	○	○	○	○	○	○	●	●
Urban revitalization & neighborhood sense	Squares	●	●	●	○	●	●	●	●
	Local clubs	●	●	○	○	○	●	●	●
	Ecological education centres	○	○	○	○	○	●	●	●
	Parks and concert areas	●	●	●	●	●	●	●	●
Alternative energy-Eco-technology	Solar	○	○	○	○	○	●	●	●
	Wind	○	○	○	○	○	●	●	●
	Biomass/ Biodiesel	○	○	○	○	○	○	●	○
	Biogas	○	○	○	○	○	○	●	●
	Geothermal	○	○	○	○	○	●	●	○
	Geoexchange pump	○	○	○	○	○	○	●	●
Physical design control in the settlement-efficient buildings	Appropriate orientation	○	◐	●	◐	●	●	●	●
	Appropriate settlement and building form related with climatic zone	●	●	○	○	●	●	●	●
	Appropriate distance between buildings related with climatic zone	◐	◐	○	○	●	●	●	●
	Appropriate building envelope	○	●	○	○	◐	●	●	●
	Appropriate inclination and topography	●	●	●	◐	●	●	●	●
	Env. Assessment methods (LEEDS, CASBEE, BREAM etc.)	○	○	○	○	○	●	●	●
	Denser typologies	●	○	●	●	○	●	●	●
	Less building footprint	●	○	●	●	○	●	●	●

● = yes, the project has, ◐= partially, ○ = no, the project has not

***Table 1.** Contiuned*

Sustainability Principles	Urban Design Techniques	Modernist	Pelican Hill	ParkVadi	BeysuPark	Arabianranta	EcoViikki	Hammarby	Bo01
Ecological protection-production	Ecological corridors	●	○	●	●	○	●	●	●
	Parks	●	●	●	●	●	●	●	●
	Urban Agriculture	○	○	○	○	○	●	●	○
	Biotope ponds	○	○	○	○	○	●	●	●
	Rehabilitation of flora-fauna	○	○	○	○	●	●	●	●
Drainage	Pervious pavement	○	○	○	○	●	●	●	●
	Canals collecting stormwater	○	○	○	○	○	●	●	●
Integrated water management	Rain barrels/Cisterns	○	○	○	○	○	●	●	●
	Green roofs	○	○	○	●	○	●	●	●
	Reuse of gray water	○	○	○	○	○	●	●	●
Local economy	Local&national entrepreneurs	◐	○	●	●	●	●	●	○
	Center for meeting&exchange	●	●	●	●	●	●	●	●
	Mixed use- shops, offices, housing, fairs, exhibitions	○	○	○	○	●	●	●	●
Reduce Reuse, Recycle- 3 'R's policy	Garbage seperation- recycling	○	○	○	○	●	●	●	●
	Vacuum collection systems	○	○	○	○	○	○	●	●
	Recycled building materials	○	○	○	○	●	●	●	●
Info. technology	Kiosks in the streets	○	○	○	○	●	○	○	●
	Wireless internet	●	○	●	○	●	●	●	●
	İntranet for booking	●	○	○	○	●	○	○	●
	Monitoring eco- areas	○	○	○	○	●	●	●	●
Affordable housing	Variety of housing options for different incomes	●	○	●	○	●	●	●	●

● = yes, the project has, ◐= partially, ○ = no, the project has not

Four projects were selected from İstanbul and Ankara in Turkey and four projects from Helsinki, Stockholm and Malmö. The projects were selected from İstanbul and Ankara as the major cities where large investments are made and different typologies in housing are experimented for these metropolitan populations. 'Modernist' and 'Pelican Hills' projects are located in the west of İstanbul, which are now trendy and luxurious, having many ads in newspapers and magazines. 'ParkVadi' and 'Beysupark' projects are located in the centre of Ankara which upper class prefers. Selected Turkish projects are presented as good quality housing development in competitive market conditions. They suggest different approaches to marketing such as idealized lifestyles. This can be seen as leading edge or elite luxury items and out of the reach of people on ordinary incomes.

'Hammarby' is in the southeast of Stockholm which is the most favourite investment tool and living environment and 'Bo01' was presented in Housing Expo 2001, still served as city of tomorrow in the west harbour of Malmö in Sweden. 'Arabianranta' is in the MIT's report in the new century digital cities (MIT Center For Real Estate, 2005). 'EcoViikki' is a kind of eco-tech settlement near a science park in Helsinki.

All are favourite and luxurious settlements in the heart of a metropolitan city and served as modern and green, smart and safe living environments that are the main selection criteria in this study. The study investigates the features of these projects from the point of ecology-technology and makes comparison between them and derives some key strategies for cities of tomorrow especially for Turkey.

This paper develops and discusses some key strategies for eco-tech urban design. It seeks to embed these principles in design, policy making and implementation at various levels of development. The strategies are derived from current urban sustainability, eco-tech design literature and western, northern European practices. Strategies are grouped under four headings: human ecology in a community and neighborhood scale, energy conservation, land and resource conservation and water conservation. Each strategy is explained separately. Particular attention is paid to the incorporation of eco-tech urban design principles and the need to construct substantive and local design techniques by the help of green technologies. A conclusion discusses the ambition of the key strategies and makes critiques of Turkish housing trends, their implementation on this basis.

3. Case study areas and ecological- technological analyses

According to this new perspective that is proposed as eco-tech, urban design experiences should be understood by considering eco-tech parameters. This kind of descriptive and analytical approach leads the author to try to scrutinize the selected cases. This issue is discussed through a comparative analysis to demonstrate the lack of eco-tech modern housing development in Turkey according to Scandinavian sustainable solutions. First, short descriptions about case study areas are given and their features are determined. Then a comparative table is prepared and some comments are given on this table.

The first project named as 'Modernist' is located on Beylikdüzü where new housing investments are made nowadays on this large and flat area, comparatively strong ground against earthquakes in İstanbul. The project aims to inhabit 40 000 people and 10 000 residences in 3 phases. The first

phase was completed. 7 high rise blocks were built having 19 storeys and the project covers an area about 6 ha (Figure 2). They claim that 85% of the area will be green, vertical development can bring this situation (Modernist Project Catalogue). The project brings variety of selections about residences. 18 different floor plans were served to the investors like studio types, 3 or 4 room types of flats. Every residence has closed car parking and storage room possibilities. A kiosk in the flats connected to the online system as intranet is used to make reservation on sport facilities and restaurants, to order from markets, to build a team for playing the games and to get other news and ads about the site. Also live broadcast is made from kindergarten, sport areas, commercial and car parking areas for security and control.

Moreover, a centre is designed for supermarket, other small shops for daily needs, health and administrative facilities with a large terrace for cafes and restaurants. Kindergarten, play areas and sports centre for aerobic, step, plates and sauna etc. are the other facilities for social infrastructure. A large open swimming pool, bike paths and pedestrian routes, basketball, volleyball, and football play grounds are alternative open air sport options (Modernist Project Catalogue). Open and green areas surround the large pool with green landscape and small ponds. Car parking and roads surrounds the blocks but a road which passes through the site serving to the pool, centre and some blocks, breaks the rule of car-free area in the inner part (Figure 2).

The second project is 'Pelican Hill' having a slogan like 'the largest and conceptual mansion project' near ecologically sensitive environment, Lake Büyükçekmece in Hadımköy which covers an area about 20 ha. 713 villas will be built and 161 of them were completed in the first phase and more than half of them were sold now with a great interest (Figure 3). The total

***Figure 2**. 'Modernist' project in Beylikdüzü, İstanbul (Modernist project catalogue)*

building areas vary from 500 to 1100 squaremetres on plots about 930 to 1850 squaremetres (Ekonomik Yöntem, 2007) which have large building footprint. 8 different architectural styles are tried by American designers and the interior designs of them are made by famous Turkish designers (Arna, 2006). 'Large Californian style villas with Mediterranean atmosphere and mixed with Anatolian architecture' (Pelican Hill web site) are new and unique but not totally local. A recreational centre is designed containing sports, health and beauty facilities, outdoor sports and lake activities are served to the residents of Pelican Hill. Also every villa having not local but Italian names like Toscana, Bologna, Fontana etc. has a pool and jacuzzi (Arna, 2006) having maximum water consumption, some villas have cinema, fitness halls and hobby ateliers as positive social activities. Project includes large green areas and squares however it is covered by wide streets for motorized vehicles (Figure 4). The landscape is created with different foreign trees and exported vegetation which is negative, local species would be used. The villas are sold over 1 500 000 $.

Figure 3. *Pelican Hill project in Büyükçekmece, Istanbul (Pelican Hill web site)*

Istanbul contains these kinds of international projects for the upper class in its periphery and the capital, Ankara where many members of parliament and bureaucrats live, is not very different from İstanbul. The largest valley named Dikmen where was the lung of Ankara, having a valley ecosystem and air circulation through city, was transformed to residential areas after 1990s and today high rise gated urban sites were built on the skirts of this valley. 13 high rise blocks and terrace houses are designed in 'ParkVadi' project in Dikmen-Çankaya. 24 hour security system, fire and smoke detectors and reception services are the other features of this residential area. They claim that all residences having smart features such as internet, heating system with smart meter, TV satellite connections and all kitchen equipment. The construction materials are not local, all exported and first class. High rise blocks include flats vary between 140 to 260 square meters with 4 rooms to 7 rooms (with a large built footprint). Terrace houses contain flats and duplex types having 220 square meters with 5 rooms (ParkVadi catalogue) (Figure 5). A bridge for motorized vehicles is designed to

connect the blocks from two sides of valley which can destroy the valley with CO_2 emissions (Figure 6). Large water canal inside the valley are designed for recreational needs for the residents.

Figure 4. *A perspective from Pelican Hill living environment (Pelican Hill web site)*

Figure 5*. ParkVadi project in Dikmen-Çankaya, Ankara (ParkVadi catalogue)*

'BeysuPark' is an urban project with a "new life" slogan where located on Beysukent on the southwest of Ankara. It covers 23.5 ha having 560 residences with blocks with 16 storeys, villas and terrace houses (Figure 7). High-rise blocks have duplex flats and 4 room flats. Villas have 2 types and terrace houses are kinds of duplex and triplex. All types are not under 200 square meters having large building footprint. A shopping centre is designed for the daily needs of the residents. Cafes, shops and restaurants are situated there in an area about 2 ha. A swimming pool, basketball grounds exist as the sport facilities in the project. All area is covered with roads for the vehicles, power lines pass through the project area. Orientation of some

buildings can be queried according to sun, shade etc. The terrace houses and their roof gardens, the settling according to topography can form the positive sides as urban design. The project aims to attract upper class here with high prices of the residences as gated community.

***Figure 6**. A perspective from ParkVadi project (ParkVadi catalogue)*

***Figure 7.** BeysuPark Project in Beysukent, Ankara (BeysuPark web site)*

Figure 8. *Plan of Arabianranta, Helsinki (City of Helsinki City Planning Dept.)*

As being the most developed countries of Europe, Sweden and Finland have great actions and programmes for sustainability. 2 projects from Finnish and 2 projects from Swedish cities are selected for this study. The first project is 'Arabianranta' which is located on the east of Helsinki, is built to eliminate the housing shortage and be an example to new century digital city which covers 85 ha in the bay, 1/3 of the area will be built area (Figure 8). The shoreline will be a park as a part of Helsinki Bay ecosystem and a bird conservation area. In Arabianranta, the central axis passes from ring road through old factory buildings which will be used as cultural center and technology museum (obeying 3 'R's principles- Reduce, Reuse, Recycle) leading via pedestrian gallery to the square. The buildings will rise 3-4 storeys and 5-6 storeys in the other yard, to get as much sun as possible. Local amenities and clubs, playing fields, day care centre, schools and markets are the other designed facilities in the project. All wastes are recycled in the recycling centre. The tramway will form the public transport backbone to this new area, also bus routes will serve (Arabianta project catalogue).

Since 1999, many information technology firms and their workers, also students prefer this site which will be mixed use art and design settlement completing a population near 12000 in 2010 (Figure 9). Nokia, Ericsson, Motorola, Sonera and IBM serve a common service to the residents and workers in this site about wireless infrastructure, mobile systems and geographic based information for social life and job possibilities (MIT Center For Real Estate, 2005).

'Eco-Viikki' is a kind of ecological-technological (eco-tech) site near university and science park in Helsinki, a near-by neighborhood to Arabianranta (Viikki, 2002). Near a natural conservation area, research fields of agricultural faculty exist in the area. The project covers 1132 ha only ¼ of the area will be built area, the rest will be designed as recreational and natural areas (Gauzin-Müller, 2002) (Figure 10). The population was about 6000 in 2002. The living and working functions are linked with the university and science park. Working functions are near to the traffic arters and recreational areas are designed near to the residential areas. It is a compact settlement with mixed-use functions (Viikki, 1995) (Figure 11). All facilities are linked with bicycle routes. Faculties and research centres, congress centre, winter garden, agricultural research fields, sample buildings with ecological materials such as straw bale and adobe, day care centre, markets and restaurants, eco-park, eco-forest prevents wind, buildings with solar systems and fans for natural ventilation are the features of this project (Gauzin-Müller, 2002).

Figure 9. *Arabianranta, Helsinki (MIT Center For Real Estate)*

Figure 10. *Eco-Viikki master plan (Viikki, 1995)*

A region named ‘Green Fingers’ includes small hobby gardens and fields for the residents to produce organic food. Rain water collection ponds and composting facilities exist in this area.

Another project is ‘Hammarby Sjöstad’ which is Stockholm’s biggest urban development. The district will offer 10 000 apartments for 25 000 residents (Figure 12). The project has imposed tough environmental requirements on buildings, infrastructural solutions and traffic environment. Innovative

solutions and new technologies are being applied to attain these goals. The first phase was completed about 2500 residential units and a service centre. The project has its own ecosystem with its own wastewater plant where wastewater is purified, heat recycled and nutrients recovered with new technologies after which it is returned to agricultural land. The rain water is led via open drains to the channel then out into lake. Energy is produced in the local heating plant which uses renewable fuel. Combustible waste is recycled as heat and food waste will become biogas. Also the waste is sucked through pipes into a central room by underground waste collection systems against collection vehicle traffic in the area. Solar cells and panels are used to get electricity and hot water. Public transportation such as ferry and light rail system are also part of reducing car use. Fuel station for cars running on electricity, biogas and ethanol exists in the site. Pre-school and school, retail stores, library, concert hall and cultural workshops and theatre transformed from an old factory are the other social services served for the residents. An environmental info. centre disseminates knowledge in the area (Hammarby Sjöstad Report).

Figure 11. *Eco-Viikki, Helsinki (Viikki,1995)*

Figure 12. *Hammarby Sjöstad model, Stockholm*

All buildings were designed by local architects who won architectural prizes about this area (Figure 13). Only sustainable, tried and tested, eco-friendly construction materials applied in the buildings. Local vegetation, oak forest and green surfaces on the main footpath help to collect rain water locally and ensure cleaner air in the dense urban landscape (Hammarby Sjöstad Report).

***Figure 13**. Hammarby Sjöstad, Stockholm*

The last project is 'Bo01' from Malmö which covers an area about 25 ha (City of Malmö Ekostaden web site). The population is about 10000 inhabitants. It is a transformation project of old harbourfront brownfield to eco-tech settlement presented in Housing Expo '01. 60 different housing styles were tried in residential areas by architectural competitions. Offices, university, shops, marina, squares share 53% of the built environment (Figure 14). Open and green areas are supported with bike, and pedestrian

***Figure 14**. Bo01 Aerial view on Malmö*

***Figure 15**. Bo01 ecological-technological housing*

paths. Green buses with hybrid engine and car pooling system with battery charged cars are used as sustainable transport. Designed by many urban planners and architects in Housing Expo, Bo01 is a best practice of living city giving ecological courses (Figure 15). All project uses 100% of local and renewable energy (wind, sun, biogas, heat from seawater) (Hancock, 2001), all buildings have100% of green roofs and as info. technologies, all settlement is a network, online time-reservation operations are held in transportation. All buildings have monitoring screens showing energy consumption, and administrative units serves environmental info. to public from web.

After giving descriptions of selected projects and criticizing some of their features due to urban ecology, a table is prepared for comparison of all projects (Table 1). Sustainability principles are put according to the related literature and some eco-tech urban design techniques are derived from these principles. For instance, bike lanes can be designed, cars running with alternative fuels can be supported, public transport should be promoted and their routes can be determined, in order to minimize traffic, car pooling system can be used in the neighborhood. Modern eco-technologies should be applied in infrastructure, alternative energy can be produced and local economy should be promoted. In order to revitalize neighborhood sense, some urban design tools and information and communication technologies are recommended. For sustainable development, affordable housing options, compact settlements and efficient buildings are given in the table. The main policy is 3 'R' s- Reduce, Reuse and Recycle to sustain and improve the quality of life (see key strategies).

If the table is deeply examined and comparison is made between the projects, it can seen that 'Modernist', 'PelicanHill', 'ParkVadi' and 'BeysuPark' projects have common features such as green parks, ecological corridors etc. The designers give the option for social meeting and exchange with a centre having shops, restaurants and clubs with a square. Except 'PelicanHill' with large villas covering huge area, the other Turkish projects have denser typologies with less building footprint. 'Modernist' and 'ParkVadi' projects serve variety of housing options for middle to upper class however the other two projects are aimed to attract only upper class. 'Modernist' and 'ParkVadi' projects use information technologies such as intranet and internet for strengthening the communication inside the site and worldwide. However, all Turkish projects are very far away from other key ecological principles which are very important from the side of infrastructure and superstructure. Only 'Modernist' project includes bike lanes, alternative cars and car pooling system are not supported. Public transport cannot serve to those areas. Ecological education centres do not exist, but education is the most important tool in this process.

Turkey has great advantage of sun, wind, thermal etc. But none of Turkish projects use solar panels, wind turbines, geo-exchange pumps and other

techniques such as thermal, biogas, biomass etc for producing electricity. Annual average sun time is 2640 hours in Turkey, this amount is about 1800 hours in northern European countries which use sun energy as three times as Turkey (Yazıcı, 2002).

Furthermore, climate control is one of the most important parameters for sustainable environments and physical environment control. Using south slopes is important in the projects to get most sun. Appropriate orientation is not completely solved in Turkish case studies. Constructors would like to have maximum economic benefit and all project area is covered by buildings oriented by all directions. Design parameters change with the climatic zone. İstanbul is in hot humid and Ankara is in temperate-dry zone. The selected projects were examined according to the other design parameters such as building form and settlement form, distance between buildings, building envelope, inclination and topography. All Scandinavian projects have not any problem about the approriateness to these parameters. However, seperated buildings are preferred to control climate effects in İstanbul. The character of settlement pattern should be loose and scattered to utilize the wind effects because of high humidity. The distance between buildings in 'Modernist' and 'PelicanHill' projects is not sufficient according to these parameters. Also 'ParkVadi' and 'BeysuPark' projects in Ankara have no appropriate settlement form as being settled on the top of a valley, by destroying the valley ecosystem. The built environment is a barrier to the wind effects when examined due to the inclination and topography in this climatic zone.

Building envelope according to the temperature values differing to the seasons are not designed as energy efficient in most of these Turkish projects. None of the buildings has been measured by environmental assessment methods such as LEEDS, CASBEE, BREAM etc. if the building itself is energy efficient or not. All Turkish projects contain swimming pools having maximum water consumption but none of them have biotope ponds, rainwater collection system amd canals to reuse this water for the garden irrigation. Urban agriculture is an unknown term for these projects and rehabilitation of existing flora-fauna is not promoted. Exported different species are brought in these areas. In only 'BeysuPark' project, terrace houses use green roofs in order to prevent urban heat island effect. Gray water coming from washing machines, dishwashers and baths are not treated, however, it can be used in toilet flushing and garden irrigation. Building materials are not recycled, oppositely newly exported. Garbage seperation and recycling are not supported in these Turkish projects like all over the country. International designers are more popular in the country but local economy and job opportunities needs to be revitalized. Mixed-use are not used as urban design techniques yet. Residential and commercial sites are designed separately in Turkish projects and security teams have important role in the inner and outer areas near the project site.

Moreover, Arabianranta is the oldest project beyond other foreign examples (Table 1). This project is announced as digital city having strong information and telecommunication technology options in the area. The only project is Arabianranta which cannot use alternative energy resources and has some insufficient water management. However, all other principles are satisfied in the project. 'Hammarby' and 'Bo01' as Swedish examples, have no negative impact to the environment, communities living in these project sites are self sufficient with alternative energy and organic food production. 'EcoViikki',

'Hammarby' and 'Bo01' are green and smart projects and eco-tech sites which are the candidates to the cities of tomorrow. As seen in Table 1, all urban techniques are applied for creating livable, ecological, productive environment using technology for eco-friendly site.

4. Key strategies for eco-tech design

Since promoting sustainable lifestyles in our towns depends mainly on the design of physical environment, this part will propose a set of key strategies that can deliver sustainable urban development through exploring ecological design in the Scandinavian projects as well as examining the latest approaches to urban design.

The basic ecological variables are land and resource, water, energy and human ecology: the way people interrelate and use the environment (Kazimee, 2002:33). So the key strategies for ecological design are organized under these variables.

Human ecology in a community and neighborhood scale:

Provide sustainable transport options between residential areas and amenities: Bike lanes and pedestrian roads are critical to enhance pedestrian sense of community. These ways should link to public transport steps. Also for traffic calming strategy, car pooling systems are accepted to reduce auto services.

Enhance neighborhood sense: Urban revitalization should be provided. To enhance neighborhood sense, emphasize pedestrian access to squares for meeting, parks, indoor and outdoor activity centres and services as daycare, shopping and ecological education centres to make something collectively for the environment.

Do not sprawl: Design for effective landuse and density. Clustered houses with denser typologies achieve quality, efficiency and affordable housing.

Promote compact settlement with efficient buildings: Carefully orient each unit to sun by providing winter gardens on the south, shade them with trees and plants, minimize openings to west and east in hot summer time. Design for natural ventilation, avoid using artificial air-conditioners.

Provide less building footprint with small and smart buildings: Efficient building units are more affordable minimizing the costs and saving the agricultural land. Do not think big and bulky.

Design affordable housing: Think variety of housing with small flats, 2, 3 or 4 room units for effective quality of living to minimize operating costs and to provide options for different incomes.

Improve internal and external comfort conditions: Develop indoor and outdoor design elements for air circulation, ventilation, balance shaded and sunny parts.

Measure the environmental efficiency of the buildings with assessment methods: Get the desired scores to reach eco-buildings.

Build with recycled materials: Use non-toxic green materials and recycled ones which do not absorb heat, provide indoor air quality and human health with sustainable resources.

Use information and geographic information technologies: to make better site selection due to climatic zones, to communicate, to monitor eco-areas, to increase neighborhood sense with intranet, internet and kiosks.

Energy conservation:
Increase the use of alternative energy by eco-technologies: Consider active solar heating systems, photovoltaic systems, wind turbines, geo-exchange pumps. Reuse wastes by producing bio-gas, gain fuel from bio-diesel etc.

Build low energy houses: Configure the design parameters and design for improved comfort conditions as low energy design in relation to the climate of the region, design to optimize all passive mode or bioclimatic options.

Land and resource conservation:
Reduce and improve urban microclimate impacts: Reduce urban heat island effect and balance built and natural environment for micro-climate.

Design ecological corridors and parks: Trees and vegetation are critical for human comfort by balancing the air quality, creating recreation and livability. Rehabilitation of flora and fauna brings the sustainability of those species in the area to enhance local environments.

Promote urban agriculture: Minimize grass areas, design permaculture gardens which is productive and provide self sufficient. Use biotope ponds to collect rainwater to irrigate permaculture gardens.

Localize the economy: Design a community centre for meeting and exchange. Promote mixed- use with shops, fairs, exhibition, offices and housing. Encourage local entrepreneurs for eco-friendly projects.

Practice 3 'R's- Reduce, Reuse, Recycle: Reduce the amount of the Earth's resources that we use. Reuse- Do not just bin it, could someone else make use of it? Recycle- Can the materials be made into something new? Control and integrate human waste and other emissions. Provide recycling for reducing the consumption. Encourage vacuum system for garbage collection in order to avoid garbage collection vehicles. Support only the purchase of recyclable products.
Design to reduce light and noise pollution of the ecosystems: Construct green noise barriers. Reduce light for fauna in biodiversity.

Water conservation:
Develop drainage systems: Retain all water on the site, design canals collecting storm water to reuse in the gardens.

Use eco-technologies for integrated water management: Harvest rain and gray water from the house; develop cisterns for use in landscaping and toilet flushing.

5. Conclusion
Today, Turkish cities and housing projects missed the appropriate density and the balance between open and built-up space without a specific character. The housing projects display monotonous isolated concrete blocks (Oktay, 2004). Streets became motorized connections. The ecological protection and rehabilitation of flora and fauna has been ignored.

However, the old traditional Turkish city was a livable environment where the life environment created collaboratively by many cultures from middle Asia to Anatolia, from the Mediterranean to Balkans. Seljuks and Ottomans or other etnic groups created good ecological settlements to learn from as they represent sustainable uses of local values and resources. The narrow and windy streets, town centers where collective activities held, mixed use functions which bring social life, survival of regional and local architectural styles, different stone, earth or wooden building traditions according to climatic regions created various townscapes. Moreover, organic street pattern, public or semi-public cul-de-sacs were meeting spaces. The traditional Turkish city is a good example of self sufficient ecological town and design with nature. The return is a must.

As seen in the case studies, Turkish designers should give perceptual richness and use of nature with the fundamental aspects of urban design. In this context, neighborhood in traditional Turkish city reflects many positive aspects as ecological, historical, cultural sustainability and identity which is an indicator of sustainable development (Suher et al., 2004).

In this study not only ecological studies, but green technology is proposed to be adapted in these issues. Eco-technologies promote efficiency with saving systems. Constructors should not doubt about high installation costs which will repay in the long term in order to delay the impact of climate change.
All metropolitan cities like İstanbul and Ankara need small neighborhoods in their periphery where people can live and work, share culture and skills. Ecologically responsive housing projects will bring more quality in our neighborhoods and cities in new developments like Scandinavian examples. While demanding million dollars from customers as project owners, the presented material should be reasonable, ecological, resource and energy saving in the long term.

The key strategies are given in this study worth examining and applying. The strategies contain methods for demonstrating human-ecological interchanges and profits are applicable everywhere. Adopting these strategies will bring resource, money and energy savings which will foster a sustainable economy against the negative impact of global climate changes, water shortage and other ecological problems. The implementation of sustainable program like Scandinavian actions, require cooperation between municipality, private firms, organizations and individuals. The process should be supported by demonstration projects. Therefore, at wide level, Turkey should learn and practice more and more.

References

Andrade, L.M.S., Romero, M.A.B. (2007), The Principles of Environmental Sustainability Applicable to Urban Design Settlements: Condominium Located in the Federal District of Brazil and inside the Paranoa Environmental Protection Area, **2nd International Congress on Environmental Planning and Management, Visions, Implementations, Results Proceedings**, eds. Kenneweg, H., Tröger, U., Berlin, 35-38

Arabianranta project catalogue, 1997, Helsinki City Planning Department

Arna, S. (2006), Bakalım Hangi Ünlü Mimarın Stili En Çok Talep Alacak?, Hürriyet, 26/09/2006

Atalık, G. (1996), **System Approach and Planning Methods and Techniques Textbook**, İTÜ Faculty of Architecture, Dept. of City&Regional Planning, İstanbul

BeysuPark web site, http://www.beysupark.com/, 20/08/2007

Bandyopadhyay P. (2001), Application of Information Technology and Impact of Cyber Eco Cities in New Millennium, In: **ISOCARP Congress**. Utrecht, 68-77

Bogunovich D. (2002), Eco-tech cities: Smart metabolism for a green urbanism. In: Brebbia CA, Martin-Duque, Wasdhwa LC eds. **The Sustainable City II**, London: Witpress, 75-84

Choguill, C.L., (2008), Developing Sustainable Neighborhoods, **Habitat International**, Vol.32, Issue 1, 41-48

City of Helsinki City Planning Dept. http://www.hel.fi/wps/portal/Kaupunkisuunnitteluvirasto_en/Artikkeli_en?WCM_GLOBAL_CONTEXT=/en/City+Planning+Department/Town+Planning/City+planning+projects/Arabianranta, 20/08/2007

City of Malmö Ekostaden web site, http://www.ekostaden.com/pdf/en_hallbar_stad_eng.pdf, 14/09/2004, http://www.ekostaden.com/pdf/det_grona_bo01_eng.pdf, 14/09/2004 http://www.ekostaden.com/pdf/vectura_eng.pdf, 14/09/2004, http://www.reteambiente.it/ra/sostenibilita/pdf/Malmo.pdf, 20/04/2005

Clark, M. (2001), **Domestic futures and sustainable residential development, Futures**, Vol. 33, 817-836.

Ercoşkun, Ö.Y. (2007), **Ecological and Technological (Eco-Tech) Design for A Sustainable City: A Case Study on Gudul**, Ankara, Ph.D. thesis, Gazi University, Institute of Natural and Applied Sciences, Urban and Regional Planning Doctorate Program, Ankara

Gauzin-Müller, D. (2002), **Sustainable Architecture And Urbanism**, Birkhäuser, Berlin

Hammarby Sjöstad Report, (2007), **The Best Environmental Solutions in Stockholm**, GlashusEtt, 2-3

Hancock, C. (2001), **Urban ecology-City of Tomorrow, Bo01 area in Malmö, Sweden: Towards a sustainable city**, City of Malmö web site http://www.ekostaden.com/pdf/article_towards_sustainable_city.pdf

IPCC (Intergovernmental Panel on Climate Change), (2007) , Climate Change, 4 May 2007: **Mitigation of Climate Change Fourth Assessment Report** http://www.ipcc.ch/SPM040507.pdf, 13/05/2007

Karaaslan, S., Ercoskun, O.Y. (2006), **The Impact of Ecology and Technology on Urban Planning, Eco-tech City Examples, The Applicability on Turkey**, Gazi University Scientific Research Projects Final Report 06/2005-20.

Kazimee, B. A. (2002), Sustainable urban design paradigm: twenty five simple things to do to make an urban neighborhood sustainable, **The Sustainable City II: Urban Regeneration and Sustainability**, 31-41

MIT (Massachusets Intitute of Technology) Center For Real Estate, (2005), **New Century Cites: Real Estate Value in a Digital World, Symposium Case Studies Report**,

Modernist project catalogue, http://www.yesilinsaat.com.tr/modernist Modernist web site , 20/08/2007 http://www.yesilinsaat.com.tr/modernist/

Oktay, D. (2004), Urban Design for Sustainability: A Study on the Turkish city, **Int. Journal of Sustain. Dev. World Ecology**, Vol. 11, 24-35

Oral, G.K., Manioğlu, G. (2005), İklimle Dengeli Tasarım: Mardin, Antakya Örnekleri, **Tasarım**, Vol.157, 136-142

ParkVadi web site, 20/08/2007 http://www.parkvadi.com/

Pelican Hill web site, 20/08/2007 http://www.pelicanhillevleri.com/

Punter, J. (2007), Developing Urban Design as Public Policy: Best Practice Principles for Design Review and Development Management, **Journal of Urban Design**, Vol.12, No.2, 167-202

Register, R. (1987), **Ecocity Berkeley Building Cities for a Healthy Future**, North Atlantic Books, California

Saumel, I., Kowarik, I. (2007), Closing the Gap! How Local Actors Respond to Climate Change Processes in Urban Landscapes, **2nd International Congress on Environmental Planning and Management, Visions, Implementations, Results Proceedings**, eds. Kenneweg, H., Tröger, U., Berlin, 419-422

Suher, H., Ocakçı, M., Ayataç, H.,K., Ertekin, Ö. (2004), An Indicator of Sustainable Development: Urban Identity, **AIZ ITU Journal of the Faculty of Architecture**, Vol.1 No.2, 26-42

Todd, N.J., Todd, J. (1993), **From Eco-Cities to Living Machines; principles for ecological design**, North Atlantic Books, California,

Wackernagel M., Rees,W., (1996), **Our Ecological Footprint: Reducing Human Impact on the Earth**, New Society Publishers, Gabriola Island

White, R.R., (2002), **Building the ecological city**, Woodhead Publishing Ltd., Cambridge, England

Van der Ryn, S., Cowan, S.,(1996), **Ecological Design**, Island Press, Washington D.C.

Viikki, (1995), **Helsinki, New University Neighborhood and Science Park**, City of Helsinki Planning Department

Viikki, (2002), **A University District And Science Park For the 2000s**, City of Helsinki Planning Department , Käpyläprint

Yazıcı, M. (2002), Yenilenebilir Enerji, **Mimar.ist**, Year: 2, Vol:6, Autumn, 77-78

Yıldız, H., T. (2004), İstanbul's New Housing Trends: The Structural Analysis of Housing Pattern in the Process of Urbanization and Globalization, **AIZ ITU Journal of the Faculty of Architecture**, Vol.1 No.2, 77-90

Yılmaz, Z., (2005), Akıllı Binalar ve Yenilebilir Enerji, **Tasarım**, Vol.157, 100-104

Türk ve İskandinav konut gelişmesinin karşılaştırılması ve eko-tek tasarım için anahtar stratejiler

Bu çalışma, Türkiye'deki mevcut lüks konut sitelerini ekolojik sürdürülebilirlik ilkeleri açısından sorgulamayı, ayrıca Türk konutları ve İskandinav ekolojik-teknolojik (eko-tek) çözümleri arasında karşılaştırmalı bir analiz yapmayı hedeflemiştir. Bunun için, kentsel tasarıma katkıda bulunacak, sürdürülebilir gelişmenin bileşenleri olan sürdürülebilir ulaşım, kompakt yerleşimler, alternatif enerji, ekolojik koruma, eko-teknolojiler, yerel ekonomi ve 3 'R' (Azalt, Yeniden Kullan, Geri Dönüştür) politikası gibi eko-tek ilkeler araştırılmıştır.

Geleceğin kentlerinin tasarımında eko-tek kavramı bir çözüm olarak seçilmiştir. 21. yüzyılda bir kentin sürdürülebilirliği için yalnızca 'bütünleşik' ve yeşil alana sahip olması yeterli olmayıp, aynı zamanda 'akıllı' olması gereklidir. Bunun çözümü ise ekolojik ve teknolojik (eko-tek) kent planlama/tasarımındadır. Eko-tek kent, küçük

ölçekli, yerel koşullara göre şekillenmiş bir modeldir. Doğa öncelikli tasarım ile ekolojik bilincin yükseltilmesi, yerel iklim, yerel kültür ve yerel peyzaj ön plana alınarak, kısa vadede uygulanabilecek, tasarruflu ve karlı ekonomik bir yatırımdır. Yerel bilgiyi önemseyen, katılımcı ve paylaşımcı, proaktif bir planlamadır. Eko-tek kentte çoklu kullanımı getirecek, uzaklığı azaltacak, esnekliği sağlayacak eko-teknolojiler kullanılır.

Bu çalışmada, İstanbul ve Ankara'da yapılan 4 proje, ekolojik ilkeler yönünden değerlendirilmiş, Finlandiya ve İsveç'ten seçilen 4 proje ise en iyi uygulamalar, sürdürülebilir çözümler olarak sunulmuştur. Seçilen projeler, İstanbul'da 'Modernist' ve 'Pelican Hills', Ankara'da 'ParkVadi' ve 'BeysuPark' projeleridir. Eko-tek kent, ekolojik, sürdürebilir, yüksek performanslı, yeşil eko-kent ile akıllı donanımlı, yüksek teknolojili barınma/çalışma mekanlarından oluşan tekno-kent gibi iki yenilikçi kavramın birleşiminden oluşmaktadır. Eko-kent ve teknokentlerden dünyada pekçok örnek olsa da ekolojiyi ve teknolojiyi esas alan örnekler yok denecek kadar azdır. Bu kapsamda İsveç-Stokholm'de 'Hammarby' ve Malmö'de 'Bo01', Finlandiya-Helsinki'de 'Arabianranta' ve 'EcoViikki' ise İskandinav örneklerini oluşturmaktadır. Türk projeleri, yarışçı konut piyasasında iyi kalite lüks konut projeleri olarak sunularak ideal yaşam tarzı hedefiyle ortaya çıktıkları için seçilmiştir. İskandinav örnekleri ise çevreye duyarlı geleceğin kentleri olarak bilinmekte ve eko-tek kentler konusunda önde gelen örneklerdir. Tüm örnek projeler, tutulan, lüks, metropoliten kentin kalbinde, modern, yeşil, akıllı ve güvenli yaşam ortamları olarak sunulduğu ve bu kriterlere uygunluğundan dolayı bu çalışmada ele alınmıştır.

Bu bağlamda arazi çalışması, mekansal çalışmalar ve yorumlamalar sonucunda, tüm seçilen örnek projeler sürdürülebilirlik ilkeleri ve eko-tek tasarım teknikleri açısından karşılaştırılmıştır. Türk projelerinde konutlar oldukça yüksek fiyatlara satılırken sürdürülebilirlik ilkeleri ve eko-tek tasarım teknikleri yönünden oldukça eksik kalmıştır. Bu kapsamda bu karşılaştırma eleştirel bir bakış açısını da beraberinde getirmiştir. İskandinav uygulamaları ise geleceğin konut sistemi konusunda bizim gibi gelişmekte olan ülkelerdeki tasarıma bu bağlamda belli stratejilerle yön verecektir.

Çalışmanın son kısmında planlama sürecinin bir kısmı olan kentsel tasarım için bir takım ekolojik-teknolojik ilkelerle birlikte anahtar stratejiler ve özel öneriler dinamik bir ilişki içinde verilmiştir. Sözkonusu anahtar stratejiler 4 başlıkta geliştirilmiştir. Bunlar komünite ve komşuluk birimi ölçeğinde ekoloji, enerji, arazi-kaynaklar ve su tasarrufudur. Herbir strateji ayrı ayrı açıklanmış ve sürdürülebilir konut geliştirme sürecinde tasarım, politika ve uygulama aşamalarını zenginleştirmek için üretilmiştir.