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The Role of Urban Planning in Solar Energy

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Authors' contributions

This work was carried out in collaboration among all authors. Author BY designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors BY, HHŞ and MTÇ managed the analyses of the study and managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Since the last quarter of the 20th-century technological advances and energy production and consumption processes in Parallel with the increasing urbanization of the world's energy demand, however, it raises ecological problems. Since the nineties, reducing the pressure on the ecological balance of the city planning approach for more efficient and livable cities has been launched. The most important determinant of the country's socio-economic structure and physical development, energy supply and consumption. In this case, the relationship is associated with creased urbanization, urban planning and energy consumption is the main source reveals the well should be constructed. This study covers and sample applications that may pose the importance of Solar Energy in Urban Planning. In this context, local government, the community embraced the energy efficiency in buildings and urban transport are the most important position on the adoption of effective measures. Locations in energy efficiency measures and costs can be reduced, local employment can be increased, reduced local and global pollution, energy dependence can be reduced and improved social living conditions. Mainly by analyzing the environmental impact of this potential assessed under the vehicle and building technology, it is important to be transferred to the urban planning process.

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1. INTRODUCTION

The importance of energy is increasing day by day. The amount of energy consumed indicates the level of development of countries. Population increase, large-scale energy production and conversion systems established in parallel with industrial development bring about cross-border effects as well as affecting the ecological balance to a great extent. For this reason, environmental problems, as much as having a national sense, encompass international characteristics. Demand for renewable energy sources is gradually going up for the number of fossil fuels is decreasing. Undesirable effects of renewable energy sources on the environment are fewer compared to those of other energy sources. Fossil fuel reserves, which are making up for a large percentage of energy need, are being depleted from one day to another, and effects of using fossil fuel reserves of the earth such as oil, coal and natural gas in the 20th century; such as ozone layer depletion, acid rains, global warming have left the world facing an environmental pollution, which is perhaps difficult to come back from [1]. Also, while fossil-based energy types involve 86% of total energy consumption in the world, energy generated from renewable and nuclear sources have shares of 7.8% and 6.5%, respectively, only in primary energy consumption [2]. Renewable energy sources cost less than fossil-based fuels. They do not run out because they are renewable and contrary to conventional fuels, they do not pose a significant threat to the environment and human health. Along with significant unfavourable outcomes such as dependence on foreign sources, high import expenditures and environmental problems, energy use that is based on fossil fuels increases the importance of renewable energy sources, due to rapid depletion of fossil fuel reserves of the world. Renewable energy sources constitute great importance also for being sustainable due to their permanent nature and for being available in every country throughout the world. Moreover, its environmental impact is quite less compared to non-renewable energy sources. Renewable energy sources are acknowledged to become the most important energy source in the 21st century, in case current technical and economic problems are solved. (Table 1) (Fig. 1) [3].

Terms such as green buildings, green energy and sustainable environment and resource use appear as the outcomes of aforementioned processes both in practice and in legal regulations. Combined with the fact of climate change created by energy crises being experienced and the greenhouse gas emissions, the subject of energy efficiency, specifically, started firstly in the USA and Europe, and then on a global scale, to be an important criterion for decision-making processes in commodity or service purchases. Demand for energy increases as technology advances. It is estimated that the greenhouse effect caused by carbon dioxide has released into the atmosphere from factory chimneys, cities and motor vehicles will result in a temperature rise of 1.5-4ºC, and then this will lead to a rise in the sea level as a result of the melting of glaciers[4]. Shell Oil Company has pointed out that the contribution of renewable energy sources to world energy will be two-thirds of the contribution of fossil fuels today by the year 2025. The importance of renewable energy types could be understood better by taking a look at gas emissions. According to reports of the European Union, carbon dioxide emission in Europe will decrease by 402 million tons annually, if renewable energy use could be doubled in a decade [5]. In United Nations Climate Change Conferences, the conclusion that "the consumption share of clean and renewable energy sources must be at least 25% among all energy types" has been drawn. It was indicated that this goal is reached in at least 30 years, and otherwise inhabitable regions would emerge throughout the world, and altered climate conditions would become permanent[6,7]. It has been monitored that CO_2 emissions in the world associated with energy have increased during 20 years [8]. Also, 70% of the total energy consumed in Turkey is being imported, and this percentage is gradually increasing. Energy importation of Turkey is expected to rise to 78% by 2020 [9]. This condition affects our country negatively in various aspects. The correct selection of the energy type and adopting its active use with this conscience will provide many benefits in economic, social and environmental aspects for our country.

1.1 Solar Energy

The radiation energy created at the end of the fusion process, which we can describe as the conversion of the hydrogen gas at the core of the Sun to helium, is solar energy [10]. 330,000 times greater than the Earth, Sun is a natural fusion reactor. Sun is a clean and inexhaustible

energy source for our world [11]. 15% of the energy consumption in the world is being planned to be derived from the Sun in 2050 [12]. Another hindrance, along with the cost of solar energy being expensive, is that there is not sufficient land for solar panels, which are to be installed to generate energy. For instance, a land of 26,000 square-kilometres is required for the solar panels, which are needed to be installed to fulfil the electricity need of the whole USA. This problem can be overcome by utilizing the roofs of buildings or concrete areas [13]. Countries within the European Union are at the forefront in the field of solar energy. By solar energy, external energy purchase increase rate can be restrained, and environmental pollution originating from fossil fuels can be prevented [14]. Because, systems installed for generating solar energy receive the energy from the Sun directly, without the gases released due to oxidation [15]. Turkey, thanks to its geographical location, is fortunate over many countries in terms of solar energy potential. According to the study conducted by the General Directorate of Electric Power Resources Survey and Development Administration, the average daily total insolation period is 7.2 hours and average annual total insolation period is 2640 hours. Average total radiation intensity has been determined to be 1311 kWh/m^2-year. In our country, solar energy is utilized generally to get hot water. Unfortunately, the solar energy potential of our country cannot be utilized sufficiently.

Table 1. Estimation of renewable energy sources in 2020

Energy source	Minimum in 2020		Maximum in 2020	
	MTEP	%	MTEP	Total %
Modern Biomass	243	45	561	42
Solar	109	20	355	26
Wind	85	15	215	16
Geothermal	40	7	91	7
Small-Scale Hydraulic	48	9	69	5
Sea Energies	14	4	55	4
Total	**539**	**100**	**1345**	**100**

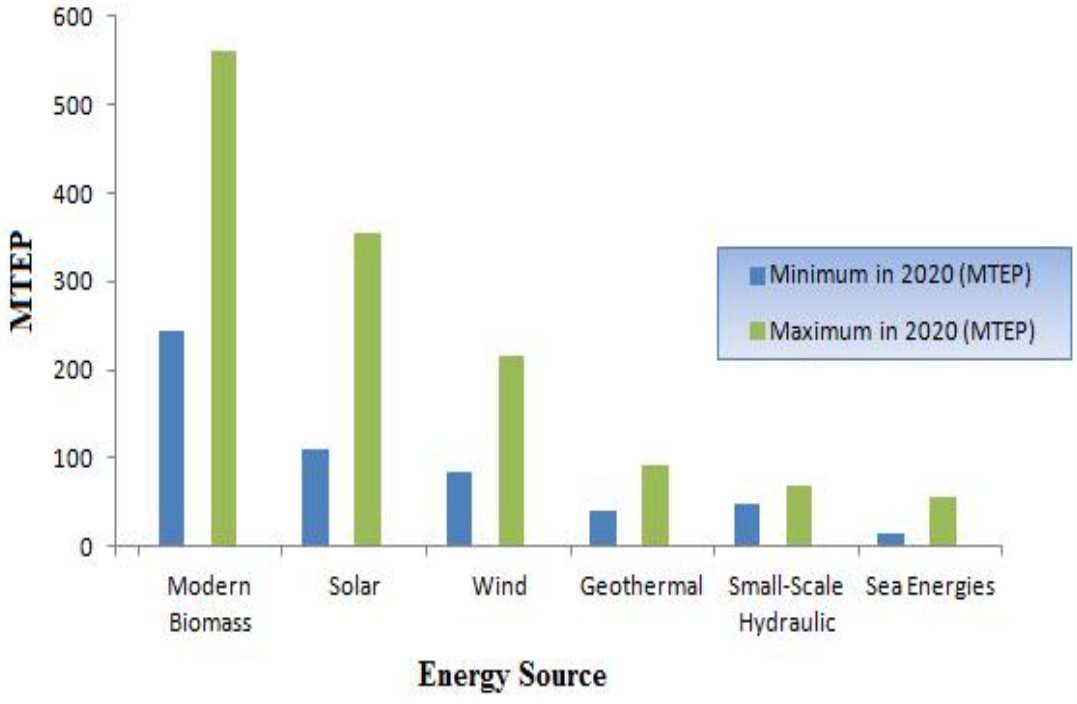

Fig. 1. Estimation of renewable energy sources in 2020

Taking a look at Table 2 and Table 3, renewable energy sources seem quite advantageous. Their investment costs and unit energy costs are relatively higher than those of other energy sources. These costs are estimated to go down in the following years by the advance of technology and transition into mass production. It is not possible to compare the power of plants established with renewable energy sources with the power of those running on fossil fuels. For this reason, there is no need to compare plants running on renewable energy sources with those running on fossil fuels; renewable energy sources have always been the complement of other energy sources.

1.2 Use of Solar Energy in Buildings

Structuring activities involve 37% of the energy that is used globally each year. Structuring activities are held responsible for more than one-third of the greenhouse gas originated throughout the world [19]. Energy consumption is considerably high in buildings in Turkey, and the share of housing/service industry in energy consumption has reached at an average rate of 34.5% [9]. The fact that this energy is fossil-fuel-based in general aggravates the problem and burdens the construction industry with great responsibilities. These reasons set forth the obligation to consume energy efficiently for the construction industry as for each industry that consumes energy. In Turkey, "Energy Efficiency Law" was passed in 2007 during the process for accession to the EU (European Union), about energy activity [20]. Other than current laws and regulations, in 2009, "Regulation for Energy Performance in Buildings", which is a wide-range regulation towards increasing energy efficiency of buildings, was prepared [21]. As is in the whole world, a significant percentage of the total energy is used for heating, air conditioning, ventilation and lighting purposes, to provide consumer comfort in buildings. These percentages are shown approximately for our country in Fig. 2. The share of energy used in buildings all around the world in total energy can go up to as much as 40%. This case is the indicator of how important energy save and management is in buildings.

Table 2. First ınvestment and unit energy production costs of energy plants[16,17]

Plant type	First ınvestment cost ($/kW)			Unit energy production cost (cent/kWh)		
	2012	2014	Change (%)	2012	2014	Change (%)
Nuclear	5385-8199	5385-8053	-1,08	7,7-11,4	9,2-13,2	17,3
Solar	3000-3500	3500-4500	23,08	14,9-20,4	18,0-26,5	26,1
Geothermal	4600-7250	4600-7250	0	8,9-14,2	8,9-14,2	0
Biomass	3000-4000	3000-4000	0	8,7-11,6	8,7-11,6	0
Coal Fueled	3000-8400	3000-8400	0	6,2-14,1	6,6-15,1	6,9
Wind (Land)	1500-2000	1400-1800	-8,58	4,8-9,5	3,7-16,2	39,2
Natural Gas-Fueled	1006-1318	1006-1318	0	6,1-8,9	6,1-8,7	-1,3

Table 3. Comparison of environmental impacts of energy types[18]

	Climate change	Acid rain	Water pollution	Soil pollution	Noise	Radiation
Oil	+	+	+	+	+	-
Coal	+	+	+	+	+	+
Natural gas	+	+	+	-	+	-
Nuclear	-	-	+	+	-	+
Hydraulic	+	-	-	-	-	-
Solar	-	-	-	-	-	-
Geothermal	-	-	+	+	-	-
Wind	-	-	-	-	+	-

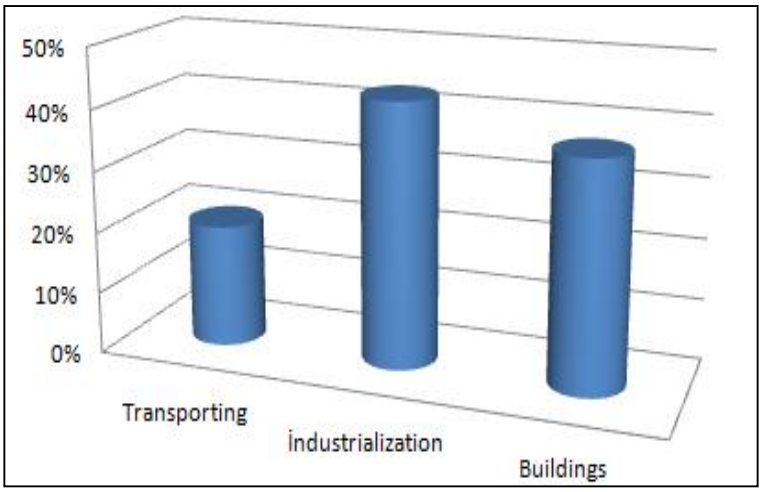

Fig. 2. Share of energy used in buildings in Turkey within the total energy consumption

Sun is an unlimited source of light and heat. In designs for using solar energy in buildings; the flow of heat energy through conduction, convection and radiation is utilized as the main principle. These natural processes are managed via a building design providing help for heating and cooling the building. Sun rays falling on the surface of the building are reflected, passed or absorbed by the construction material. Also, the heat generated by the Sun causes foreseeable air movements within designed spaces. This essential effect of sun heat guides the selection of material providing heating or cooling effect within the structure and the design of construction members. During construction material selection in these designs; thickness of the material, density (5g/cm^3), heat conduction coefficient (A) (W/m$^{2\circ}$K), specific heat (c) (Wh/m$^{3\circ}$K), its surface's light absorption and reflection coefficient, flatness or roughness of the surface, emptiness and fullness must be taken into consideration. It is possible to benefit from solar energy actively and passively in architecture with precautions taken in the design [22]. Use of solar energy with passive systems in buildings. Design applications for passive solar systems can be used to increase solar heat gains during the winter months of solar energy, cooling and ventilation during the summer months and natural lighting. The basic principle for using solar energy for heating is to design the elements of the building shell for this purpose and to make use of solar radiation as much as possible. According to the energy they produce solar energy conversion systems; It is divided into solar thermal heating systems which produce heat energy and photovoltaic systems which produce electricity (PV systems).

2. Sustainable Solar-Based City Planning

There are two methods in solar-based and sustainable city planning; namely, city planning process and solar-based city planning.

2.1 During the City Planning Process

- ✓ The intervention program as described
  Environmental protection
  Economical development
  Social needs
- ✓ Space analysis is conducted
  Economic analysis (sectors of activity, employment, entrepreneurship)
  Environmental analysis (Climatic factors, biophysical properties, topography form)
  Social analysis (social structure, population, history and cultural heritage, education level of the population)
  City analysis (City system, building environment, transportation networks)
- ✓ Plan design is prepared
  Parametric city design "(District forms-building volumes and elevation distance ratio-Autocad, 3D Max, Revit)
  City plan proposal (Plan size and shape of the building design and installation of residential-public areas of road and transport-line design)
- ✓ Implementation is evaluated
  Functions of the selection area
  Environmental performance
  Management program

2.2 During the Solar-Based City Planning Process

- ✓ An energy model is described
  Suitable renewable energy resources
  The goal of reducing CO_2 emission
  Electricity demand
- ✓ Solar potential estimation is carried out
  Energy analysis (Statistics for solar and electricity in buildings - electricity prices - photovoltaic technology)
  Solar analysis (Radiation on the soil-sunlight levels depending on city density-solar potential of existing roof areas)
- ✓ Solar design is carried out
  Solar simulation (Total, direct and diffuse solar radiation-shading-daylight-Arcgis, Ecotect)
  Production of solar energy (Production of solar energy in roof and facade areas-estimation of energy demands
- ✓ Implementation is evaluated
  Energy balance of the selected region
  Reduction of CO_2 emissions
  PV technology costs
  Zero energy buildings

After following these steps, the phase of determining the "New City Model" commences [23].

3. PLANNING OF SUSTAINABLE CITIES

In our era when technology has rapidly become widespread and developed, active and efficient use of energy and preservation of the environment has grown into two components that are complementing each other. The subject of the utilization and reclamation of renewable energy sources within urban planning strategies has proceeded to the implementation phase. The view we are facing today when reflections of the latest developments of technology and science on an industry-specific basis are combined with ecological values is the phenomenon of eco-city. In the world and our country, good implementation instances are observed, which are called settlements where energy is used actively and efficiently, renewable energies are generated and utilized, environment is preserved, carbon emissions are reduced to zero in the struggle against climate change, global warming, drought and desertification; and in which all kinds of details are planned by thinking on them within the framework of a master plan. The common feature of all these settlements is their provision of new lifestyles completely detached from carbon-based fuels [24].

4. SOLAR POWER PRACTICES IN THE WORLD AND TURKEY

4.1 Dongtan Island (China)

4.1.1 The aim of the dongtan eco-city project

- ➢ The use of energy efficiency and renewable energies
- ➢ The impact of Dongtan on climate change is the lowest in every field where energy is used
- ➢ Flexibility in energy presentation and production
- ➢ Improving efficiency is also based on the provision of energy security that will reduce costs.

4.1.2 Dongtan city plan

- ➢ Green corridors, open and wide public areas, roofing covered with green vegetation, provision of public transport using hydrogen-based and clean fuel-powered vehicles, bicycle and pedestrian roads and city equipment are foreseen.
- ➢ People will walk, cycle or transport public transport
- ➢ Design elements that increase air quality are used to reduce noise
- ➢ Energy from wind, sun, is expected to be obtained from biological fuels and urban waste
- ➢ Hydrogen fuel batteries will be used for public transportation
- ➢ Organic farming is planned.

Constructed by encompassing in itself urban design, planning, sustainable energy management, cultural planning, waste management, operation and implementation of renewable energies, economy and commerce planning, social development, sustainable structure design, architecture, infrastructure, landscape designs and ecology.

4.2 Masdar (United Arab Emirates)

No carbon emissions in the settlement where none of the gas or petroleum products will be consumed are foreseen and 80% of the water is reused. Water will allow multiple uses of the drainage channels will be made. The conversion of waste into energy to be used as fertilizer for landscaping material as a portion of the waste is used for the treatment of sewage wastes energy. In Masdar Campus; solar energy, photovoltaic batteries, wind and hydrogen energy are used as renewable clean energy, wastewater is filtered to

be used for irrigation, vehicles are used, which are a small, programmable, personal light rail system that operates only when a need of going to another location arises, and a pedestrian-sensitive transportation and settlement infrastructure is provided. It is planned to be completed in 2017, and the population of this settlement is considered to be up to 50,000 people.10 feet of narrow streets no more than the width of up to 5-storey building, the roof is equipped with solar cells, first as a PV (photovoltaic) in settlements with construction of the factory, is 500 MW hydrogen plant is planned. In the plan of Masdar, benefiting from geothermal energy as well as from a solar energy production factory with a capacity of 40 to 60 megawatts and wind farms is proposed. Gray water will be used for irrigation and other purposes and it is foreseen that reuse of 80% of the used water will be reused many times and the plan which is targeted for zero waste production will be used as biological wastes, high nutritive soil and artificial fertilizer, Industrial wastes are evaluated for reuse.

4.3 Zira Island (Azerbaijan)

In the master plan of the island, where only wind and solar energy will be benefited from, the plan is not based only on generating energy by using the wind and the sun in the region; waste, energy and resource management is being tried to executed in a holistic approach, with planning in its focus, by foreseeing the collection of drinking water by a saline water filtration system, establishment of a wastewater purification plant and reuse of solid wastes as fertilizer. Inspired by the seven hills of Azerbaijan, it is anticipated that 7 basic structures will be connected by paths, green areas and coastal shores.

4.4 Paljassaare Peninsula (Estonia)

Within the peninsula,energy provision through wind farms and integrated heat and electric system, generation of the remainder of required energy from wastewater processing plant near the gulf, structure designs which reduce heat loss 70% compared to conventional houses of the same dimensions, artificial hills used for providing a shelter against high winds blowing from the Baltic Sea, grate system that reduces the wind corridor formation possibility, and elevations for buildings that do not block each other in order to maximize the solar energy of the area experiencing a long, dark period during the winter have been determined.

4.5 Gothenburg (Sweden)

It has been redesigned as the "SuperSustainable City". The master plan implemented in the city includes everything from green roof gardens to roads that provide water and energy economy, from high solar panels to wind turbines. In the plan inspired by the architectural legacy of Gothenburg, the use of traditional yellow bricks and granite pavements is projected, and gazebos overlooking the south are designed as roofs that allow having fun, using solar energy by panels, and that are suitable for food production. Another feature of these roofs is that they reduce heating and cooling needs of buildings, and including at the same time in most of these roofs small wind turbines that reduce energy need is also considered within the scope of the plan. Planning of transit roads in a fashion to collect stormwater and solar energy is proposed.

4.6 Treasure Island (United States)

In the middle of the San Francisco bay and 1.5 kilometres square, the area is an island dating back to 1939 with 3000 inhabitants. Alternative solutions for organic farming, rainwater recycling, water treatment and clean transportation have been adopted. It is envisaged that the buildings will have LEED (Leading Edge in Energy and Environment Design) certification. It is aimed to install 70% of the area with solar energy panels by the year 2020, and generate 30 million kilowatts/hour electricity annually from the sun in relation with solar and wind energy production.

4.7 Sherford (England)

This is the eco-project of Prince Charles. It is planned to be completed in 2020 and to host 12,000 people. Structure types of the traditional English towns taken as the basis, water and sewage wastewater is reused. Most of the structures make use of solar power systems and wind energy, and vegetation cover coats the roofs of buildings. Free bicycles are available at this residence. The entrance of cars is prohibited in some areas.

4.8 Lund (Sweden)

In this study, annual total sun radiation that falls in the structure envelope of a block by simulation software. All panels to be used were considered to be PV. In all geometries, floors were planned in 10 m width and 3 m height. Blocks were simulated initially in North-South (NS) alignment,

and later in East-West (EW) alignment. The blocks are designed in North-South direction. The surrounding buildings are considered at the same intensity. With Ecotect, surfaces with solar radiation of 650 kWh/m^2.year were selected. The reason for selecting this value is 15% efficient solar cell of about 100 kWh/m^2.yıl able to generate energy. Solar panel area is considered to be approximately 75% of the facade or roof area. The electricity use of the buildings is considered as 50 kWh/m^2.year.

4.9 Malmoe (Sweden)

The use of more solar energy has been explored in the buildings planned to be built in Malmoe, southern Sweden. The city of Malmoe has been re-planned. This planning document design and 3D digital model are determined.

4.10 Alcabideche (Portugal)

Alcabideche, about 1.88 ha, depending on the area of Portugal is a small town in Cascais Municipality. A new approach to sustainable urban planning has been developed by considering only PV systems as a source of renewable energy. In the energy analysis made, 13% efficient PV systems are considered for use in the roof and the optimum panel slope is 38 °. Electricity costs 0.1925 €/kWh, the building of the electricity consumption values in determining housing 4587 kWh / capita.year, non-residential and commercial building 200 kWh/m^2.yıl, industrial building 312 kWh/m^2.yıl electricity consumption is based. For the collection of solar radiation data, ArcGis software was used by combining topographical features with local geographical information.

4.11 Queensland (Australia)

In Queensland state located northeast of Australia, the effect of the distribution of shadowed area in between buildings on sunlight gathering, for the optimization of building shapes and neighbourhood morphology. Total spherical sun radiation amount that falls on the outer envelope of the building in building and facade design has been examined [23].

4.12 Dragon Stadium (Taiwan)

Constructed in Taiwan, this stadium is the first stadium in the world that runs 100% on solar energy. The stadium, opened in 2009, has a capacity of 40,000 people and is covered with 8,884 solar panels. These panels overcompensate the electricity need of 3,300 light sources and 2 massive scoreboards of the stadium and generate 1,14 kWh of electricity per year. The excess energy production is being sold by the government of Taiwan [25].

4.13 Gazi Technopark GES (Solar Energy Plant)

Gazi University Technopark is the first technopark which has a 300 kW of installed power and supplies its energy need from renewable energy sources. Fixed and sun-tracking mobile panel application over the roof, ground level and parking garage Solar parking lot, sun-tracking panel system (Tracker) and Turkey's first "Electric Car Charging Station" that runs on solar energy [26].

4.14 Muğla Municipality

With the first Photovoltaic System connected to the network, which has been approved and commissioned by TEDAŞ, it was aimed to supply 78% of the electricity need of the slaughterhouse facility bound to Muğla Municipality. The name of the project was “Our Unending Source Sun”, and this project of 105 kW power granted a subsidy from GEKA (Southern Aegean Region Development Agency) [27].

4.15 Gürsu Municipality

Solar House project of Gürsu Municipality has received the first unlicensed invoice of Turkey by selling the electric power it produced to the related distribution company (UEDAŞ). The plant of 96 kW power granted a subsidy from BEBKA (Bursa Eskişehir Bilecik Development Agency) [28].

4.16 Erikoğlu GES(Solar Energy Plant)

Located at Denizli, Serinhisar, this plant has a power of 500 Kw, and excess electric power produced by the system was sold to AYDEM and an income was generated [29].

4.17 Adana Cement GES(Solar Energy Plant)

Located within Adana Cement Factory, this plant is the first largest Solar Energy Plant project that has been approved in Turkey. It produces approximately 775.000 kWh of electric power annually, and it brings about a CO_2 emission reduction of 409.200 kg annually, the same amount of emission reduction provided by 409

Fig. 3. Other implementation areas

40-year-old mature trees during their entire lifetime [30].

Other implementation areas

- ✓ Mobese City Surveillance Systems
- ✓ Solar Bus Station
- ✓ Street Lighting by Solar Energy
- ✓ Solar ATM
- ✓ Solar Facade Siding
- ✓ Adana Sustainable Green Building Project
- ✓ Technocity Science Center, Adana Smart Bank Project
- ✓ Traffic Management Studies in Adana (Fig. 3)[31].

5. CONCLUSION AND RECOMMENDA-TIONS

Nature has adequate resources and facilities for people to live a balanced life without harming the environment, to become civilized, and to even increase their comfortable life standards by industrialization. Should we give time for the natural balance to be established, nature can rejuvenate itself. The increase in the number of energy results in a multiplication of environmental problems in number. Emerging environmental issues threaten human health, and create short or long term effects such as the disruption of ecological balance. More than half of greenhouse gas emissions are produced in cities. For this reason, improvement of energy efficiency in cities is the most important step to be taken for removing carbon out of the economy. Therefore, it is imperative to pay less attention to volume, shape and layout in the design of new buildings, and rather to pay attention to the use of renewable sources that are integrated with buildings, and not to overlook the relationship between concepts of building and city[23]. The number of examples in which passive and active solar heating systems are employed in new residential buildings, and which embody the bioclimatic building feature is increasing day by day. Brand new materials, smart facade and roof systems, natural artificial lighting systems, the use of renewable energy sources such as photovoltaic panels, building and energy control systems are examples of these technological developments. However, plannings are carried out without urban design plans, and without paying attention to matters of utter importance; such as building spacings and locations, climate, lighting condition, alignment and air circulation. And this puts cities in a dire strait on the matter of sustainability in the dimension of energy. Renewable and active use of energy within the frame of sustainability will be possible by the implementation of correct regulations and standards that are in force, and yield corre ct results in energy-active building design and construction. There are examples of these implementations throughout the world. The most effective way of ensuring sustainability in energy is to design buildings at the preliminary level with energy-active systems. The design should allow flexibility and variability criteria, and spaces should be used functionally [32]. The energy need of the growing population and developing industry cannot be supplied with

Turkey's energy sources. For this reason, the gap between energy production and consumption is growing wider very fast. The utilization of green energy sources must be encouraged by taking the rapid depletion of energy sources into consideration, and incentives must be provided to the private sector in this field. With this goal, the importance of using the resources of the country more actively has increased. Research and Development studies must be accelerated in university and company levels for eradicating the lack of technical knowledge and material related especially with renewable energy sources; in other words, to lessen the dependancy to foreign countries. Institutions engaging in such activities must be provided with more support. Protecting the environment and the climate must be paid attention to while employing energy production methods.

COMPETİNG İNTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Yelmen B. Impact of Renewable Energy Sources on Energy Quality ULIBTK'11 18. National Congress of Heat Science and Technology 07-10. Zonguldak; 2011.
2. Altın V. Our Energy File Science and Technical Magazine.2007;470.
3. Turkey Energy Production; 2006.
   Available:http://www.enerji.gov.tr/enerjiuretimi. Htm
4. Semenderoglu A. Environment and People Throughout History. Ecology; 1992;3.
5. Available:http://webcache.googleusercontent.com/search?q=cache:FWvLmOTpT6gJ:/.14.10.2011
6. 1-10 December Protocol conclusion of the 3rd Conference of the Parties to the United Nations Framework Convention on Climate Change in Kyoto; 1997.
7. Gürsoy U. Rustless Rose Clean Energy, Iskenderun. Environmental Protection Society Publication; 1999.
8. Anonymous, Energy Information Administration (EIA) Turkey: Environmental Issues.
   Available:http://www.eia.doe.gov/emeu/cabs/turkenv.html online, 10.11.2010
9. Anonymous, Vision 2023 Technology Forecast Project Preliminary Report on Energy and Natural Resources Panel, Tübitak, Ankara, 2003.
10. Available:www.eie.gov.tr/turkce/gunes/gunesenerjisi.html.(01-09-2004)
11. Karabulut Y. Turkey Energy Resources, A.Ü Printery, Ankara; 2000.
12. Dogan M. Industrialization and Environmental Problems. New and Renewable Energy Sources Symposium, TMMOB, Kayseri. 2001;245-251.
13. Parfit M. "Alternative Energy", National Geographic, August. 2005;88.
14. Available:www.tubitak.gov.tr/btpd/btspd/platform/enerji/altgrup/cevre/bolum4.pdf
15. Parfit M. 2005, "Alternative Energy", National Geographic, August. 2005;87.
16. Levelized Cost of Energy Analysis, lizard version 6.0; 2012.
17. Levelized Cost of Energy Analysis, lizard version 8.0; 2014.
18. Durmaz MC. Renewable Energy and Resources Ataturk University. Department of Chemical Engineering, Erzurum, p.7.
19. Anonymous, International Energy Ageny, Online.
    Available:http://www.iea.org/ 11.11.2010
20. Anonymous. Energy Efficiency Law No. 5627; 2007.
21. Anonymous. 27075 numbered Energy Performance Regulation in Buildings, Ankara; 2008.
22. Available:http://www.kobifinans.com.tr/tr/sektor/011902/16775/4 Online, 09.11.2010
23. Atmaca H. Solar Energy as a Design Parameter in Urban Planning 6th Solar Energy Systems Symposium and Exhibition. Cultural Center –Mersin; 2013.
24. Yıldırım H, Kaynak Z, Kumcu N. Use of Efficient and Efficient Use of Energies and Planning of Sustainable Cities in the Context of Environmental Protection; Examples of International Practices Tmmob Turkey VII. Energy Symposium Reports Energy Efficiency. Kızılay – Ankara; 2009.
25. Available:http://www.solaripedia.com/13/346/taiwan_stadium_100_percent_solar-powered.html/03.11.2016.
26. Available:www.gaziteknopark.com.tr/
27. Available:www.alternatifenerji.com
28. Available:www. gursu.bel.tr.

29. Available:www.hurrıyet.com.tr-
30. Available:www.adanacimento.com.tr
31. Yelmen B. 4th D-8 Task Force Meeting on Technology Cooperation Bilkent/ Ankara.Turkey; 2016.
32. Mehel N. Wind Energy Potential in the world and Turkey, and Germany-Turkey Usage Comparison, Master's Degree, Osmangazi University Social Sciences Institute, Eskişehir; 2010.

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