



SOLAR ENERGY AND THE CITY'S FUTURE REFLECTION

Alkan^{a,*}, A., Alkan Bala^a, H.

^a Department of Architecture, Faculty Of Architecture, University of Selçuk, Konya, TURKEY *E-Mail: alkan@selcuk.edu.tr

ARTICLE INFO

Received: 13 May 2017
Received in revised form:
29 May 2017
Accepted: 6 June 2017

Keywords:

Solar City, Energy,
Development, Future
Dimension

A B S T R A C T

In this article, it is aimed to bring an intellectual declination to the aspects of “solar energy” deeply affecting the future of urbanization and planning activities and accordingly, the changes that may occur in urban macro form. The changes that may emerge in the forms of producing and consuming the energy naturally affects the urbanization process in addition to technological a socio-economical developments. The process should be evaluated through totalitarian developments. When the complexity of the matter is considered, deep theoretical declination is required. In this study, the references and basic resources which haven't been explained in detail within the text for technological developments and biotope of the future were employed. The purpose of the study is to share our estimations about the demands of those developments and legal, administrative, and social behavior patterns that is required to occur accordingly not make interpretations about “technical” dimensions which require expertising on solar energy. In addition, we also aim to come up for discussion about important ontological problems we regarded vital in the relationships between energy and city. As a result of those discussions and researches, it is a beginning that is hoped to provide contributions to change the planning paradigm.

© 2017 Published by University of Tehran Press. All rights reserved.

1. Introduction

The urbanization and movement of the big cities which are the most striking result for humanity as a result of the industrial revolution which began in the 17th century are going on without slowing down. The part of the world population which lives in cities exceeded those who live in the rural area for the first time in 2010. Despite all those difficult problems, it seems that more and more people will live in big cities in the future so long as the level of development and reconstruction increases. In the developing world, more than five million people migrate to the big cities every month. Namely, two Meşheds, five Kum cities are added to the big cities of the world [1].

Big cities where more than half of the world population lives are responsible for the 80% of the global greenhouse gas emissions and 75% of the energy consumption [2]. The administrators of those cities which rapidly grow and increase in number have fallen behind the urbanization since the beginning. The cities have expanded, turned into the piles of problems and then the administrators have begun to search for a solution to those problems. Those paradigm

masterminds and scientists working on the urbanization were led to the dilemma of people who follow the problems and seek solutions to the current problems. It isn't a paradigm which is inevitable to change but can change easily. Because the industrial revolution and great and radical social order of “The Second Wave” established to serve it are still in progress [3]. If city planning may comprehend the coming new and huge wave of change and also perceive with this demolition what it should substitute for the structure of the second wave which will be demolished by this system, it will achieve to establish the new urban macro form and new planning paradigm.

One of the strong elements of the approaching huge change will be the energy and especially solar energy. At the moment, 20% of the gross national product in the world is produced in the economically prominent ten cities. In order to keep those cities within the process of competition, they should comply with new civilization order and execute the huge spatial change required by it. Spreading of solar energy seems inevitable for sustaining the development and change. Parallel to the increase in population, the rate of people living in big cities continues to increase the energy

consumption in the form of geometrical progression. Besides being the most important resource which may respond to this increase, the solar energy will turn into the type of energy which may execute the demand for “liberalization” in the contents in the book 2050 by Passing (2011) and exists in the spirit of new civilization [4].



Figure 1

The referred basic resources should be examined to follow the content of the information cited in this study

In the expectation that it could contribute to the perception of the relationships between energy and urbanization, the important theories related to estimating the direction of those developments and the civilization of the future were only cited in this study. It should be considered that, however, the referred basic resources should be examined to follow the content of the information cited in this study (Figure 1).

2. The Direction and Dimensions of the Change

It is compulsory to do following items in order to perceive the great change occurring in the world well and also understand its reflections to urban developments;

- To look through macro scale exiting the winding of the daily problems,
- Correctly determine the effective factors of the change,
- Correctly estimate the level of change to be reached at the targeted time,
- Correctly interpret the interaction between the change and city.

In the past, the scientists who tend towards the estimation of the changes in the social dynamics provided significant contributions to the process of city planning. Among the major approaches related to the main axis of the study, for example, Jean Fourastie illuminated following;

- “The theory of sectors” explaining that the society lives one of the major stages (or all of them at the same time) through “sectoral distribution of the working population”,
- Through “2000 hours” theory based on decreasing the working hours, future was enlightened in 1930’s towards 1970’s and even 2000’s [5].

Similarly, the theory of R.W. Rostow based on the assumption that the societies would experience five major stages (the societies of Traditional, Preparation period, Activation period, Maturity period, and Nass consumption period) provided significant contributions to the relationships between civilization and urbanization [6].

Beginning with Platon; Hegel, Marx, Keynes, Popper, Friedman and others, economic developments, control and formation of production instruments all provided significant clues to the planners about the future of civilization through the relationships between consumption, class, and society [7]. Similar studies are also in progress even today through using current technologies of information and communication. The levels of actualizing those theories, of course, don’t exhibit accuracy. However, this huge wave of change may be a significant opportunity to change the classical perception of planning as “first, you grow up; you clean it later on”.

In his works called “The Shock” and “The Third Wave-A Futurist Classical on Economy”, Alvin Toffler classifies the stages of development in the societies in three groups. Those stages he explained through the metaphor of wave are as follows:

- The first wave represents the agriculture-based civilization beginning in 8.000 BC and continuing until 1650-1750 AD,
- The second wave represents the industrial revolution began in 1750’s and is still in progress,
- The third wave represents the period of information-communication-technology and freedoms which start when the number of white collars increases the blue collars in the USA in 1955 and we have been running through [8] (Figure 2).

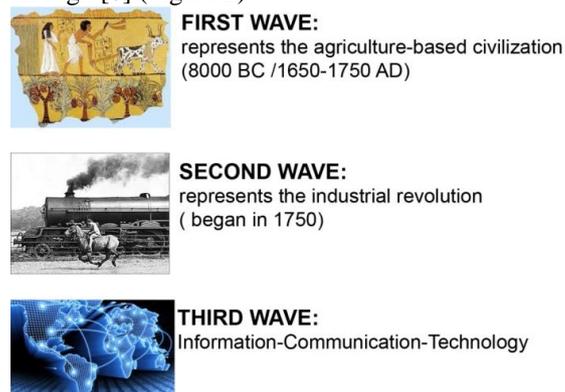


Figure 2. “The Shock” and “The Third Wave-A Futurist Classical on Economy”,

Alvin Toffler classifies the stages of development in the societies in three groups.

According to Daniel Yergin, the third wave is the name for the mobilization of disarmament and environment began to minimize the dependence for petrol which marks our age. The sensitivity of environment which began in 1980’s will

gradually gain importance and alternative sources will be brought to the agenda more strongly [9].

The developed societies of our times encounter the conflicts between the third wave and old and rusty economic perceptions and institutions of the second wave. Those conflicts reveal new political faces in addition to the social tensions all over the world. The discriminations of class, race, gender or groups all keep in the background. The essence of the matter is that it is not possible to immediately recognize the incoming new order when we discriminated the changes brought by the third wave of the institutions and rules of the second wave which has started to retreat slowly [10].

No matter we classify our status in, the third wave in this new historical breakpoint where change is inevitable brings along our new life style too. This new life style inevitably describes an urban space quite different from the second wave cities.

In addition to the wave theory of Toffler, David Passig suggests "the Theory of Four Dimension" which explains that "The perception of distance could be broadened [4]. In this theory, we can find that how human beings could strengthen their economies through using new fields and which instruments of the war he could use within the context of his struggles [4]. Passig analyzes the stages of huge change in the civilization in five phases similar to the phases of the economical developments by Rostow starting it from the culture of point by Cairncross [11] (zero dimensions). In the fourth dimension which is the last of those stages, we will witness bigger revolutions than those we have experienced so far. Although humanity has found methods to transfer fields from the bytes since the beginning of the 21.st century, he isn't free from the energy sources it owns. "Extracting fuel from deep parts of the earth, transporting it to far distances aren't enough for the freedom hidden in the fourth dimension and this consciousness of freedom will seek for freedom " (Figure 3) [2].

ZERO DIMENSION- Colecting Plant, Hunting

FIRST DIMENSION- Agricultural

SECOND DIMENSION-Industrial

THIRD DIMENSION - Mass Production

FOURTH DIMENSION -Individual Technology
focused production



Figure 3. Five phases of David Passig [2]

In order to actualize and sustain the fourth dimension which equals to the third wave civilization of Toffler, the first element we need is the energy. Until quite recently, the energy paradigm was transferred to the fossil fuels such as petrol, gas, and coal obtained from its own inner resources, hydraulic and nuclear energy. First of all, the disaster occurred in Chernobyl nuclear power plant in 1986, the spillage of 140.000 drums of petrol into the sea upon the super-tanker called Rixxon Valdez in Alaska in 1989 [9], and the finally Fukushima nuclear accident in Japan required moving to renewable (solar) energy sources. New

energy sources needed by the new civilization should be both "sustainable" and "clean" (Table 1).

IS THE OF SOLAR ENERGY LIMITLESS AND ITS USE PROBLEM-FREE?

Human beings achieved an important development in his seek for recovering from the addiction to space through transmitting data wirelessly. However, those data-transmitting devices or transport-communication devices are unable to recover from the addiction to the walls and cables. They have to plug in their devices and charge them for a few hours. For that reason, we should head to other directions about producing and transferring energy disregarding their sufficiency (starting from the variants of environment and freedom).

Through his theory of "A-biogenic Petrol", Thomas Gold mentions about giant bacteriological masses which exist more than 10 km deep from the earth surface and live in the environment hotter than 100°C, feed on methane and hydrocarbons and own petrol as the side product.

According to Gold, petrol will never be used up and there is the source of energy will be enough for 500 million years according to the consumption estimations in 1900's [12].

"Even this theory is valid; this is not the source of energy which the civilization of the third or fourth dimension needs. Because; this new civilization needs not only the physical adequateness of the energy but also the availability of the energy which developing technology needs most. It should be easily accessible and cheap. A new energy type which can answer the demand which new civilization revealed in the human mind for liberation' [4].

In the current consumption system, 75% of the global energy is consumed in cities and 40% of this amount is consumed in homes. About 50% of the consumption in homes is used for lightening. The more level of urbanization increases, the more this energy consumption inevitably increases in geometrical progression. The level of technology achieved today allows human beings to produce this energy in the form of "Solar energy" easily. However, the problem at the moment is related to the storage of this energy. According to the scientists, the sun is a rich resource. At the consumption of our age, the energy sent by the sun within two hours is enough to satisfy the total need of earth for energy for a month.

Answers are needed for the following questions about the solar energy which is expected to become the source of energy consumed most by the year 2050;

- **Which possible effects of this usage even in the minimal level may be seen?**
- **How much will the consumption level increase in the dimension of a new civilization? How will the use of solar energy affect the ontological balance after this increase?**

Considering the data of 2011, the dimension of energy gap and the levels of the need for energy may be seen if the average of Island (17.42 step/person) which is the biggest energy consumer (electric consumption, 53072 kWh/person) and the average of the world is 1.87 step/person (electric consumption, 3.155 kWh/person) is considered [13]. In this case, only 1/360 of the energy sent by the sun satisfies the

Table 1. Phases of human mankind of life cycle

FAMILY	Big Family	Nuclear family	Electronic Family	individual rights and freedoms focused family	
DWELLING	Big House based on farm	Big House	Small House Apart Room	cooperative apartment house public houses	Electronic House
PRODUCT	Collecting Plant Hunting	Agricultural	Industrial	Mass Production	Individual Technology focused production
TRANSPORTATION	Pedestrian scale-safety-first vehicle wheel	Motor vehicle Railway system Mass Transportation	Individual transportation	Information and Technology	nuclear fission
ENERGY	muscle	Initial energy resources Coal		petroleum Oil hydraulics Wind power etc.	SOLAR ENERGY
CITY	Pedestrian City	Industrial City		Free City	

total energy needed in the world but this amount may rise to the level of 1/36 in the theoretical environment. Can this opportunity lead to the changes in the ontological balances of the world and result in the unforeseen developments?

There is another unexplored dimension of using the solar energy coming from the atmosphere through converting; there are waves in the micro-frequencies of thought with various density and frequencies which circulate in the atmosphere and transmitted by the human brain. We don't know yet the level those waves of thought affect the ontological balance and sustainability of the earth and its management and

motivation. What is certain that those waves exist and play an important role for macro balances.

I had listened to it from a mevlevi dervish 45 years ago: "Even though has a speed and weight. Everything you think walks around in the atmosphere and find its value when it meets the receivers convenient to its frequency. In the near future, the science will measure the speed and weight of the thought." I think it is becoming true.

The density of the power environment established in the relationship between the sun and atmosphere will gain a new density through this consumption. Unfortunately, we have no idea about the possible results at this dimension which we know to exist but we haven't explored yet.

- **Are there unrecoverable results of the world of science disregards this factor in the new balance to be established through the energy consumption?**

3. Results and Discussion

The solar energy drew the attention of the people at the beginning of the period when the energy gap started to be felt, and the years which the petrol wars have left their mark on the 20.th century. After the energy consumption period

which the second wave civilization has massified, "The Solar Panels" have been one of the most important topics to be discussed. Although the crisis which may be encountered in the plane of thought isn't known yet, the idea of locating Space Based Solar Panels (SBSP) on the space in order to deal with the results of consumption on the climate and tectonic movements and in order to increase the energy productivity has been discussed since 1960's. Through this method, the solar panels located on the Geostationary Orbit (GEO) at the height of 36.000 km away from the earth are used to collect the solar energy and convert to electricity. This energy is transmitted to the receiver stations in the world using microwave rays. After Dr. Peter Glaser who suggested this idea, a team guided by William Brown succeeded in transmitting the electricity of 30kw to a distance of 1.6 km with the productivity rate of 84% using micro waves in 1975 [4].

It is possible to extend this list. However, our purpose here isn't to list the activities conducted related to the topic, but to draw attention to the awareness and sensitivity in the triangle of the Sun-the Earth-energy. The current situation may be summarized as follows:

- The new production-distribution systems of solar energy will change the concept and perception of distance.
- The terms addiction and space will be interrogated.
- Current energy transmission and consumption infrastructure will completely change.
- The changeable potential of solar energy will completely change the traditional perception of management and attitude patterns.
- "The slow change" existing in the nature of social behavior systems will have difficulty in keeping step with the technological change which gains speed at each stage. The emerging "cultural delay" will confront us as a chain of problems difficult to solve.

- Human beings will experience the freedom through electrical devices in the field he has never had.

THE URBAN REFLECTIONS

The scientists working on solar energy predict that the activities such as producing energy in the space through solar panels and transmit this energy to the earth using micro wave or laser technologies could be executed within the following century or within 50 or 60 years in case there is important conflict in the world. If such predictions are actualized, how will the cities of the future be shaped when they are uniformed with changes existing on especially technologies of information, communication, and transportation? It is clear that telecommunication technologies will change the physical tissues of the cities and their economic roles within the macro form. Radical changes were started with the sizes of the computers are getting smaller and smaller everyday portability and they are turning into more portable devices, they all get out capacities, the transportation system of the city, their functioning style and time [14]. During new civilization period, it is possible to summarize the determinative elements of this change supported by solar energy;

- On the focus of the urban space of the future, there will be the "**Electronic House**" where the activities of sheltering, education and working conducted together. "The House" which escapes from the imposition of "popularization" will be a building where human beings constructed independently from the jurisdictions such as big city, city center, and the closeness to work areas. A transformation associating the perception of "the house for production-consumption" will come into agenda [10]. A new comprehension of the city will be developed through the opportunities of energy which has escaped from the ties such as massive sheltering and production sites imposed by the industrial revolution, special function regions, easy and massive transportation, compact city and sustainable settlements etc. Parallel to the liberalized individual, we may call it as the "**Free Cities**".
- Instead of the "elementary family" which dissolution seems inevitable, "**Electronic family commune**" may be the sociological unit which equals to the macro form of the free cities.
- Changing relationship between production and consumption will deeply shock the term of traditional shopping. In addition to the developing new transportation vehicles and technologies, changing technologies of commercial perception and conveyance of goods will radically change our current transportation infrastructure. From this day on, it will not be wrong to say the city of the third wave will have a macro form which is less dense, common and feeding the freedoms. The clues of privatization and popularization of air transporting may be seen today [15].
- Despite the demands for physical transportation with lower density, the flow of information and goods at high speed and density, and an urban space which circulated by the large fields fit in

bytes. The discrimination between rural and urban is minimized and the amorph settlements determine the borders.

- We switch to an urban space where the concept of center declines, the term of peak hour is forgotten, the level of activity decreases but the economic scales increases exceeding all types of estimations.

The most important obstacle and the field of conflict for the formation of the free cities will be the reflex of traditional to defend and generate itself. It a dream to expect the technological change which changes at an unprecedented pace is reflected in the place in the same speed. In addition to the reflexes of the industrial revolution for defending the institutions and places, the construction of the urban spaces which will be abandoned and rebuilt and host big populations mean economically huge investments.

Preparation of legal, administrative and social values that comply with the norms of the new civilization and which will provide the formation of the free city standing in front of us as a threshold as important as the economic power.

4. Conclusions

The industrial revolution which has left its own mark on the city of the 20th century, the wars of petrol (energy), ethical nationalism shaped by the terms of fear and security and its fights are all leaving their places to a new paradigm. The struggle of sovereignty conducted through petrol regions is substituting with the race for controlling the space. The main aim of this struggle is as follows;

- Locating solar panels on the space,
- Transmit the obtained energy to the earth and distribute it there.

The countries which achieve it and control the production sites and the system of transport and distribution will be the super power of new civilization which owns the control.

In order that the individual who utters his demand for freedom more and more loudly achieve his target, change the political perceptions, enriching the content of the term democracy are the following items which the individual user and the vehicles of production and transmitting demand;

- Cheap and easily-accessible, always available,
- Sustainable without interruption,
- Free from the addiction of place and orbit,
- Satisfying our sensitivity for the environment is "**clean energy**".

If we can obtain this energy we need from the **Solar Energy**, the "**Free Cities**" where the cities liberate, the terms related to the city is completely changed, flexible, common, relying on environmental values and shaped in accordance with the demands of free individuals are on the way for actualization during new civilization period in front of us.

Human beings reached a new turnout;

- Realizing this development, through starting to prepare the political, legal, economic, and physical conditions of the urban formation and conduct a painless transformation.
- Sustaining the current resistance, accepting the status after the painful and contentious process and trying to find solutions for the giant urbanization problems which exists as a result of

the perception of “grow first and then you can clean”.

This attitude enables the dissociating the human beings of third wave and fourth wave and the human beings of the industrial revolution.

References

- [1] Yüceer,S.N., 2015, The Environment and Energy in Building, Nobel Yayınevi. Ankara.
- [2] www.siemens.co.tr, "Sustainable City"
- [3] Toffler,A., 2008, The Third Wave. Koridor Yayınları, İstanbul.
- [4] Passig,D, 2011, 2050, Koton Kitap.İstanbul, pp. 111, 138-139.
- [5] Göçer,O, 1979,Introduction to City Planning, KDMMA Yayınları, Konya.
- [6] Rostow,R.W., 1980, The Stages of Financial development. Kalem Yayınevi.İstanbul
- [7] Popper,K.R., 2013, The Open Society and its Enemies. Liberte Yayınları. Ankara.
- [8] Toffler, A., 1970, Shock, Koridor Yayınevi.. İstanbul, pp. 414-426.
- [9] Yergin,D., 1999, Petrol.p.898. Türkiye İş Bankası Yayınları. Ankara, pp.
- [10] Toffler, A. The Third Wave. Koridor Yayınları, İst.2008, pp.12, 247-274.
- [11] Cairncross, F., 1997, The Death of Distance. Harward Business School.
- [12] Gold, Thomas, 2001, The Deep Hot Beosphere: They Myth of Fossil Fuels. Copernicus Books. New York.
- [13] Koç,E.and Şenel, M.C,2005, "The Status of Energy in the World and in Turkey" Mühendis ve Makine. Volume;54 No:639. Ankara
- [14] Meşhur.F.A.and Meşhur,M.Ç, 2007, "New Information and Communication Technologies (NICT's) and Changing Urban Areas Regarding Sustainability". ENHR International Conference 25-28 June 2007 Rotterdam.
- [15] Meşhur,H.F.A. 2011, The Envrinmental Role of ICTsand Sustainable Development.