

Analysis of Turkey's Sustainable Development Performance at Last Decade by Applying Green Economy Indicators

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Abstract

In recent years, sustainable development has become a worldwide discourse, driven by international treaties global environmental organizations and bodies such as European Union, OECD. Sustainable development is a concept to be analyzed aspects of economic, social, environmental and institutional. With the advents of sustainable development, green economic development has become one of the most important economic issues. Countries which target economic, social and institutional development should not neglect environmental development. Development of green economy is the best way of slowing the negative ecological and environmental impact. Developing countries neglect the protection of the natural environment in the process of rapid industrialization. As a result of this situation, natural resources rapidly run out and environmental quality begins to deteriorate. These negative results return a significant cost to society. In this study, Turkey economy which has averagely 5.5% economic growth in the last 10 years will be analyzed in terms of green economy indicators. Turkey is a highly suitable ecological condition for crop production, animal husbandry, fisheries and forestry activities because of its geographical position. The basic components of ecological conditions are climate, highly variable the shape of the earth,

water, can be made large agricultural land, forest and meadow and pasture, as well as Turkey has also other natural resources. It is known as source of metals and solar and winds are ones of the most energy resources for Turkey. Turkey which one of the fastest growing economies in recent years can be analyzed in terms of some data how efficient uses natural resources. In this study, Turkey economy will be analyzed in terms of ecological footprint index and which sources energy produced. In 2007, ecological footprint index is 2.7 global hectares and in 2002 it was 2.0. Turkey has increasing ecological deficit day by day. Ecological deficit is 1.4 global hectares in 2007. In 2000-2010, energy use per capita has increased parallel to economic growth. According to energy data, Turkey foreign energy dependency has increased in last decade. In addition, share of renewable sources in total electricity production hasn't changed significantly. The foregoing findings indicate that Turkey currently belongs to an economic development pattern based on high resource consumption. The economic development is mainly established on the exploitation and utilization of nonrenewable resources. Therefore, Turkey should change the development pattern, regulate the industrial structure, promote the utilization rate of resources, develop green pollution-free products, and enhance the sustainable development of ecological economic system.

1.INTRODUCTION

Last decade performance of Turkish economy attracts everyone's attention. If we told more tangible words, both economic growth figures and the duration of the overcoming crisis are remarkable progress. In the last decade, Turkey's economy has grown averagely 5.5%. While it was achieving this economic growth, environmental issue which is one of the concepts of sustainable development has been neglected. Sustainable development constitutes a very important place in Turkey's National Environmental Action Plan and Eighth Five-Year Development Plan. Despite this situation, it is discussed that the shortcomings of these two documents and not yet fully tangible success achieved. Turkey has discussed "development or environment?" vicious cycle issue for many years.

In recent years, Turkey has been living the process of rapid industrialization and urbanization. However, pressures on the environment of these situations are increasing day by day. For example; a fast rate of urbanization in Turkey and spreading out of the city's natural boundaries, like demographic trends in the world, bring a heavy burden on ecosystems across the country. This situation raises two important problems. Firstly, because of increasing demands such as food, energy and water, resources of the city are not sufficient. In addition, due to growing consumption, waste collection and pollution abatement systems of the city are also forced. This is a major burden to the natural environment. Secondly, a structure of the city which lives a lot of people under human conditions emerges.

Moreover, unplanned urbanization is not limited only to these areas of the city, but also creates regions, not far from the center, have not been supported by adequate infrastructure. This situation creates disasters causing the loss of life and property in less developed and unsuitable regions of Istanbul and other large cities for settlement because of natural events such as a sudden and heavy rainfall. This has led to major burden on country's economy. A wide variety of effects such as climate change and environmental changes that may be severe, given the current economic and social structure to force in terms of both environmental and development goals is possible to produce an even darker scenarios. Due to these and other problems, such as threatened urbanized areas, rural areas, especially some of the damage caused by agricultural practices on biological diversity and ecosystem and the country's energy policy dilemmas, economic, social and ecological sustainability is threatened.

With the global flow of sustainable development becoming a major trend, green business, and economic issues related to green practices has since gained attention. World Bank (1998) pointed out that the green economy is the best way of slowing the negative ecological and environmental impact. In sustainable development, international community's develop Green Economy assessment models or indicators successively in order to obtain an authentic and effective analysis of eco-environment and natural resource depreciation conditions, as well as to modify human economic activities to achieve management objectives through indicator assessment. As a whole, Green Economy assessment indices or measurement types that have been developed all have their individual features. Most strive for sustainable development in factors including society, economics, ecology, and the environment (Chen et al. 2009).

In recent years, Turkey is actively promoting green economic-related computing work in order to advance the sustainable development as a nearly national warning and guide for decision making. However, due to scope of survey and completeness of data collection constraints, objective and comprehensive testing is still difficult in reflecting the status of development of the domestic green economy. This study attempted to apply the model of ecological economics and ecological footprint analysis to assess the value of environmentally sustainable development in Turkey. The method of the core concepts of ecological footprint is the land area as productivity and carrying capacity of the conversion of waste based on assessment of local residents to support a particular land area required (amount of resources); in the energy analysis, how much of the energy produced from renewable sources, how much of it produced from non-renewable sources and how much of the renewable sources produced from hydroelectric sources or the other renewable sources will be analyzed. Also, it will be analyzed to changes of energy use per capita and energy dependency.

2.Literature review

2.1.Ecological Footprint

While human handle and use earth, produce and apply technology and information, consume natural resources and meet the requirements of living; they followed by aggressive behavior towards nature without taking living space (ecosphere) into account Ecological destruction occurs as a result of the balance of ecosystem degradation. All living area of the planet is threatened. An ecological problem which is a quite complex structure and is realized in a long time has grown exponentially and has spread the whole planet with no end feature. Factors such as Industrialization, urbanization, political, economic and technological development increase ecological destruction and ecological problems are placed head of the agenda of modern societies. Ecological footprint is a product of ecological awareness-raising efforts to become aware of the destruction. This concept is firstly used by Dr. Mathis Wackernagel, Prof. William Rees et al. The scientists developed for the new calculation method and technique to measure the amount and productivity of pristine natural resources, to product solutions preventing the constantly destruction and consumption of nature. Ecological footprint uses corresponding biological productive land to estimate the resource consumption and waste absorption area of a specific population or economy.

Ecological footprint is a quantitative technique that shows the amount of biologically productive area is consumed all planet, the size of land and water areas is needed for waste disposal, how much biologically productive area is used by families or people and the number of planets is needed for future needs (Rapport, 2000).

While ecological footprint is calculated, two basic foundations are followed. Firstly, it is viewed in resources consumption and waste produced. Secondly, it is measured to the biologically productive areas required to product needs and disposal the waste.

Researches on ecological footprint provide awareness of the destructive and impoverishing effects of liberal economic policies rapidly depleting the planet's resources and forcing carrying capacity of the planet. In this respect, measurement of the ecological footprint is a new contribution to drawing attention efforts of the world's carrying capacity. The pressure of consumer society on the planet caused by global capitalism is a growing ecological footprint (ÖztunalıKayır, 2003). Population is the other factor which contributes to the ecological destruction like consumption. Since the ideas put forward by Thomas Malthus in 1798, it is drawn attention that the human population has increased far above the planet's carrying capacity (Rapport, 2000).

Calculation of ecological footprint itself is not a prediction model but what is used to assess the current status. Its designed function lies in providing ecological camera to photograph the utilization of nature by human beings (Rees, 2000). In terms of the world or a country, ecological footprint studies focus on comparing every country's consumption of ecological carrying capacity or analyzing the appropriation of ecological carrying capacity by trade; in terms of cities, ecological footprint is used to check the contrast to average national value or to assess sustainable strategies; in terms of household unit, calculation or simple questionnaire is used to investigate individual consumption, compare the impact of selection process and gradually increasing consumption items. Therefore, this study aims to find out the impact factors of Turkey's sustainable development through empirical analysis of ecological footprint in Turkey and based on this, to further provide a reference for working out the policies of Turkey's sustainable development.

3. Energy

Energy has a crucial role in achieving sustainable development objectives. Especially, the use of fossil-based fuels to meet energy needs of the communities leads to the important economic, environmental and social problems.

Energy creates a fundamental dilemma in terms of sustainable development. Despite the necessity of achieving socio-economic objectives of energy, particularly fossil-based energy systems is closely linked with environmental issues such as atmospheric pollution and climate change (Gururaja, 2003). There are many environmental problems arising from the use of energy, energy production and transformation. For example; 11 environmental concerns that energy plays an important role can be defined. These are major environmental accidents, water pollution, land use and spatial effects, marine pollution, radiation and radioactivity, solid waste disposal, hazardous air pollutants, air quality reduction, acid residues, the ozone layer and global climate change. While energy policy has largely taken into account economic factors in the 1970s and 1980s, clean fuels and energy technologies as well as to control the environmental impact through energy efficiency has increasingly attracted the interest during the last ten years (Rosen and Dinçer, 2001). The above-mentioned climate change is a global problem requiring global solutions. To address this problem, discussed issues differ from the developed and developing countries. Emphases on the fundamental issues in industrialized countries are energy efficiency and the transition to less polluting energy sources feature. In developing countries, energy is needed to increase economic growth for poverty reduction (Stigson, 1999). Energy is one of the most important

elements of a country to survive. Operation of factories, burning stoves in homes, the achievement of transport communications, in short, everything depends on energy to sustain life. An Energy problem adversely affects the functions of a country. A country's national security and welfare can be measured with the energy power. A country is not possible to defend itself without energy (Alniak, 2006).

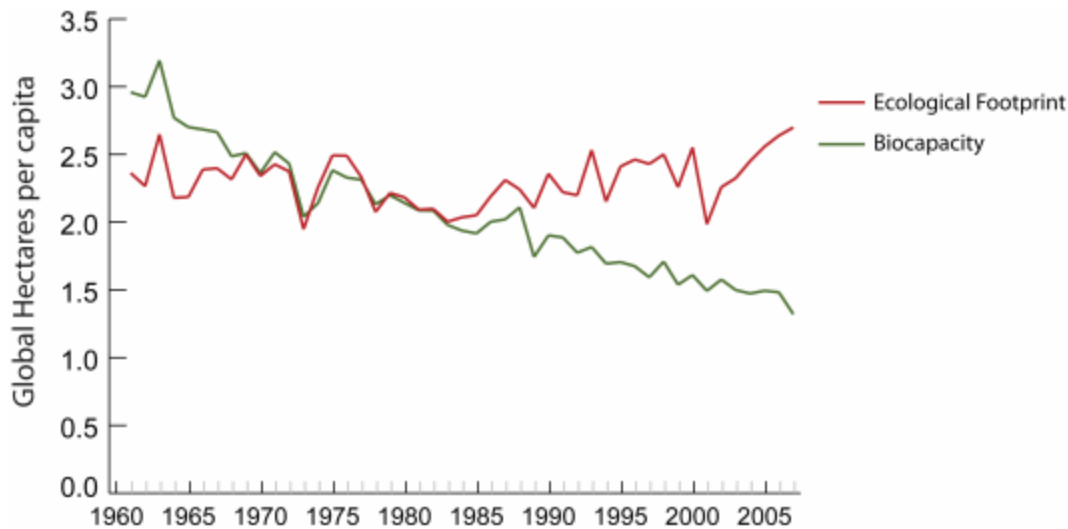
Supply of secure energy sources is necessary for the development of a society but it is not a sufficient factor. Moreover, sustainable development requires the supply of sustainable energy sources. Access to sustainable energy services is one of the necessary elements of sustainable development (Volpi, 2005). Fossil fuels (coal, oil and natural gas) are recognized as limited supply of energy resources. The sunlight, wind and water (hydro) powers are generally renewable and have been underlined that these powers are used for a long time. In addition, wastes converting to useful forms of energy and biomass fuel are seen as sustainable energy sources. Sustainable development also requires the efficient use of energy resources as possible (Dinçer and Rosen, 1999).

To achieve sustainable development, green energy play an important role in meeting energy needs in both industrial and domestic applications. Therefore, the purpose of sustainable development in a country, the development and use of green energy strategies and technologies should be given priority. Widespread use of green energy sources and technologies in both developing and developed countries are vital importance for the sustainability of energy sector and are among the key issues which should receive priority (Midilli et al., 2006). Therefore, in this study, we analyzed the energy data of the last ten years. As a result, how much of the energy generated from renewable sources will be examined. In addition, How much of the electricity generated from renewable hydroelectric sources is obtained and how much is from other renewable sources will be examined and their change over the years. Energy import rates will be analyzed to provide a significant contribution to sustainable development of Turkey will participate to develop green energy policies and strategies.

4. Analysis

4.1. Ecological Footprint Indicators Analysis

Wackernagel and Rees have seen mandatory calculation of ecological footprint to achieve sustainability; they published footprints of different countries in a report in 1997. In this report, 52 countries make up 80% of the world's total population were analyzed and some countries consumed higher amount of biological productive area than theirs. After this initial report, calculations of ecological footprints of countries are often renewed. Ecological footprint indicators of 152 countries have been measured so far by Global Footprint Network who pioneered ecological footprint studies. National and global calculations based on international scientific accepted organizations data such as United Nations (UN), Food and Agriculture Organization (FAO), United Nations Conference on Trade and Development (UNCTAD), World Resources Institute (WRI).



Source: www.footprintnetwork.org

Figure 1 tracks the per-person resource demand (Ecological Footprint) and resource supply (Biocapacity) in Turkey since 1961. Biocapacity varies each year with ecosystem management, agricultural practices (such as fertilizer use and irrigation), ecosystem degradation, and weather.

According to average footprint per capita and biocapacity graph of Turkey in 1961-2007 is published by Global Footprint Network Organization, it is seen that ecological footprint index has increased parallel to rapid economic growth. According to this graph, it is seen that the size of biocapacity of Turkey has decreased continuously since 1961. This decline seems to have accelerated in recent years with high economic growth. Looking at the figure, the years exceeded biocapacity coincide with the period of the neo-liberal policies gained momentum and started to change consumption habits (Akillı et al., 2008).

Calculation of ecological footprint index provides the chance to compare the many data of countries, individuals, cities, villages, businesses, institutions. For example; if the footprint size of the individual is below the national average, the individual does not constitute a pressure on natural resources; on the contrary, the individual is thought to consume natural values. In addition, comparing the footprint of each country to its own biological capacity is useful for back to see what remains. In the case of using much more natural resources as they have, the ecological deficit consists in terms of natural resources of countries. Conversely, if biological capacity of a country is more than the ecological footprint, it means that this country has ecological reserve. Looking at Graph 1, Turkey gives a continuous ecological deficit after 1980s. This deficit is increasing along with rapid industrialization in recent years. Ecological footprint index, biological capacity, ecological deficit or reserves of countries were published by Global Footprint Network Organization in 2002, 2005 and 2007 in terms of income levels and regions. According to these publications, the ecological footprint index of Turkey has increased to 2.7 from 2.0 between 2002 and 2007. In contrast, the amount of biocapacity has decreased from 1.4 to 1.3 global hectares. Ecological deficit being 0.6 in 2002 has increased to 1.4 global hectares. According to 2002 data, it required 2.2 global hectares productive land per person to survive. However, in the planet, it is predicted 1.8 global hectares productive land as the ecological footprint per capita. That is, 0.4 global hectares ecological deficit occurs in the entire world. According to calculations made in 2007, this deficit increased from 0.9 global hectares per person.

Table 1 Ecological Footprint, 2007 (Global Hectares)

	Population	Ecological footprint of consumption	Cropland footprint	Grazing footprint	Forest footprint	Fishing ground footprint	Carbon footprint	Built-up land
World	6671.6	2.7	0.59	0.21	0.29	0.11	1.44	0.06
High income countries	1031.4	6.1	1.02	0.23	0.70	0.26	3.78	0.11
Middle income countries	4323.3	2.0	0.54	0.15	0.20	0.11	0.88	0.07
Low income countries	1303.3	1.2	0.46	0.11	0.24	0.06	0.25	0.07
Turkey	73.0	2.7	0.96	0.08	0.29	0.06	1.24	0.07

Source: www.footprintnetwork.org

According to the data in Table 1, the size of ecological footprint per capita is proportional to levels of income of countries. Ecological footprint index is high in the countries with high income levels; it is low in the low income countries. Looking at the data of 2007 in table 1 and table 2, Turkey`s ecological footprint index is the same the world average ecological footprint but Turkey`s biocapacity size is lower than the world`s. According to table 2, all country groups classified income levels gives ecological deficit.

Table 2 Bio-capacity, 2007 (Global Hectares)

	Population	Cropland	Grazing Land	Forest	Fishing Ground	Built Land	Total Biocapacity	Ecological Deficit or Reserve
World	6671.6	0.59	0.23	0.74	0.16	0.06	1.8	0.9
High income countries	1031.4	0.99	0.29	1.19	0.49	0.11	3.1	3.0
Middle income countries	4323.3	0.53	0.22	0.76	0.13	0.07	1.7	0.2
Low income countries	1303.3	0.44	0.21	0.29	0.07	0.07	1.1	0.1
Turkey	73.0	0.77	0.12	0.32	0.05	0.05	1.3	1.4

Source: www.footprintnetwork.org

According to these data, the pressures of people on environment seem to be very clear. Abnormal nature events are the results of these pressures in recent years. We must give up some habits damaging nature for a livable world. It is necessary that policy makers make arrangements and decisions in this direction. For example; renewable energy resources should use for production energy to reduce carbon footprint index that has important share in ecological footprint index.

4.2. Energy analysis

To achieve environmentally sustainable development, instead of traditional fossil-based fuels, the use of alternative or renewable energy sources has brought. These green energy sources which consists of Water (hydro), solar, geothermal and solar energy don't damage

environment, so the required sub-structures are formed by many countries to use these sources. According to the last 10 years energy data of Turkey, there has been no change in the shares of renewable energy resources in total energy production. The share of hydroelectric sources in total electricity production was 24.7% in 2000; this figure was % 24.5 in 2010. Share of hydropower resources has increased 30.6% in 2004, then it entered downward trend and it realized 16.8% in 2008. And then it was starting to rise again and it was 24.5% in 2010.

When we looked at the energy data of the last 10 years, renewable energy sources excluding hydroelectric sources has very small share of total electricity production. While share of these sources in total electricity production was 0.2% in 2000, this rate rose to 1.9% in 2010. This rate didn't change much until 2006. This rate increased regularly to 1.9% level in 2006-2010. This rate is far behind comparing the EU and OECD countries' averages. Looking at the data of energy use per capita in recent years, we see an increase in parallel with economic growth. In 2001, energy use per person was 1091 kg oil. This figure increased 1441 kg oil in 2010.

Table 3 Energy Ratios of Turkey in 2000-2010

Year	Energy use per capita (kg oil)	Energy imports, net (% of energy use)	Electricity production of hydroelectric sources (% of total)	Electricity production From renewable sources, excluding hydroelectric sources(%of total)
2000	1200	66.1	24.7	0.2
2001	1091	65.3	19.6	0.3
2002	1134	67.5	26.0	0.2
2003	1173	69.7	25.1	0.2
2004	1203	70.2	30.6	0.2
2005	1238	71.6	24.4	0.1
2006	1347	71.7	25.1	0.2
2007	1429	72.7	18.7	0.3
2008	1389	70.6	16.8	0.6
2009	1359	69.0	18.5	1.1
2010	1441	71.1	24.5	1.9

Source: Worldbank database

Energy imports rates of Turkey showing energy dependency are increasing even more the last 10 years. While the ratio of energy imports was 66.1% in 2000, it increased by 71.1% in 2010. This rate was averagely 61% in EU and it was 30% in OECD countries in 2010. From these data, Turkey is a country of growing foreign-based. Turkey is a developing country based on non-renewable energy sources. In addition, rapid growth in recent years has grown energy needs; energy use per person has increased much more too. When it is considered this rapid increase and foreign energy dependency, Turkey has to invest in renewable energy sources. Turkey should change the development patterns.

5. Summary

According to ecological footprint data that explained in 2002 by global footprint network organization, Turkey's per capita footprint amount is calculated 2.0 global hectares, and bio-capacity amount 1.4. In 2002 Turkey's per capita ecological deficit was 0.6 global hectares. According to 2007 data, this deficit is explained as 1.4. With the rapid industrialization and urbanization in recent years, the damage to the environment has increased. The per capita energy used increased from 1200 kg oil to 1441 kg oil between 2000-2010. As an indicator of

dependence on foreign energy, imports rates increased from %66.1 to %71.1. The energy from hydroelectric sources which have the largest share of renewable sources declined to %24.5, but this decline is not significant. Although the energy produced from other renewable sources is not change significantly, there has been a steady increase since 2006.

The foregoing findings indicate that Turkey currently belongs to an economic development pattern of high resource consumption. The economic development is mainly established on the exploitation and utilization of nonrenewable resources. Therefore, Turkey should change the development pattern, regulate the industrial structure, promote the utilization rate of resources, reinforce the introduction of feedback energy, develop green pollution-free products, increase the added value of products, and enhance the sustainable development of ecological-economic system. The above analyses display that the fast development of Turkey economy is based on the over-exploitation of environmental resources.

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