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Renewable Energy Sources of Turkey and Assessment of Sustainability

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Abstract

Renewable technologies are considered as clean sources of energy and optimal use of these resources minimize environmental impacts, produce minimum secondary wastes and are sustainable based on current and future economic and social needs. Research and Development studies promise an optimistic future for the use of renewable energy sources. In our study renewable energy sources orderly; solar, biomass, geothermal, wind, or hydropower, are reviewed and most favorable one among them is given priority to increase its contribution to Turkey's electricity generation is examined by employing SWOT (Strength, Weakness, Opportunity, Threats) Analysis. These renewable energy sources(RES) are assessed with respect to selected criteria and sub-criteria that are determined as a result of a comprehensive literature survey by a group of experts who are mostly academicians and professionals working in public and private sector. As a result of this study, it is found that satisfaction of energy goals are given higher priority compared to satisfaction of environmental goals and all renewable energy sources are selected ,especially hydropower is more effective, useful as the most preferred renewable energy source to increase its contribution to Turkey's electricity generation.

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Keywords: Renewable Energy Sources; Electricity Generation; Sustainability; Assessment; SWOT Analysis

1. Introduction

Energy is the power and backbone of a society's development and generation of wealth. In the future, we must have a sustainable, affordable and environment friendly energy supply. Conventional fossil energy sources will be replaced by renewable sources, gradually. The negative aspect of import dependence of the energy resources led to

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the energy supply security threat concept and renewable sources are designated as the remedy for this threat. Recently, renewable energy resources (RER) have received growing attention all over the world. Since RER help in decreasing import based energy dependency, diversifying energy portfolios and contributing sustainable development, many countries began to seek ways to promote their RER and increase the share of renewable energy in their energy mixes. From the volatility of global oil prices to political instability of petroleum exporter countries , imbalances of international energy trade to environmental concerns, there are many factors forcing countries to promote RER. Parallel to these trends, Turkey's energy demand is increasing rapidly because of the growing rate of population, industrialization, technological improvements and development (NREL., 1997).

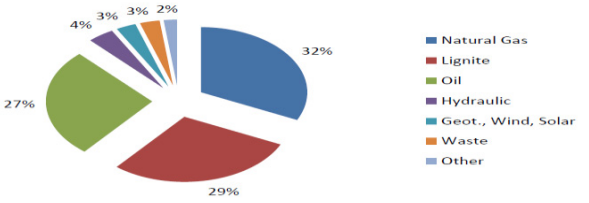


Fig. 1. Primary energy consumption by sources in 2012

To achieve sustainable development, Ministry of Energy and Natural Resources (ETKB) has set the following mission: ―Its our mission to ensure efficient, effective, safe, and environment-sensitive use of energy and natural resources in a way that reduces external dependency of our country, and makes the greatest contribution to our country's welfare (ETKB, 2010.) In supplying the increasing energy demand and maintaining environmental and economic objectives, development of renewable energy sources of the country is very important. The major renewable energy sources of Turkey are solar energy, biomass energy, geothermal energy, wind energy, and hydropower. These sources are utilized in many areas especially for heating purposes and generating electricity. In this study, evaluation of these renewable energy sources in terms of increasing their contribution in electricity generation is considered. Therefore, evaluation and planning of renewable energy sources for electricity generation will provide important guidance for achieving sustainable development (ETKB, 2010.Wind & ETKB, 2010 .Geothermal). Identification of the best renewable energy source to invest money is an important issue since this decision will affect future energy policies of the country (ETKB, Enerji, Geothermal & SolarEnergy, 2010). In order to evaluate the major renewable energy sources of Turkey, a survey is prepared based on literature review and send out to 120 experts who are academicians and professionals from public and private sector. These experts are selected by considering their experiences and previous studies on renewable energy sources, technologies, market conditions, and policies. A total of 40 surveys are collected back and evaluated.

In the survey study, experts are asked to evaluate renewable energy sources with respect to two main criteria; Energy Objectives and Environmental Objectives. An extended literature review is conducted and criteria used for Energy Objectives and Environmental Objectives are developed based on the literature review. Then experts' responses to the survey are evaluated using SWOT Analysis.

2. Renewable Energy Potential of Turkey

2.1. What is Renewable Energy?

IEA (2013) defines renewable energy as energy derived from natural processes (e.g. sunlight and wind) that are replenished at a faster rate than they are consumed (IEA, Executive Summary & FAQs, 2013).Similarly, U.S. Department of Energy states that renewable energy uses energy sources that are continually replenished by nature-the sun, the wind, water, the Earth's heat, and plants. Solar, wind, geothermal, hydro, and some forms of biomass are common sources of renewable energy(NREL, 1997 & NREL, 2001).

2.2. Renewable Energy Sources

Main renewable energy sources; solar, biomass, geothermal, wind, and hydropower are briefly explained here.

2.2.1. Solar Energy in Turkey

Being a natural source of energy, solar energy is the most popular one among other sources of renewable energy. Having a high potential for solar energy due to its geographical position, Turkey's average annual total sunshine duration is calculated as 2.640 hours (daily total is 7,2 hours), and average total radiation pressure as 1.311 kWh/m²-year (daily total is 3,6 kWh/m²). Solar cooking is the most direct and convenient application of solar energy (Wentzel & Pouris,2007). Solar energy has reasonably low energy density: Photo Voltaic (PV) modules require a large surface area for small amounts of energy generation (Panwar , Kaushik & Kothari ,2011). While varying considerably in terms of methodology, materials and level of technology used, solar energy technologies may be divided into two main groups : -Thermal Solar Technologies (TST) and Concentrating Solar Power (CSP): In these technologies, whereby solar energy is used to generate heat, heat can be used either directly or for generating electricity. CSP power plants use different mirror positions to generate electricity by converting solar energy into high temperature heat. Since they can be built at desired power ratings, they are typically used for powering signaling equipment, meeting rural electricity demand, etc.- Solar Cells: Semiconductors which are also called photovoltaic cells transform sunlight directly to electricity(Kaygusuz, & Sarı, A,2006b; Kaygusuz, Yuksek & Sari, 2007; Kaygusuz & Kaygusuz,2002).

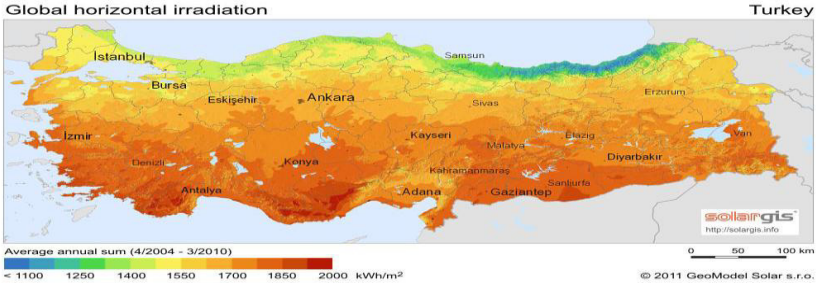


Fig. 2. Solar map of Turkey (SolarGIS, 2013).

At present, Turkey does not have an organized commercial and domestic photovoltaic (PV) programme, because the government has no intention in promoting PV technology with existing energy policies. On the other hand, there is a good potential for PV applications in the local market since the country is enormously suitable due to high rates of solar radiation and available land for PV applications(Cıcek , Ozturk & Ozek,2009)

2.2.2. Hydraulic Energy in Turkey

Among various sources of energy, hydroelectric power plants are somewhat preferred because they are environment-friendly and have a low potential risk. Hydroelectric power plants are an environment-friendly, clean, renewable, lasting and efficient domestic resource with low operational costs and no fuel cost, which is not externally dependent and also serve as a counter assurance for energy prices(IRENA.IEA,2013).

Turkey's technically feasible hydroelectric potential is 36.000 MW. Presently 150 hydroelectric power plants (HEPP) that are in operation correspond to an installed power of 13.830 MW and 38% of the total potential(NREL, 1997 & NREL. NREL, 2013). 16,77% of electricity generated in 2008 came from hydroelectric power plants. Recent draughts have substantially limited the contribution of hydroelectric power plants to electricity generation. With regard to recent energy data, due to the reasons like plant failures, maintenance/repair works, operational policy, draughts, etc. overall capacity utilization in energy generation is around 73%. Capacity utilization is 68% in thermal power plants, and 94% in hydroelectric power plants. Our country, Turkey aim at utilizing in electricity generation all hydroelectric potential that is technically and economically viable by the year 2023. The scope of New Energy Law no#.5346 on Renewable Energy Resources (YEK) has been expanded to include wave, stream and tidal energy, and all other sources for generating energy which are suitable for building canal or river type

hydroelectric power plants, or hydroelectric power plants with a reservoir area of less than 15 km² (Wentzel & Pouris ,2007; ETKB,2010).
Hydropower systems capture the energy in the moving (falling) water by hydro turbines. The rotating mechanical energy is then converted to electricity in order to meet the market demand, safely, cheaply and efficiently. Hydropower plants are configured in one of two ways. “River Type” projects use the natural flow of a river by diverting it into canals that lead into a power plant. In the second configuration, water is stored in a reservoir (dam) and sent to the power generation turbines as needed(Bhaskara, Sreenivasulu, Babu & Vijayanand ,2012; YEGM, 2012). The location of the hydroelectric power plants should be carefully planned in order to avoid possible threats to wildlife and plants; historical sites; agricultural areas; protection areas and similar locations of importance. Complete river basin management studies should be prepared and taken into consideration, instead of just rerouting water to the power turbines by collector pipes. The riverbed derivation (completely altering the course of a riverbed or combining with another riverbed) must be strictly controlled (TMMOB,2012; TMMOB,2013).

2.2.3. Wind Energy in Turkey

Wind is a renewable, free and indigenous energy source that has few environmental impacts and generates no pollution. Wind technology is being used around the world as an excellent means of electricity generation for serving growing energy needs. A wind turbine rotor (usually consisting of three blades) converts the wind’s kinetic energy into mechanical energy and a generator is used for the generation of the electricity for productive use(YEGM. 2012).
Wind electric turbines provide electricity for residential or business use or for use by grid electric utility companies. In fact, all of these side effects can be mitigated by correct planning activities and choices in location and size of the proper wind farm projects(Armstrong & John & Hamrin, 2000). With Turkey Wind Energy Potential Atlas (REPA), which was realized in 2007, it is calculated that our country has a minimum wind energy potential of 5.000 MW in regions with annual wind speed of 8,5 m/s and higher, and 48.000 MW with wind speed higher than 7,0 m/s (ETKB.2010).

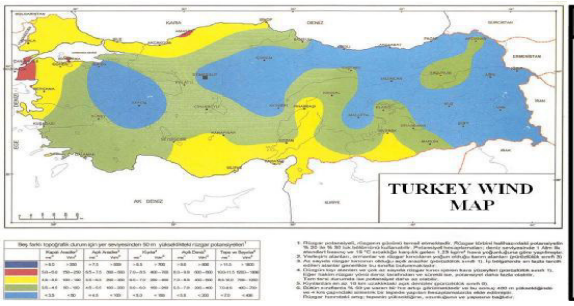


Fig. 3. Turkey Wind Map (TUREB)

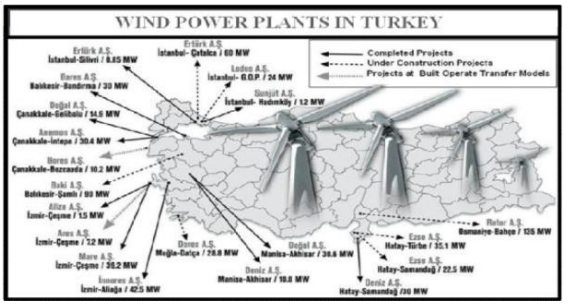


Fig. 4. Wind Power Plants in Turkey (Radikal,22.06.2008)

Turkey wind map is given in Fig 3. Fig 4 gives a review of completed and ongoing wind power plant projects in Turkey. Design and production of wind turbines have not yet been the subjects of serious planning legislation in Turkey. The Turkish industry is currently in a position of being a limited player in the manufacture of turbines and other components. The scale and cost of a wind farm will almost certainly require the involvement of private investment, with its inevitable demand for an attractive rate of return(Cıcek , Ozturk & Ozek, 2009; YEGM. 2012).

2.2.4. Geothermal Energy in Turkey

Geothermal technology utilizes recent developments in drilling technology and it is possible to establish systems at depths of up to 5km. In such systems, water is injected into the hot rock via one well, it is then superheated by the rock before being abstracted via another well. It is calculated that 99.9% of the earth’s mass is over 100 degrees centigrade and continuously generates hot water resources (Renewable Energy Association. Renewable Energy

Technologies. 2013). Improper location of power stations and improper drilling of hot steam wells might lead to release of hazardous materials like boron, arsenic, mercury and noble gases. There is also a risk of liquid depletion if the water is not pumped back to the well after usage(Bhaskara, Sreenivasulu, Babu & Vijayanand ,2012).

The first 5 world countries in geothermal heating and spa practices are China, Japan, USA, Iceland and Turkey (ETKB. 2010). Turkey is located on the Alpine-Himalayan organic belt, having one eighth of the world's geothermal potential. Turkey has 170 geothermal fields over 400 C temperature and around 1000 hot and mineralized natural self-flowing springs and they are located mainly on West, North-west and Central Anatolia. Electricity generation projections of Turkey are also 500MWe from Germencik, Kizildere, Tuzla and several of the other fields by the year 2010 and 1000MWe by 2020 (Cıcek , Ozturk & Ozek, 2009).

2.2.5. Bio Energy in Turkey

Bioenergy is generated from biofuels - organic materials such as trees, agricultural residues, animal wastes, grass, aquatic plants, and municipal waste. These fuels store energy captured from the sun during photosynthesis. Bioenergy technology extracts the energy stored in biofuels through direct combustion or by converting the fuel into charcoal, liquid, or gas (Armstrong, John & Hamrin. ,2000). Ideally, energy crops can grow on a marginal amount of land, grow without fertilizers or extensive maintenance, and protect the soil from erosion. However, there are examples of land-grabbing, where large amounts of agricultural lands are used for biofuel crops, decreasing the food output and fertility of soil (Renewable Energy Association. Renewable Energy Technologies. 2013). The amount of biogas that can be produced in Turkey, considering its animal waste potential, is reported as 1,5 to 2 MTEP (million tons equivalent of petroleum). While our waste potential is around 8,6 million tons equivalent of petroleum (TEP), 6 million TEP is used for heating. In 2007, the total amount energy obtained from biomass sources was 11 thousand TEP(ETKB. 2010) For heat and electricity production, there are existing projects, mainly using combustion. The land area to replace a significant portion of the electricity currently generated by coal limits the use of biomass. In case of biomass, the following links are clearly weak;

• Resource compatibility, • User support, • Needs assessment, • Using wastes for fuel may degrade soil quality.

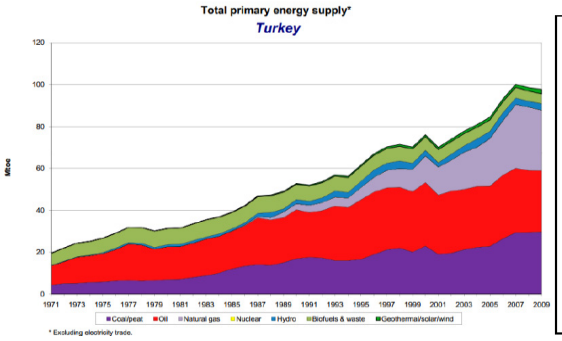
• Sugar plantations, sawmills, etc. often owned by rural elite. • Could results in competition between land uses for feed/fuel. It is difficult to collect large quantities of biomass wastes due to their disperse nature. The availability of some types of biomass is seasonal (IRENA,2013; YEGM. 2012).

3. Turkey's Current Situation in RE Usage and Installed Capacity

Turkey is presently in the initiating stage to experience the need for the transition from the fossil energy sources to the renewable sources, considering the compliance to the EU and world experiences. The value of these experiences is of great importance, because learning from these experiences saves time to effective implementation and make the successful conversion to the renewable energy sources. Turkey's current usage of renewable energy sources are at very low levels compared with other equivalent developing countries. In that sense Turkey, generally has less renewable resources. Turkey has to improve its renewable sources utilization rate in order to minimize the high import dependency for the fossil fuels. As seen in the hydro-electric projects, water related sources are being used in electricity generation since the 1950s. However; solar, wind, biogas, biomass and geothermal energy sources did not achieve the real resource utilization rate that they deserve (IRENA,2013). Along with the hydroelectric power plant projects, with the ever increasing demand for energy, like other countries, Turkey began to benefit from other energy sources like coal, oil and natural gas in the recent years (Fig 5). These types of energy sources were imported from abroad and creates additional budgetary costs and import dependencies. Turkey has become an energy importing country, supplying more than 50% of its energy demand from imported energy sources. Oil and Natural Gas have the largest share in importation(IRENA,2013 ; Istanbul Development Agency, 2012).

In the recent years Natural Gas has been introduced to Turkey's energy generation sum in order to distribute the imported energy sources in rather well balanced manner. (Kaygusuz & Bilgen, 2008b; Kaygusuz, Kamil, & Kaygusuz,2002). The import dependency of Turkey in the main fossil fuel types combined (petroleum, coal and natural gas) was never under 50% since 1991 (Fig.6). From 2004, upward the import dependence of Turkey is over 70%. From 2009, Turkey's import dependence for coal is decreasing from 90% downward and petroleum products import dependence is increasing over 90% as a result of the increase in the number of petroleum powered vehicles and fleet of

airplanes. Specifically, the use of natural gas has been remarkably increasing since the 1980s. At first, this consumption was in the form of household utility power (in ovens etc.)(Kaygusuz, 2004 ; Kaygusuz, 2006a).



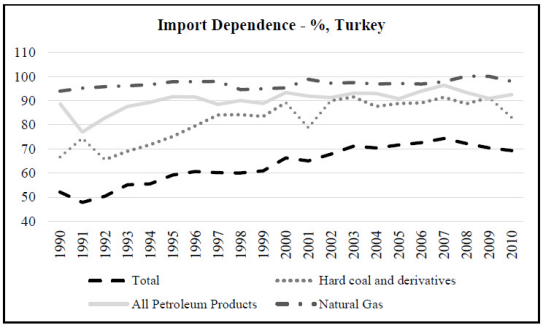


Fig.5. Turkey's Total energy supply by sources(International Energy Agency,2014) Fig 6.Turkey's Import Dependency Percentage by source and years, (Eurostat)

However, by the introduction of the new technology gas turbines, the natural gas became the major source of national electricity network (Fig 5). The 98% of the natural gas consumption is met by importation (Fig.6). This situation not only increases the amount spent on the imported fossil fuels, but also raises the level of greenhouse gases (mostly carbon dioxide) emissions of Turkey.

4. Literature Review- Renewable Energy Potential of Turkey

Financing of R&D projects are offered via national funds by State Planning Organization (DPT), TUBITAK-TEYDEB and research funds of universities. International co-operation is sought not only in terms of funds but also in terms of know how exchange. The Technology and Innovation Support Program (TEYDEB) of TUBITAK is a R&D assistance program for industrial companies. This includes a financial contribution by the Scientific and Technical Research Council of Turkey and by the Undersecretary of Foreign Trade for up to 60% of the total eligible cost incurred over the duration (up to 36 months) of an individual R&D project. In summary, Turkey has abundant renewable energy resources. Compared with the EU countries, in many areas, Turkey's capacity exceeds the EU countries (Global Energy Network Institute,2011).

Fig. 7. The Operational Wind Turbine Farms in Turkey, 2012

Renewable energy investments can be grouped into two customary methods in Turkey:

a. The renewable energy investments that are made due to the electricity production license permitted from Energy Market Regulatory Authority. These projects have commercial characteristics with the involvement of financial, technical and operational companies.

b. The same investments that do not require license from EPDK (Energy Market Regulation Council). These investments have a capacity limitation of 500kW, which is approximately equal to the consumption of 50-75 houses. These projects have a private or household, cooperative driven characteristics. Generally Turkish large commercial companies group together with foreign financial and technical groups to accomplish licenses (a.) type of wind farm projects. These kinds of investments are made with the most feasible and accessible locations which are located in

western Anatolia, as seen in (Fig. 7). The estimated economic potentials of Turkey's renewable energy sources and developed parts of these potentials in terms of electricity generation are given in Table 1.

Table 1. Potentials of Turkey's Renewable Energy Sources.

Renewable Energy Source	Economic Potential (billion kWh/year)	Current Installed Capacity (MW)	Share in Total Installed Capacity of Turkey (%)	References
Solar Energy	380	-	-	ETKB(2010)
Biomass	290	150	0.3	Karayılmazlar Et al.(2010), DSİ(2013)
Geothermal	1.4	160	0.3	(Cebeci,2005) DSİ(2013)
Wind Energy	50	2.200	4	(Cebeci,2005) DSİ(2013)
Hydropower	140	20.000	35	ETKB(2010), DSİ(2013)

According to many researchers, Turkey, in terms of renewable energy resources abundance is one of the richest countries in the world. Erdem (2010) argues that Turkey has the biggest potential in hydro, wind and geothermal energy among European countries. Biomass and solar energy also exist well enough in Turkey to promote its energy dependence reduction process. Excluding biomass, all other renewables can be regarded as supportive tools in sustainable development action of Turkey. Since hydro power is utilized relatively efficient manner compared to other new emerging renewable sources in Turkey and the debates on the overall impacts of biomass still exist and could not be concluded, the scope of the Turkish renewable energy sources in this study will be composed of three main RER which are wind, solar and geothermal energy(Erdem, 2010).

Michael Levi, another expert in The Wall Street Journal's article (2013), who is the director at Council of Foreign Relations in U.S., argues that there are three reasons to consider solar over other renewable energy supplies. The first reason is that solar power may benefit from improvements in materials, computing, and nanotechnology in ways other technologies may not benefit as effectively comparing to solar power can do. The second reason is that solar power has a growing potential, from rooftop generation to off-grid and micro-grid energy form in often sunny developing countries that lack of adequate infrastructure. In a recent study, Ogunlu (2012) stated in his research that Turkey is at the edge of deciding its pathway to reach its goal concerning utilization of renewable energy sources, especially with wind power. He investigated the project called Competitive Renewable Energy Zone (CREZ) in Texas which utilizes new transmission projects to transfer the wind power into electricity in an efficient manner(Ogunlu, 2012). The key principles that can help countries to achieve sustainable energy are phasing out fossil fuels as soon as possible, increasing energy efficiency, implementing clean, renewable solutions, and discarding dirty, unsustainable energy resources(EREC 2010, 2010a, 2010b & 2010c) . A sustainable world energy outlook report prepared by European Renewable Energy Council also highlights the significant role of renewable energy by supporting that renewable energy can contribute to sustainable economic growth, high quality jobs, technology developments, global competitiveness and industrial and research leadership (EREC 2010, 2010a, 2010b & 2010c ; ETKB. 2010).

5. SWOT Analysis of Renewable Energies for Sustainability Assessment of Renewable Energy in Turkey

The results of the renewable energy sources SWOT analysis that we've examined for whole scope of Turkey are as follows:

S: Strengths

-It is full transition zone between very rich natural gas and oil resources on east and very large consumer regions on west. In the same way it is also in the middle of the energy corridor between south and north.

-Turkey is governed by the rule of law. It has more democratic and secular nature unlike the other neighbouring countries sitting on top of oil and gas assets. Therefore it is attractive for energy supplying countries. Because Turkey is also a major importing country and plays a key role in connecting the energy supply lines into the Europe.

-The accumulation of contracting and engineering services sectors are a substantial advantage.

-Due to its geographical location Turkey has a large number of natural resources. In terms of geothermal resources it is among the top five countries in the world.

-The potential of solar energy power in Turkey is higher than the total potential of many European countries. In terms of its growth potential the electricity market is one of the most promising market in Europe.

W: Weaknesses

-Although there is a qualified part in the sector, most energy agencies in Turkey is ruled by incompetent **staff.** In addition to this discord and strife between institutions are at the level of chaos.

-BOTAS is taking high-interest loans to maintain its business due to metropolitan municipalities in Turkey that are not paying for natural gas. However these institutions should work with profit targets regardless of political accountability.

-The need of foreign companies with their expertise and experience owing to lack of many Turkish companies qualification in the sector of environmental technologies - Low efficiency in energy use compared to Europe.

-Low level of financial resources and appropriate credit opportunities for domestic entrepreneurs.

O: Opportunities

-The possibility of finding a high resource potential that can be used to new renewable energy technologies.

-Increasing demand for Turkey's environmental products and services sub-sectors such as waste management, water supply and management and air pollution control in consequence of economic growth, industrialization and urbanization.

-Due care on renewable energy to reduce Turkey's energy import.

-Significant investment opportunities in the renewable energy market.

T: Threats

-Dependence on foreign technology at hydroelectric and wind power equipment .

-Renewable energy sources in Turkey and in the world are belong to the public.

-The process of liberalisation and delay in private sector investments.

6 . Conclusion

With regard to diversification of energy resources, reduction of level of dependence upon foreign resources and to maintain the safe energy resources , the growth of renewable energy resources simultaneously and to increase the share of the renewable energy among other sources in Turkey, carries very important role. There are stil many steps that Turkey must take in terms of %100 compliance to the global renewable energy vision and to proceed with the attainment of the energy needs from renewable sources. These are;

-To improve competitive financial power of renewable energy resources.

-To maintain the growth of the renewable energy resources simultaneously.

-To ease the administrative processes to integrate the renewable energy resources into national grid.

-To remove the technical barriers in front of the electrical grid connections.

The incentives that are granted to generate the renewable energy resources, specially solar and wind power are reasonably lower than the relevant European countries in Turkey. Relevant economic analysis must be updated and greenhouse gas emissions must be taken into account in the light of the global petroleum price increase projections for sound evaluation of incentives on renewable energy resources stronger and encouraging legal initiatives must be taken toward efficient use of the renewable energy potential other than hydroelectrical power. On the other hand, existing legal requirements limits the permitted maximum established power potential. In consideration of Turkey's suitable geographic position with regard to diversity of renewable energy resources, relevant decision makers and industrial investors must take initiaves promptly to tackle that important matter , to realize low carbon industrial growth and to reduce the dependence on foreign countries in using petroleum, natural gas and coal resources. As the result of the mutual interviews with relevant energy experts, the outcome of the SWOT analysis classified and evaluated as existing legal requirements on renewable energy resources under 'policy' heading , market conditions and tendencies under 'market' heading, technological level under 'technology' and social responses under 'social dimension'. Relevant findings can be cited as follows;

-The relevant legal requirement in the renewable energy fields, named as RES ('YEK') is a precious opportunity as there are great expectations for creating reasonably high added value in energy sector.

- Main set backs in the issue; weakness in sectoral planning , insufficiency in technical infra structure and the lack of proper environmental legislation , such as 'any one who harms the environment will pay for the consequence.'

- However there is still hope that, existing malpractice will be corrected such as lack of clear definition in legislation for hybrid systems, offering similar price for all kind of electricity that are to be generated from all kind of

renewable sources regardless of their technological level,
- It is also expected that popularity and attractivity of renewable energy sources will be increased by granting reasonable incentives.
- Country's dependence on Premium energy sources such as petroleum.will be reduced and evidently national budget deficit will be lowered.
- It is regarded as a big opportunity for signing Kyoto protocol.
- Lack of efficient communication and co-ordination among relevant organizations lie as a weakness to be overcome.- Turkey has reached a growth level of % 220 in 2012-2013 years in investing wind energy field.
- Following the issue of most recent energy law NEL (YEK), existing established power of renewable energy sources has shown a ten-fold growth. -A big improvement in solar energy area is expected after relevant regulations completed in this area
- The worldwide emerged financial crises at the end of 2007 was prevented considerably against a probable energy crises in Turkey.
- While this crises in Turkey increasing investment appetite, licence applications to EMRC (EPDK) with the intent of producing electricity from wind energy was reached a level of record as 78000 MW.
- Investors are encouraged with purchase guarantee given by law along with resource reliability in particular wind, solar and geothermal energy.
- Specially the investors are encouraged with the source reliability and purchasing assurance by government that is outlined in the new energy law.
- Considerable increase in R&D incentives has resulted new hopes in investing in renewable energy sector.
- Apparent weak points in this field can be cited as insufficient qualified people, lack of energy technologies policy and semi developed R&D studies in comparison to developed countries.
- Especially wind energy barriers experienced in network and wind turbine supply bottlenecks experienced in the international market are perceived as a threat at renewable energies in general. When switched to energy farming rural development will be provided in addition with the increase of job opportunities in these regions a great social contribution will be done to prevent migration.
- Political instability is perceived as the only threat in the social dimension.
-When compared with a thermal plant with indirect effects on environment and society (social costs) renewable energy can be seen as an opportunity. Due to the extreme demand in today's world there are problems as well as supply of raw materials and production of some components. The present downturn significantly affects the prices of products. This difficulties affects investments in our country and this situation causes delays in construction of licensed power plants.
The establishment of sources of renewable energy inclusive economy based on energy sources - hydrogen at a national or global level is a gigantic endeavour that requires vision, commitment and technical parts. Such an endavour would have a tremendous socioeconomic impact and would be much easier to accomplish on a smaller scale. The choice of conventional energy is often limited and their cost may be several times higher than the renewable energy. For the future study, The establishment of a renewable energy island(region) will be environmentally sensitive could be favourite tourist destination and most importantly could have plenty of clean, renewable energy sources in the form of wind, solar, geothermal, waves, ocean currents and ocean thermal gradients. These must be used to generate electricity. This region could have the following goals: -Providing organizational and technical assistance for starting these kinds of projects.-Linking users, local governments, suppliers, financiers and suppliers. -Popularizing sources of renewable energy.

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