The Attitude of Developed and Developing Countries Towards the Kyoto Protocol and the Case of Turkey

Damla Ayhan
Istanbul Kultur University, Istanbul, Turkey

The problem of global climate change is one of the biggest present-day global problems. This problem, which has become a current issue because of the energy crisis that happened in 1970s, as well as growing awareness of environment, have not only changed the notion of development but also led to a transformation of non-renewable energy resources. Due to rapid population growth, the depletion of the non-renewable energy resources and the raising consciousness about global climate change our comprehension of traditional development has yielded to sustainable development, while energy structure and preferences have also changed from non-renewable energy resources to renewable energy resources. As this changed pattern and problem are global, they have removed the borders among governments, required international cooperation and thus, new international actors have stepped in.

In this study, the countries are divided into two parts as developed countries and developing countries. As developed countries; USA and EU countries are selected while China and India are selected as developing countries. Also as a developing country, Turkey’s energy and climate policies, attitude towards the Kyoto Protocol signed within the scope of United Nations and the positive and the negative effects of the Protocol on the country are investigated. In this sense, it has been observed that the question of whether or not the Protocol contributes to the economy of developing countries correlates with whether or not these countries are on the side of the Protocol and it has also been observed that being on the side of the Protocol is not a threat to Turkey’s development. If applied correctly, the policies that Turkey will pursue within the scope of the Protocol will help the country to reduce foreign energy dependency and cooperate with other countries. A comparative method is used in this paper.

Keywords: energy policy, environment policy, renewable energy resources, non-renewable energy resources, Kyoto Protocol, Turkey

A New Period in Global Climate Change: Kyoto Protocol

The Kyoto Protocol is the most comprehensive agreement prepared within the context of the fight against climate change. Following the United Nations Framework Convention on Climate Change (UNFCCC)’s entering into force, it was prepared as a result of 2.5 years of ongoing negotiations and opened for signature in 1997. However, it was not implemented instantly.

The main objective of the Protocol is defined as “achieving to stop atmospheric greenhouse gas concentrations in the atmosphere, dangerous anthropogenic effect on system of climate at a level that will
THE ATTITUDE OF DEVELOPED AND DEVELOPING COUNTRIES

prevent" (UNFCCC, 2003). How the protocol would work in practice was determined in 1998 in the Fourth Conference of the Parties.

The Kyoto Protocol, which is a document supporting and strengthening the UNFCCC, has the same objectives and foundations as the agreement. To become a party to the Protocol, it is also required to be a party to the UNFCCC. According to Article 3 of the Kyoto Protocol:

> The Parties included in UNFCCC Annex I shall, individually or jointly, ensure that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A do not exceed their assigned amounts, calculated pursuant to their quantified emission limitation and reduction commitments inscribed in Annex B and in accordance with the provisions of this Article, with a view to reducing their overall emissions of such gases by at least 5% below 1990 levels in the commitment period 2008 to 2012. (REC, 2006, p. 36)

According to the Protocol, in addition to the obligations determined for Annex-I countries, countries on the list of the UNFCCC’s Annex-II developed members of the Organization for Economic Cooperation and Development (OECD) will also provide developing countries with financial and technological support in the efforts of greenhouse gas reduction.

According to Article 25 of the Kyoto Protocol, the Protocol’s accomplishment is possible only if:

> This Protocol shall enter into force on the ninetieth day after the date on which not less than 55 Parties to the Convention, incorporating Parties included in Annex I which accounted in total for at least 55 per cent of the total carbon dioxide emissions for 1990 of the Parties included in Annex I, have deposited their instruments of ratification, acceptance, approval or accession. (REC, 2006, p. 49)

The Kyoto Protocol entered into force with the signature of Iceland on May 23, 2002, when the condition of 55 countries was achieved and on November 18, 2004 with Russia’s participation in the Protocol, a proportion of 55% was achieved, and Protocol entered into force with the approval of 156 states and the EU on February 16, 2005.

The Kyoto Protocol has two Annexes: Annex-A and Annex-B. Annex-A lists six greenhouse gases. For the period of 2008-2012 states on the FCCC Annex-I list are obliged to decrease their total emissions of CO₂, CH₄, and N₂O to 5% below 1990 levels. In addition, these countries are obliged to decrease their total emissions of HFC, PFC, and SF₆’s gases to 5% below 1995 levels.

Annex-B of the Protocol also shows the numerical target of emission reduction for the party states on the FCCC list based on the year 1990 compared to this year. Accordingly, the target determined for each state is different.

All of the parties of the Convention are obliged to fulfill the obligations related to climate change. Therefore, each state will prepare an inventory related to their greenhouse gas emissions and present a report of “National Notification” including the activities realized related to the implementation of the Convention.

Mechanisms aim to make parties’ enterprises for reducing emissions active by ensuring the opportunity to realize them in different states at a lower cost. In this way, on the one hand developed countries will achieve their goals at a lower cost and on the other hand developing countries will get rid of the burden on their shoulders.

**Attitude of Developing Countries Towards the Kyoto Protocol**

The primary objective for developing countries is economic development. Though high increases in greenhouse gas emissions have occurred in these countries in recent years, taking precautions against climate
change is not among their priorities. Development projects and the fight against poverty come before the problems of climate change and reducing emissions. Accordingly, developing countries do not care about whether the Kyoto Protocol will contribute to their economic development. It is necessary to develop strategies to ensure both the adaptation of these countries to the Kyoto Protocol and economic development to speed up the participation of developing countries in climate change conventions of climate change.

There is no limitation in greenhouse gas emissions for developing countries in the Kyoto Protocol. However, because of the rapid economic growth of countries like India and China, the level of their emissions has reached serious proportions. Although India and China have approved the Protocol, they are not under any obligations as they are not taken as developed countries yet. It would not be wrong to say that these countries have approved the Protocol to direct the process after 2012 and to benefit from flexibility mechanisms.

**Attitude of India Towards the Kyoto Protocol**

Although India approved the Kyoto Protocol on August 26, 2002, due to having developing non-annex-I country status, it was not put under any obligation. However, as of November 30, 2012, with its 959 registered projects it is the second country following China that has made considerable use of Clean Development Mechanism (CDM). This amount forms 18.6% of global projects. Projects which have the greatest share are biomass and wind power projects (see Figure 1). With these projects it is aimed to decrease the average annual 76,605 tons of CO₂ emissions (IGES, 2013).

The most important property of CDM projects in India is the great share (83.5%) of “unilateral” CDM projects developed by Indian shareholders, without the direct participation of Annex-I countries. Project developers in India take the responsibility for the projects, transaction costs, and project risks. Therefore, loan prices offered by unilateral CDM projects are higher than bilateral CDM projects or multilateral CDM projects.

![Figure 1. Distribution of India’s registered CDM projects as of May 31, 2012. Source: IGES, 2013.](image)

For the contract that would replace the Protocol upon the expiration of the Kyoto Protocol in 2012, the country wants sanctions to be increased especially on developed countries in order for them to act within the scope of the CCFC and decrease greenhouse gas emissions.
Attitude of China Towards the Kyoto Protocol

China signed the Kyoto Protocol on May 29, 1998, and approved it on August 30, 2002. However, the country did not make a precise and concrete commitment to decreasing greenhouse gas emissions after the Protocol. In addition to this, China considers global climate change quite seriously compared to India and makes great effort to follow policies that would enable the usage of renewable energy and increases in energy efficiency.

With its 2,676 registered projects as of November 1, 2012, China is the country that makes use of CDM at the utmost level (IGES, 2012). Projects which have the greatest share within China’s projects are hydropower and wind-power (see Figure 2).

China has conflicts with developed countries, primarily with the USA, in terms of the Kyoto Protocol. The main reason for these conflicts is that China does not want to make a precise and concrete commitment to decreasing greenhouse gas emissions according to the Kyoto Protocol. However, although the country has avoided making a concrete commitment, China tries to do its part with investments in the field of renewable energy and energy conservation projects and within the scope of the global climate change problem as the leading user of CDM. In the “National Climate Change Program” which was prepared in June 2007, China made a commitment to fulfilling its responsibilities according to the Kyoto Protocol on the condition that it would be pioneered and supported financially and technologically by developed countries (China’s National Climate Change Programme, 2007).

Attitude of Developed Countries Towards the Kyoto Protocol

The Kyoto Protocol sees developed countries as having the main responsibility for the increase in greenhouse gas emissions to date. Accordingly, these countries are asked to adapt to the policies for preventing climate change and reducing emissions. However, among developed countries such as especially the USA, China, and India of whose greenhouse gas emissions are very high, there is objection to the decision not to limit gas emissions and they blame the developing countries as much as the developed ones. Therefore, the Kyoto
Protocol causes a conflict between developed and developing countries.

**Attitude of the USA Towards the Kyoto Protocol**

It would not be wrong to summarize the attitude of the USA towards the Kyoto Protocol generally as “fight against global climate change as long as it does not conflict with national interests”. The economic and political power of the USA is apparent. Therefore, decisions taken and policies applied would be in vain in the international arena without this country.

The USA is the country which has most resisted the Kyoto Protocol. In this context the USA has had conflict with developing countries and primarily with China in particular. Conflicts between the USA and China about decreasing greenhouse gas started at COP4. At this meeting the USA demanded decreases in greenhouse emissions from developing countries as well, but China turned this demand down stating they would use development rights and did not want make decreases. Similarly, the USA had a similar conflict with the EU at COP6 and demanded to use flexibility mechanisms—primarily ETM-limitlessly. The EU stated that these mechanisms should be used in addition while decreasing emission rates; the main thing to do is to make emissions decrease with national action plans.

Without making considerable changes in policies and growth, the USA wanted to fulfill the obligation only through flexibility mechanisms and carbon sinks (Karakaya & Özçağ, 2003). Right after the inability to arrive at any agreement about these issues at COP6 on the grounds that developing countries such as China and India did not fulfill obligations to fight climate change and this obligation was only charged to developed countries, the US President George W. Bush emphasized that they would not decrease emissions until developing countries did so and then withdrew from the Kyoto Protocol in March 2001.

Conflicts on emission decreases still continue between the USA and developing countries. This conflict could not be concluded at the Copenhagen Meeting which was the last Conference of Parties and the USA, whose emissions per capita are at the utmost level, did not abandon their economic interest in the name of “national interest”.

**Attitude of the EU Towards the Kyoto Protocol**

With their release target which was determined by themselves in the Luxembourg Environment and Energy Council in 1990 long before the inurement of the CCFC, the EU took earlier steps in international efforts. Moreover, the EU also emphasized in the process of CCFC that climate change is a global problem, therefore all countries, but primarily developed ones, should fulfill concrete obligations. The EU became a party in the Contract with the inurement of the CCFC on March 21, 1994.

Before the World Summit on Sustainable Development which was held in Johannesburg during August 26-September 4, 2002, the EU required its 15 members to complete the Kyoto Protocol approval process. All the member nations completed the approval process on May 31, 2002 and the EU declared that they had approved the Protocol.

In the 2008-2012 period the obligation of the EU in the Kyoto Protocol was to decrease releases including the six greenhouse gases mentioned in the Contract to 8% below 1990 levels. However, to preserve the common target of an 8% release reduction, obligations were shared among member nations according to “EU Burden Sharing” by considering economic size and releases per capita and therefore, a different emission target was determined for each member nation. Total proportional shares of greenhouse reduction targets of EU nations are presented in Table 1.
### Table 1

**CO₂ Emission Reduction Obligations (%) of EU Member Nations Within the Scope of the Kyoto Protocol According to “Burden Sharing”**

| EU-27         | 2008-2012 period targets (%) |
|---------------|------------------------------|
| Germany       | -21                          |
| Austria       | -13                          |
| Belgium       | -7                           |
| Bulgaria      | -8                           |
| Czech Rep.    | -8                           |
| Denmark       | -21                          |
| Estonia       | -8                           |
| Finland       | 0                            |
| France        | 0                            |
| South Cyprus* | -                            |
| Netherlands   | -6                           |
| England       | -12.5                        |
| Ireland       | +13                          |
| Spain         | +15                          |
| Sweden        | +4                           |
| Italy         | -6.5                         |
| Latvia        | -8                           |
| Lithuania     | -8                           |
| Luxemburg     | -28                          |
| Hungary       | -6                           |
| Malta*        | -                            |
| Poland        | -6                           |
| Portuguese    | +27                          |
| Romania       | -8                           |
| Slovenia      | -8                           |
| Slovak Rep.   | -8                           |
| Greece        | +25                          |

*Non-Annex I countries which do not have emission reduction targets. Source: Lea, 2005.

At the end of 2010, 27 EU member nations were able to decrease their common emissions to below 15.5% of the 1990 base year. This fact shows that the EU has taken firm steps towards the targets determined within the scope of the Kyoto Protocol (European Commission, 2012).

Adopting specific targets in order to decrease emissions long before participating in the CCFC enabled the EU to attain quite a powerful position in international negotiations. In the Kyoto Protocol process the EU defended that climate change is a global problem, therefore all countries, but primarily developed ones, should fulfill concrete obligations. In this sense, the EU has been a model and leader for other developed countries. The EU is regarded as the only power that would realize the Protocol especially after the withdrawal of the USA from the Kyoto Protocol in 2001.

**Turkey’s Attitude Towards Energy-Environment Policies, Climate Change and the Kyoto Protocol**

Turkey has a significant role in the subject of energy due to its geographic location. It is in the position of a transition area between the EU and the Middle East and Caucasus where energy resources are located.
It meets its need for energy 27% from oil, 34.6% from natural gas, 27.4% from coal, and 10% from renewable energy resources (BP Statistical Review of World Energy, 2012). As of the end of the 2010, Turkey’s total primary energy production is 32.5 million TEP, total primary energy consumption is 83.4 million TEP and importation is 87.4 million TEP. Oil accounts for 42% of this import amount, natural gas accounts for 40% and pit coal, coking coal, and petro coke account for 18% (Ministry of Energy and Natural Resources, 2012). In terms of energy reserves and capacity, the country is richer with respect to renewable energy resources than non-renewable energy resources.

**Turkey’s Non-renewable Energy Resources**

Turkey’s non-renewable energy resources are oil, natural gas, and coal. It is not a rich country in terms of oil reserves. However, there are exploration activities performed by the Turkish Petroleum Corporation (TPC) which is Turkey’s national oil company.

In addition to the TPC, there have been 44 companies performing research and exploration both in the sea and on the land since the end of 2011. Twenty four of them are domestic companies, the other 20 are foreign companies.

Although there have been many discussions about the number of oil reserves in Turkey, according to data from the Turkish Republic General Directorate of Petroleum Affairs, the proved, probable and possible oil reserve is 1.03 billion tons, recoverable oil is 183.4 million tons and cumulative production is 137.9 million tons (GDPA, 2011c). Turkey’s average petrol production from 1999 to 2011 was 2.5 million tons per year (GDPA, 2011a).

As it can be seen in Table 2, though there are slight increases and decreases in Turkey’s petroleum production, it has ranged between 2.1 and 2.9 million tons since 1999. Petroleum consumption has been 32 million tons since the end of the 2011 and this rate increased by 5% compared to 2010 (BP Statistical Review of World Energy, 2012). One of the most prominent reasons for this is a rapid increase in the cost of petroleum. Turkey makes up a small portion of the world’s oil consumption (0.8%).

Table 2

| Years | Production (million ton) | Consumption (million ton) |
|-------|--------------------------|---------------------------|
| 1999  | 2.9                      | 29.5                      |
| 2000  | 2.7                      | 31.1                      |
| 2001  | 2.6                      | 29.7                      |
| 2002  | 2.4                      | 30.5                      |
| 2003  | 2.4                      | 30.5                      |
| 2004  | 2.3                      | 30.8                      |
| 2005  | 2.3                      | 30.9                      |
| 2006  | 2.2                      | 32.7                      |
| 2007  | 2.1                      | 33.5                      |
| 2008  | 2.2                      | 31.9                      |
| 2009  | 2.4                      | 31.6                      |
| 2010  | 2.5                      | 30.2                      |
| 2011  | 2.4                      | 32                        |

*Note:* Source: The table is constituted by the author from the sources of GDPA (2011a) and BP Statistical Review of World Energy (2012).
Turkey’s petroleum importation is mainly from Saudi Arabia, Iran, Libya, the Russian Federation, Kazakhstan, and Syria. Total importation was 22.2 million tons between January 2012 and September 2012 (TREMRA, 2012). As production is very low, Turkey’s exportation is performed with one time agreements at very low levels and it is not consistent.

As it can be seen in Table 2, Turkey’s petroleum consumption is 13 times higher than its production. This makes the country dependent on petroleum. In addition to this, 57% of the companies that implement petroleum prospecting and exploitation are foreign which obviously shows the position of Turkey in the petroleum industry.

According to GDPA data in 2011, after Turkey’s cumulative production, the fact that the remaining recoverable oil reserve is 45.4 million tons is one of the indicators of the necessity for Turkey to steer towards renewable energy resources.

Turkey is also quite poor in natural gas as it is in oil reserves. “Use of Natural Gas in Turkey was started with the use of natural gas explored in the fields of natural gas areas, Hamitabat and Kumrular, in 1970 in cement factories in 1976” (TREMRA, 2011). Then use of natural gas was popularized to prevent air pollution and to meet the energy demand. Contracts were signed which are still valid today with the Russian Federation, Algeria, Nigeria, Iran, Turkmenistan, and Azerbaijan, respectively.

By the end of 2011 the country’s proved, probable and possible natural gas reserve was 25.5 billion m³, its recoverable natural gas was 20 billion m³, cumulative production was 12.8 billion m³ and the remaining recoverable gas was 7.2 billion m³ (GDPA, 2011b). Natural gas production between the years 1999-2011 was 700 billion m³ on average.

From 1999 to 2011 Turkey’s consumption of natural gas increased from 12.4 million tons to 45.7 million tons, showing a 170% increase. Turkey makes up 1.4% of the world’s natural gas consumption (BP Statistical Review of World Energy, 2012). Since 2009, 90% of natural gas consumption has been met by the main supplier of the market, the Petroleum Pipeline Corporation. The rest of it is met by six companies with licenses for wholesale trade, four of which are foreign companies and the other two are domestic.

Table 3

| Years | Production (million m³) | Consumption (billion m³) |
|-------|-------------------------|--------------------------|
| 1999  | 731.1                   | 12.4                     |
| 2000  | 639.2                   | 14.6                     |
| 2001  | 311.6                   | 16                       |
| 2002  | 378.4                   | 17.4                     |
| 2003  | 560.6                   | 20.9                     |
| 2004  | 707                     | 22.1                     |
| 2005  | 896.4                   | 26.9                     |
| 2006  | 906.6                   | 30.5                     |
| 2007  | 893.1                   | 35.1                     |
| 2008  | 1,013.9                 | 37.5                     |
| 2009  | 729.4                   | 35.7                     |
| 2010  | 726                     | 39                       |
| 2011  | 793.4                   | 45.7                     |

*Note. Source: The table is constituted by the author from the sources of GDPA (2011a) and BP Statistical Review of World Energy (2012).*
The status of natural gas is worse than that of oil in Turkey. Although the country’s remaining recoverable natural gas reserve is 7.2 billion m³, our annual consumption is 45.7 billion m³. Accordingly, even the consumption of its reserve is far from meeting the demand for consumption in any way. Natural gas production is just the one—forty four of its consumption so the country is highly foreign dependent (98%). Natural gas is mainly imported from the Russian Federation (58%), Iran (19%), Azerbaijan (9%), Algeria (9%), and Nigeria (3%). Turkey’s total imports by the end of 2011 were 43.9 billion m³. Turkey exports small amounts to Greece as a result of the completion of Turkey-Greece Pipeline. 2011 exportation figures were 714 cm³ (TREMRA, 2011).

Turkey can be regarded as being at moderate levels in world-ranking in terms of brown coal reserves and production, and at the lower end for pit coal. Six percent of the world’s total brown coal reserves are in our country. Brown coal reserves are spread throughout the country, the total reserve is 11.8 billion tons. Pit coal reserves are mostly in the area of Zonguldak and the total reserve is 1.3 billion tons (General Directorate of Turkish Coal, 2011). The Electricity Generation Company owns 41% of the rights to the brown coal reserves, the General Directorate of Mineral Research and Exploration owns 23%, the General Directorate of Turkish Coal owns 22% and the rest of it belongs to the private sector. Most of the brown coal reserves were explored in 1976-1990; there has not been comprehensive research since these years.

Although Turkey is a rich country in terms of coal reserves, production still does not meet the demand. According to Table 4, total coal production is 72.2 million tons, while consumption had reached 94.8 million tons by the end of 2010.

Table 4

| Years | Production (million ton) | Consumption (million ton) |
|-------|-------------------------|--------------------------|
|       | Pit coal | Brown coal | Total | Pit coal | Brown coal | Total |
| 1999  | 2        | 65.1       | 67.1  | 11.4     | 64         | 75.4   |
| 2000  | 2.4      | 60.9       | 63.3  | 15.5     | 64.4       | 79.9   |
| 2001  | 2.5      | 59.6       | 62.1  | 11.2     | 61         | 72.2   |
| 2002  | 2.3      | 51.7       | 54    | 13.8     | 52         | 65.8   |
| 2003  | 2.1      | 46.2       | 48.3  | 17.5     | 46.1       | 63.6   |
| 2004  | 1.9      | 43.7       | 45.6  | 18.9     | 44.8       | 63.7   |
| 2005  | 2.2      | 57.7       | 59.9  | 19.4     | 56.6       | 76     |
| 2006  | 2.3      | 61.5       | 63.8  | 22.8     | 60.2       | 83     |
| 2007  | 2.5      | 72.1       | 74.6  | 25.4     | 72.3       | 97.7   |
| 2008  | 2.6      | 76.2       | 78.8  | 22.7     | 75.3       | 98     |
| 2009  | 2.9      | 75.6       | 78.5  | 23.7     | 75.6       | 99.3   |
| 2010  | 2.5      | 69.7       | 72.2  | 25.6     | 69.2       | 94.8   |

Note. Source: Ministry of Energy and Natural Resources, 2012.

Turkey is a rich country in terms of coal reserves and these reserves are expected to increase. The cost of coal production is lower than the production of other resources and this is important as it ensures the supply of energy security. However, as it is the source of energy which pollutes the environment and air the most, it requires clean energy technologies while it is used.

As a result, Turkey is highly dependent on foreign countries for oil and natural gas. Oil reserves are enough for 1.5 years at most, and natural gas resources cannot meet the consumption. In terms of import-dependence on non-renewable sources, although there is less dependence on coal which contributes to
climate change if the current policies are continued, its use will cause problems in the long-term.

Because Turkey is highly dependent on importation, leaving non-renewable resources aside completely and making use of renewable resources would not be a realistic solution to all these problems. Aside from oil, the situation of natural gas and coal is revealed by taking their present states into consideration. In Turkey the dominant view since 1980 in energy politics has been that domestic energy resources are not enough; even if all of the resources are used, the energy shortage will not be met. However, this view, which ignores domestic resources, is one of the main reasons for the energy shortage (Pamir, 2003).

Turkey’s rate of meeting domestic energy consumption is 36%. In other words, Turkey meets 64% of its energy need from imported resources. If the current policies are continued and Turkey is considered to be a developing country, these statistics will increase rapidly in the coming years.

As a country which pays a premium for oil and natural gas, Turkey should reduce its dependence on these two resources, should start and speed up coal exploration which was stopped 40 years ago and should develop and popularize the use of clean technologies for coal. Beyond all of these, Turkey should reduce its dependence on natural gas, almost all of which is currently imported. Accordingly, Turkey should reduce its use of natural gas for electricity generation which is 67%, oil of which 90% is imported and its proportion in transportation which is 52%.

This state of non-renewable energy resources and the transformation towards renewable energy resources requires the improvement of Turkey’s non-renewable energy resources, the clear determination of its potential for energy, and the necessary steps should also be taken without losing any time in this matter.

**Turkey’s Renewable Energy Resources**

Turkey is a rich country in terms of renewable and clean energy resources. Turkey’s renewable energy resources are hydroelectric energy, geothermal energy, bioenergy, solar, and wind power.

Turkey’s gross potential is 433 billion kWh, its technical potential is 216 billion kWh, and although there is no consensus, its economic potential in terms of detected technical and economic hydroelectric energy potential is 129.9 billion kWh.

In total 772 hydroelectric plants make up on average 129.9 billion kWh of energy generation, 142 of them are in service, 41 of them are at the construction level, and 589 of them are at project level (GDEPRS, 2011b). Moreover, hydroelectric plants with capacity of 5,000 MW have started to be constructed and are planned to be completed by 2013.

Forty five point nine billion kWh of Turkey’s total energy potential which is 129.9 billion kWh per year, in other words, one third, is currently being used. If its share in total primary energy consumption is considered to be just 8.7%, plants at construction level should start to be in service and the necessity of making the most of these resources for the sake of the country emerges.

Geothermal energy is thermal energy generated and stored in the Earth. Geothermal energy can be used to generate electricity, to heat, in heat pumps, spas, fishing farms, greenhouse cultivation and industry but in Turkey it is used just for generating electricity and for heating. The country is the fifth largest country in the world in applications of non-geothermal electricity.

Turkey’s total potential for probable geothermal resources in electricity is 2,000 Megawatts electric (Mwe), and for thermal it is 31,500 MWt. The elucidated capacity in electricity is 93 MWe, and for thermal it is 4,000 MWt (O. Mertoğlu, M. Mertoğlu, & Bakır, 2006). Turkey is the 10th country with 31,500 MWts energy
potential.

Since May 2009 Turkey has used 77.2 MWe of the total capacity of electricity which is 93 MWe in four geothermal areas in total. On the condition that Turkey uses all of its potential for geothermal energy, it will ensure a net income of 6.8 billion dollars and its natural gas importation is expected to decrease one billion m³ per year (GDEPRS, 2011a). Accordingly, geothermal resources should be in service as soon as possible both for generating electricity and for heating.

When solar power is examined, if a part of the Eastern Black Sea Region is excluded, it is technically and economically possible to make use of solar power countrywide. In total, Turkey’s solar power has reached 10,000 times the electricity power of 1997. According to studies by the General Directorate of Meteorology between the years of 1966 and 1982, Turkey’s average sunshine duration per year is 2,640 hours. It is 7.3 hours per a day on average. However, later some of the measurements made by the Electrical Power Resources Survey and Development Administration showed that these studies were performed with low values and do not reflect the genuine potential (Akova, 2008). Turkey has significant potential for solar power, if the necessary investment is made. On average 1,500 kWh solar energy can be produced from a square meter.

Turkey’s best solar energy fields are the Southeastern Anatolia Region, the Mediterranean Region, the Eastern Anatolia Region, the Central Anatolia Region, and the Black Sea Region, respectively. Furthermore, the month in which the most solar energy can be generated is July and the month in which the least solar energy can be generated is December. When the averages are considered, Turkey is above the limit of 2,000 hours for benefiting from solar power economically.

The field in which solar power is widely used is heating water systems. The total coverage of installed solar collectors is 11 million m² in Turkey. Turkey is one of the foremost countries in the world with this amount and has an industry with capacity for exportation.

The history of investment in wind power dates back to 1998 which is really early. One of the other remarkable points about wind power is that the whole of the field is in the hands of the private sector. The public sector has not made any investment in this field.

Turkey’s most productive regions in terms of wind power are the Marmara, Aegean, and Eastern Mediterranean coastal regions. There are 33 wind farms in service with an installed capacity of 1,029.85 MW in total 11 wind farms at construction level with an installed capacity of 492.35 MW were expected to have been completed in 2010 and there are 17 wind farms which will be with an installed capacity of 644.45 MW (TUREB, 2011). In other words, when all of the farms start to generate wind power, Turkey’s installed capacity will be 2,166 MW in total.

After the preparation period of wind farms is completed, these farms will be in service within a year which is a short time and this is an advantage. Besides this, there are no disadvantages such as high turbine costs or a long time to get a return on the investment cost. Although diverse incentives are offered compared to other countries and when the lack of turbine manufacturers is taken into account, these incentives are not enough.

To sum up, there is a clear lack of non-renewable energy resources in Turkey. When it is considered in terms of the economy, the country is highly dependent on importation. Moreover, the traditional energy resources that we are using cause important environmental problems such as pollution and forest destruction. However, the country is very rich in renewable energy resources but they cannot be made use of as much as they should.

Except for the capital costs, renewable energy resources are cheap. They have been supported by the
technological developments occurring over the years. These resources are rich; they do not cause foreign dependence or pollution. They are beyond the reach of the effects of all crises and as they do not have the problem of transportation, they can be found when needed.

The most suitable energy resource among renewable resources is hydroelectric energy. Therefore, many plants which are at construction level should be put into service as soon as possible; all of the potential for this resource should be used. The country should be as successful in generating electricity from geothermal energy as it is in non-electricity applications. Turkey is one of the foremost countries in using solar power for heating but generating power with photovoltaic batteries should be included among its plans. Incentives for wind power of which the cost of capital is very high should be increased with laws made to ensure more investment as soon as possible.

**Turkey’s Energy-Environment and Climate Change Policies**

Production and consumption of energy was at quite a limited level in the pre-Republic period in Turkey. In the early years of the Republic energy was used not in industry but in houses for the purpose of heating. Kerosene was used for lighting. In the period between 1923 and 1930, the necessity to create an independent economic model in all sectors was emphasized based on the speech by Mustafa Kemal Atatürk in the First Economic Congress of İzmir (İnan, 1972). However, foreign capital was not excluded; investments in the energy sector were concentrated in the coupling of the public and private sectors. With the statist policies performed in the 1930s, this period was important in terms of the first enterprises and organizations. However, not enough accumulation of private capital was ensured in this period (TÜSİAD, 1998). In the First and Second Five-Year Development Plans prepared for the years between 1933 and 1942, the objectives were to increase the production of energy and reduce the dependence on foreign sources. The Electrical Power Resources Survey and Development Administration and the Mineral Research and Exploration Institute were founded in 1935 (Kepenek & Yentürk, 2005). Oil was explored for the first time in Raman in 1940. In addition to these, Etibank was established in this period and planned to carry out the activities of generation, transportation, and distribution of electricity. In this period, pit coal mines in Ereğli which were foreign-capitalized were nationalized and transferred to Etibank. Moreover, the Petroleum Office was established in 1941 and foreign-capitalized and privileged foreign partnerships were also nationalized. Despite all of these regulations, the generation of electricity was at a very limited and local level and so the cost of energy was extremely high.

When the Post-Second World War period is considered, it was seen that priority was given to the energy sector. With the attempts of industrialization and urbanization, the increase in demand for energy caused priority to be given to the energy sector. The “Turkish Economic Development Plan” entered into force in 1947 and the energy policies of Etibank were included. “Liberal Economy” policies started to be applied after the Democrat Party come to power in 1950 and the aim was to decrease the role of the government. However, the developments that occurred were opposite to what was planned and the public sector developed in the energy field. In 1953 the State Hydraulic Works and in 1957 the Turkish Coal Institute and TPC were established. State investments in the field of hydraulic energy were made. Moreover, among the resources based on purchasing and selling, the share of oil was quite high.

Dealing with the renewable energy resources for the first time in Turkey, occurred in the Fourth Development Plan. However, the first enterprises related to this were only realized in the early 1990s.

Consumption of non-renewable energy resources has shown an increase on a large scale over the years in
Turkey. Therefore, total greenhouse gas emissions increased 100.5% from 1990 to 2010 (IEA, 2012).

The first inventory for greenhouse gas according to the Tier I Method determined by the IPCC in Turkey was prepared for the years between 1990 and 1997 by the State Institute of Statistics, whose current name is the Turkish Statistical Institute. Accordingly, as Turkey’s greenhouse gas emissions were 200.7 million CO₂, in case Turkey becomes a party to the UNFCCC, Turkey must reduce its greenhouse gas emissions to the rate between the years of 2008 and 2012.

As it can be seen in Table 5, CO₂ has the highest rate in terms of greenhouse emissions in Turkey. The rates of the other greenhouse gases are lower compared to CO₂.

Table 5

| Years | Carbon dioxide emission (Mt CO₂) | Methane (Mt CO₂) | Nitrose oxide (Mt CO₂) | F Gases (Mt CO₂) | Total greenhouse gas emissions (Mt CO₂) |
|-------|----------------------------------|-------------------|------------------------|-----------------|----------------------------------------|
| 1996  | 192.1                            | 49.31             | 16.40                  | 0.89            | 258.62                                 |
| 1997  | 205.18                           | 50.59             | 14.98                  | 1.13            | 271.88                                 |
| 1998  | 204.32                           | 51.90             | 16.65                  | 1.18            | 274.05                                 |
| 1999  | 203.68                           | 53.14             | 16.93                  | 1.03            | 274.78                                 |
| 2000  | 225.43                           | 53.30             | 16.62                  | 1.66            | 297.01                                 |
| 2001  | 208.99                           | 52.74             | 14.69                  | 1.70            | 278.11                                 |
| 2002  | 217.93                           | 50.43             | 15.32                  | 2.41            | 286.09                                 |
| 2003  | 232.64                           | 51.63             | 15.67                  | 2.80            | 302.75                                 |
| 2004  | 243.43                           | 49.37             | 16.00                  | 3.46            | 312.26                                 |
| 2005  | 259.61                           | 52.35             | 14.18                  | 3.73            | 329.87                                 |
| 2006  | 276.72                           | 53.33             | 15.55                  | 4.05            | 349.64                                 |
| 2007  | 307.92                           | 55.58             | 12.35                  | 4.13            | 379.98                                 |
| 2008  | 297.12                           | 54.29             | 11.57                  | 3.51            | 366.50                                 |

Note. Source: The table was prepared by the author using the data in T.R. Prime Ministry Turkish Statistical Institution (2011).

Table 6

Comparison of Energy Consumption and CO₂ Emissions According to Resources

| Consumption and emissions | 1999 | 2007 |
|---------------------------|------|------|
|                           | Total amount | Share in total (%) | Total amount | Share in total (%) |
| Energy consumption        |      |          |      |          |
| Coal (million ton)        | 75.4 | -       | 97.7 | -       |
| Oil (million ton)         | 29.5 | -       | 30.5 | -       |
| Natural gas (billion m³)  | 12.4 | -       | 35.1 | -       |
| CO₂ emission (Mt CO₂)     |      |          |      |          |
| Coal                      | 121  | 44      | 163.4| 43      |
| Oil                       | 112.8| 41      | 114  | 29.7    |
| Natural gas               | 41.2 | 15      | 102.6| 26.8    |

Notes. As the energy consumption units are different from one another, their shares in total could not be shown. Source: The information in the table is required from the sources T.R. Prime Ministry Turkish Statistical Institution (2011), Ministry of Energy and Natural Resources (2012), and BP Statistical Review of World Energy (2012) by the author.

According to the data in Table 6, in the period 1999-2007 consumption of coal increased 30%, oil increased 3%, and natural gas increased 183%. The increase in the consumption of natural gas between these years is remarkable. Similarly, when emissions are considered, both in 1999 and 2007 the source of the highest
emissions is coal and the lowest was natural gas. Natural gas, even the lowest one had a 26.8% share among 
CO₂ emissions. Compared to this, Turkey’s emissions per head are 3.6 tons of CO₂ which is under the world 
average of four tons (emissions per head in the USA are 19.10 tons of CO₂, in China 4.58 tons of CO₂, in the 
EU 7.92 tons of CO₂, and in India 1.18 ton of CO₂) (IEA, 2012).

Accordingly, it would not be wrong to say that Turkey’s per-head responsibility for CO₂ emissions that 
cause global climate change is lower compared to other countries.

Turkey’s studies on climate change were started in the preparatory process of the FCCC. In this context, 
Turkey created working groups by establishing the National Climate Coordination Group under the leadership 
of the General Directorate of the Turkish State Meteorological Service in Turkey in January 1991. These 
groups prepared reports on the determination of the present state in Turkey, energy technologies, protection of 
the atmosphere, and climate change. Later, in 2010 the Coordination Committee on Climate Change was 
established with a Prime Ministry Circular and this committee was revised and eight working groups were 
created on the subjects of “examining the effects of climate change”, “industry, house, waste management and 
reducing greenhouse gas in the service sector”, “reducing greenhouse gas in the energy sector”, “emission 
inventory for greenhouse gases”, “reducing greenhouse gas in the transport sector”, “land use and change in 
land use and forestry”, “developing policy and strategies”, and “education and raising the awareness of the 
public”.

The T.R. Ministry of Environment and Forestry published two studies; one of them called “Turkey 
Becomes a Solution Partner” was published in December 2009 and the other called “Document of National 
Climate Change Strategy” was published in May 2010. These studies involved basic indicators related to 
climate change and Turkey, the control of greenhouse gas emissions, energy, transportation, industry, waste, 
land use, agriculture, and forestry, adaptation to climate change and the subjects of technology, financing, 
education, related to these in short-, medium-, and long-term plans.

In addition to these studies, the Department of Climate Change was established within the body of the 
Ministry of Environment and Forestry in July 2010. The primary duties of this department are as follows: the 
control of the substances causing climate change and the thinning of the ozone layer, monitoring national and 
international developments for recycling and the eradicating and assessing them helping to determine the 
policies and strategies related to the subject, maintaining the negotiations as a part of the international 
agreements and protocols made related to climate change and the protection of the ozone layer, carrying out 
studies on fulfilling the obligations given to Turkey, determining the criteria related to the importation and 
exportation of the substances causing climate change and the thinning of the ozone layer and control of them, 
maintaining studies on the project and market-based activities as part of the emission trade, studies on reduction, 
adaptation, transfer of technology and financing within the context of climate change, monitoring national and 
international developments and assessing them and conducting studies about their implementation, conducting 
studies on renewable energy resources and the use of clean energy and collaborating with national and 
international organizations on conducted studies (Official Newspaper, 2010).

Despite all these studies and developments, the members of the working groups changed frequently so the 
required expertise could not be fulfilled. Even if the parties which are realized by the UNFCCC participated in 
the meetings, the level of participation was very minimal and continuity could not be ensured; there was no 
participation in the meetings and technical meetings organized by the UNFCCC.

Although there is not any legislation for climate change and greenhouse gases yet, diverse phrases such as
protection of the environment, prevention of environmental pollution, incentives for clean technologies, compulsory standards for the prevention of environmental pollution and taxes have been added to the Environmental Law and various regulations. No comprehensive study has been conducted in this field.

**Turkey’s Attitude Towards the Kyoto Protocol**

Turkey’s attitude towards the UNFCCC differs from its attitude towards the Kyoto Protocol. Turkey’s attitude was in favor of cancelling the Convention’s Annex till the Rio Summit which ran in the period 1992-1997. However, in the period after 1997 which started in Kyoto, Turkey still wanted to cancel the Annex of the Convention but at the same time it favored determining a softer target for greenhouse gases (Türkış, 2001).

The Kyoto Protocol was approved by the TBMM (Grand National Assembly of Turkey) on February 5, 2009 with Law 5836 and on February 17, 2009, with Law 27144 it was put into force by being published in the Official Newspaper.

Obligations in the Protocol which were required to be fulfilled between 2008 and 2012 were not binding for Turkey. Obligations which will be determined will be binding for Turkey for post-2012.

By approving the Protocol, Turkey has made great progress related to the environmental obligations which are required to be fulfilled in the EU process. Furthermore, the country has taken a stance which is solution-based and requiring collaboration to the problem of global warming which is a very important matter causing many negotiations and searches for solutions in the international arena. In addition to all of these, Turkey took the opportunity of participating as a country which has the right to speak, to vote, and to look after its own benefits in the negotiations as part of the 16th Conference of Parties organized in Cancun between the dates of November 29 and December 10, 2010.

There are disadvantages as well as advantages of the Protocol. If the actions taken to reduce high increases of greenhouse gases by fulfilling the obligations required by the Protocol after Turkey became a party are insufficient, it is possible that Turkey may be exposed to sanctions.

Turkey was not under any obligation in the framework of the Kyoto Protocol to reduce the emissions during the process until 2012. Documents by the National Climate Change Strategy and the Department of Climate Change established within the body of the Ministry of Environment and Forestry of which details are defined in the previous chapters can be regarded as concrete proof that Turkey has started to make preparations for the post-2012 process.

**Conclusions**

Energy-environment and global climate change are concepts which are like the parts of a whole that dominates the agenda of the international arena. In the process of establishing and executing energy-environment policies, even these policies differ because of countries’ economic systems and political regimes. The differences in the common objectives of their international policies can be summarized as ensuring people live in a healthy environment, the protection of environmental values and ensuring the compatibility of obligations which are required by energy-environment policies with the principles of justice. International collaboration in the matter of the energy-environment causes conflicts as it requires reorganization and allocating funds. Accordingly, at this point economic and political factors more than scientific concerns become a part of the work. In addition, this unfair allocation in energy resources embitters conflicts.
During the solution seeking process on an international scale on energy-environment and climate change, the main issue in energy-environment policies is the issue of divvying up the responsibility between countries.

If Turkey’s point of view is considered, on the one hand the country is utterly dependent on non-renewable energy resources and imports; on the other hand it has the makings of renewable energy resources. The policies that Turkey will implement in order to reduce greenhouse gas emissions within the context of the Protocol—for example, progress in terms of renewable energy resources—may also be a contributing cause which will clear away the foreign dependency of Turkey. The country’s concern for the climate change issue on the international scale, its co-operation and its taking sides with countries that make an effort have played out as a gesture of goodwill. This is also important in the way of Turkey having a voice in international negotiations and assemblies relevant to this matter.

The main problematic question in Turkey, as it is in the other ever-developing countries, is whether or not being a party to the Kyoto Protocol will create trouble. Being a party to the Protocol whose long form purpose is only to reduce greenhouse gas emissions is not a problem to militate against Turkey’s development. There is no doubt that Turkey will successfully get through it only if it looks after its own economic and national interests without bringing in domestic politics. Those are the policies that Turkey should follow to resolve the problem. First of all, Turkey should comprehend the potential of renewable energy resources and support them as early as possible. With its own companies Turkey should play a part in the process of searching for non-renewable resources and petroleum production. It should have control over the production and the portage. When importation of resources is statutory then a policy of diversifying the resources instead of sticking to a few should be implemented. Turkey should not only focus on the issue of increasing renewable resources, but it should also do emergency research on how to use coal which is of capital importance and which abounds via clean energy technologies and should immediately restart the research across the country that has been stopped for the last forty years.

References

Akova, İ. (2008). Renewable energy resources (pp. 71-72). Ankara: Nobel Publications Distribution.

BP Statistical Review of World Energy. (2012). Retrieved from http://www.bp.com/assets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2011/STAGING/local_assets/pdf/statistical_review_of_world_energy_full_report_2012.pdf

China’s National Climate Change Programme. (2007). Retrieved from http://www.ccchina.gov.cn/WebSite/CCChina/UpFile/File188.pdf

European Commission. (2012). Fact sheet on climate change. Retrieved from http://ec.europa.eu/clima/publications/docs/factsheet_climate_change_2012_en.pdf

General Directorate of Electric Power Resources Surveys (GDEPRS). (2011a). Geothermal energy in Turkey. Retrieved from http://www.eie.gov.tr/turkce/YEK/jeotermal/13turkiyede_jeotermal_enerji.html

General Directorate of Electric Power Resources Surveys (GDEPRS). (2011b). Distribution of Turkey’s hydroelectric energy potential’s according to project levels. Retrieved from http://www.eie.gov.tr/turkce/YEK/HES/proje/PRJ_DUR_DAG_TAB.xls

General Directorate of Petroleum Affairs (GDPA). (2011a). Production of crude oil and natural gas by years. Retrieved from http://www.pigm.gov.tr/uretim.php

General Directorate of Petroleum Affairs (GDPA). (2011b). Turkey’s natural gas reserves by the end of 2011. Retrieved from http://www.pigm.gov.tr/istatistikler.php

General Directorate of Petroleum Affairs (GDPA). (2011c). Turkey’s crude oil reserves by the end of 2011. Retrieved from http://www.pigm.gov.tr/istatistikler.php

General Directorate of Turkish Coal. (2011). Report of coal sector. Retrieved from
Institute for Global Environmental Strategies (IGES). (2012). *Market mechanisms country fact sheet: China.* Retrieved from http://enviroscope.iges.or.jp/modules/envirolib/upload/984/attach/china_final.pdf

Institute for Global Environmental Strategies (IGES). (2013). *Market mechanisms country fact sheet: India.* Retrieved from http://enviroscope.iges.or.jp/modules/envirolib/upload/984/attach/india_final.pdf

International Energy Agency (IEA). (2012). *CO₂ emissions from fuel combustion-highlights.* Retrieved from http://www.iea.org/co2highlights/co2highlights.pdf

Karakaya, E., & Özçağ, M. (2003). The evaluation of the Kyoto protocol from Turkey’s perspective and the analysis of CO₂ emissions distinctive with the decomposing method. Proceedings from VII METU Economy Conference. Ankara.

Kepenek, Y., & Yentürk, N. (2005). *Turkish economy.* Istanbul: Remzi Bookstore Publishing.

Lea, R. (2005). *The 2006 essential guide to European Union.* Retrieved from http://www.cps.org.uk/cps_catalog/CPS_assets/239_ProductPreviewFile.pdf

Mertoğlu, O., Mertoğlu, M., & Bakır, N. (2006). *In geothermal activities development and goals of 2013.* İstanbul: Turkish National Committee.

Ministry of Energy and Natural Resources. (2012). *Mavi Kitap 2012.* Retrieved from http://www.enerji.gov.tr/yayinlar_raporlar/Mavi_Kitap_2012.pdf

Official Newspaper. (2009). *EU framework convention on climate change intended for a regulation related to Turkey’s participation in Kyoto Protocol.* Retrieved from http://rega.basbakanlik.gov.tr/main.aspx?home=http://rega.basbakanlik.gov.tr/eskiler/2009/02/20090217.htm&main=http://rega.basbakanlik.gov.tr/eskiler/2009/02/20090217.htm

Official Newspaper. (2010). *Duties of central organization of Ministry of Environment and Forestry, regulation making amendment on the regulation of operating principles and procedures.* Retrieved from http://rega.basbakanlik.gov.tr/main.aspx?home=http://rega.basbakanlik.gov.tr/eskiler/2010/07/20100728.htm&main=http://rega.basbakanlik.gov.tr/eskiler/2010/07/20100728.htm

Pamir, N. (2003). *Energy in Turkey and in the world, Turkey’s energy resources and policies.* Metallurgy Magazine, 134, 13

Regional Environmental Center-REC Turkey. (2006). *UN framework agreement on climate change and Kyoto Protocol, texts and basic information.* Retrieved from http://iklim.cob.gov.tr/iklim/Files/REC_unfccc.pdf

Republic of Turkey Ministry of Energy and Natural Resources. (2011). *The year 2008, the tables of general energy balance.* Retrieved from http://www.enerji.gov.tr/EKLENTI_VIEW/index.php/raporlar/detayGoster/46124

T.R. Prime Ministry Turkish Statistical Institution. (2011). *Environmental statistics.* Retrieved from http://www.tuik.gov.tr/Gosterge.do?metod=GostergeListe&tb_id=10&ust_id=3

Türkeş, M. (2001). *Protection of global climate, framework convention on climate change and Turkey.* Retrieved from http://www.mgm.gov.tr/FILES/iklim/idecs.pdf

Turkish Industrialists’ and Businessmen’s Association (TÜSİAD). (1998). *Assessment of Turkey’s energy strategies while entering 21th century.* Turkish: TÜSİAD Publishing.

Turkish Republic Energy Market Regulatory Authority (TREMRA). (2011). *Sector report of natural gas market in 2009.* Retrieved from http://www.epdk.gov.tr/yayin_rapor/dogalgaz/2009/2009.pdf

Turkish Republic Energy Market Regulatory Authority (TREMRA). (2012). *Sector report of oil market September 2012.* Retrieved from http://www.epdk.org.tr/documents/petrol/rapor_yayin/PPD_Eylul_2012

Turkish Wind Energy Association (TUREB). (2011). *Project of wind farms in service in Turkey.* Retrieved from http://www.ruzgarenerjisibirligi.org.tr/index.php?option=com_docman&Itemid=86

United Nations Framework Convention on Climate Change (UNFCCC). (2003). *Taking care of climate: Framework convention on climate change and a guide to Kyoto protocol.* Retrieved from http:// unfccc.int/resource/docs/publications/caring_trk.pdf