MSc Program
Renewable Energy in Central and Eastern Europe

Carbon Market in Turkey and its Implications on the Control of Greenhouse Gas Emissions

A Master's Thesis submitted for the degree of
"Master of Science"

supervised by
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Affidavit

I, **Okyay Nabi Özkozacı** hereby declares

1. that I am the sole author of the present Master Thesis, "Carbon Market in Turkey and its Implications on the Control of Greenhouse Gas Emissions", 66 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
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Abstract

In the last decades, the effects of rapid climate change have been commonly recognised. As it is widely accepted, main catalysts for climate change are greenhouse gases. Many governments and communities are making an effort to prevent or at least to limit the emissions of greenhouse gases.

For this purpose, the United Nations Framework Convention on Climate Change (UNFCCC) sets new regulations to parties in order to provide same understanding and identical approach to fight against the hazardous emissions. In this context, Kyoto Protocol appears as an international legally binding agreement aimed at limiting emissions of several greenhouse gases. The Kyoto Protocol now covers more than 160 countries globally. Turkey became a Party to the Kyoto Protocol on 26 August 2009. Turkey defines its situation under UNFCCC as a sui generis case vis-à-vis the current climate regime. Due to its request to be recognized as transition economy, Turkey remained as an Annex-I Party of the UNFCCC but as a later comer to the Kyoto Protocol, Turkey did not have any reduction commitment during the period of 2008-2012. Although Turkey did not have any restrictions, Turkey started to regulate its structure with general environmental objectives set by Turkish Government and developed Voluntary Emission Reduction Market in Turkey.

These progresses show that Turkey desires to integrate its climate change policies into development policies. However, the majority of industrial owners in Turkey are not sharing the same aspect as it is adopted by the Turkish Government. Turkey is accepted as one of the fast developing countries and new restrictions considering new environmental policies against global warming intimidate the manufacturers.

Therefore, a conflict appeared between these two opposing views, whether to take actively part in Kyoto Protocol or not. The subject is reviewed in this scope to find a significant answer to this discussion.

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List of Abbreviations, Acronyms and Units

AAUs	Assigned Amount Units
AWG-KP	the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol
AWG-LCA	The Ad Hoc Working Group on Long-term Cooperative Action under the Convention
CBCC	The Coordination Board on Climate Change
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CFCs	Chlorofluorocarbons
CH_4	Methane
CO_2	Carbon Dioxide
CO_2 eq.	Carbon Dioxide Equivalent
COP7	Seventh session of the Conference of the Parties
COP17	Seventeenth session of the Conference of the Parties
COP18	Eighteenth session of the Conference of the Parties
CRF	Common Reporting Format
EITs	Economies in Transition
ERUs	Emission Reduction Units
EUAs	European Union Allowances
EU	European Union
EU ETS	EU Emissions Trading System
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHGs	Green House Gases
HFCs	Hydrofluorocarbons
H_2O	Water
IET	International Emissions Trading
IPCC	The Intergovernmental Party on Climate Change
JI	Joint Implementation
KP	Kyoto Protocol
LULUCF	Land use, land-use change and forestry

LDCs	Least Developed Countries
MW	Megawatt
NAMAs	National Appropriate Mitigation Actions
NAP	National Allocation Plan
NGO	A non-governmental organization
NIR	National Inventory Report
NCCAP	National Climate Change Action Plan
N_2O	Nitrous Oxide
NMVOC	Non-methane Volatile Organic Compounds
OECD	Organization for Economic Co-operation and Development
PFCs	Perfluorocarbons
RMUs	Removal Units
SBI	Subsidiary Body for Implementation
SBSTA	Subsidiary Body for Scientific and Technological Advice
SF_6	Sulfur Hexafluoride
TG	Turkish Government
UNCED	United Nations Conference on Environment and Development
UNFCCC	The United Nations Framework Convention on Climate Change
U.S.	United States (of America)
VERs	Voluntary Emission Reductions or Verified Emission Reductions

1. Introduction

1.1. Overview

Climate change is nowadays extensively recognized as the major environmental problem facing the earth. The greenhouse gases are identified as being responsible for giving rise to climate change. Some greenhouse gases such as carbon dioxide occur naturally and are emitted to the atmosphere through natural processes and human activities. Other greenhouse gases (e.g. fluorinated gases) are created and emitted solely through human activities.

The primary sources of GHGs are the automobiles, factories and power plants using fossil fuels. Most of the global emissions come from the combustion of fossil fuels releasing carbon dioxide (CO_2), a greenhouse gas, to the atmosphere. Other greenhouse gases come from agricultural activities, namely methane (CH_4) and nitrous oxide (N_2O) in addition to CO_2. On the other hand, deforestration is another major effect which cuts the natural cycle called photosynthesis and so blocks the capture of carbon dioxide through green plants. Additionally, growth of the population implies the increase of requirements and demands of the people. Therefore, this increases the manufacturing processes as well as the industry processes. Industrial gases e.g. SF_6 and HFCs, used in such common devices and applications as refrigerators, air conditioners, insulation, medical aerosols and semiconductors additionally catalyze the green house effect.

Many nations, communities and individuals are taking action to reduce greenhouse gas emissions and prevent global warming by reducing dependence on fossil fuels, increasing the use of renewable energy, expanding forests and making lifestyle choices that help to sustain the environment.

The United Nations Framework Convention on Climate Change (UNFCCC) sets a comprehensive framework for countries within its structure to cope with the challenge posed by climate change. Towards this end, policy makers of the countries have the cumbrous task of minimizing the economic and social consequences of changing the production and consumption patterns of energy.

The Kyoto Protocol to the UNFCCC sets legally binding greenhouse gas (GHG) emission limitation commitments to industrialised countries as well as countries in transition. The Kyoto Protocol offers these countries some flexibility in meeting their obligations by three market-based mechanisms: Joint Implementation (JI), the Clean Development Mechanism (CDM) and International Emissions Trading (IET). CDM and JI are also called project-based mechanisms. These three mechanisms give industrialised countries an opportunity for cost-effective options to reach their Kyoto target.

Beside the mechanisms under the Kyoto-Protocol the European Union (EU) has started implementing emission trading for which CO_2 took centre stage in the first phase (2005-2007), and a second phase to run from 2008-2012 to coincide with the first Kyoto commitment period.

After establishing the Environment Ministry in 1991, Turkey has started to make explicit progress by identifiying its most urgent environmental problems. Up to this date, there was an unnerving air pollution in Ankara (Capital City) and in Istanbul but followingly it is solved in a short period of time.

The Ministry of Environment was accoupled with the Forestry Ministry in 2003. With respect to its goal to join the European Union, Turkey has made nonignorable development in updating and modernizing its environmental legislation. Turkey faces a backlog of environmental problems, requiring enormous outlays for infrastructure. The most pressing requirements are for solid waste management, water treatment plants, wastewater treatment facilities and conservation of biodiversity. The discovery of a number of chemical waste sites in 2006 has highlighted weakness in environmental law and oversight.

Turkey defines its situation under UNFCCC as a sui generis case vis-à-vis the current climate regime. Because of its membership to the Organization for Economic Co-operation and Development (OECD), Turkey was included among the countries of the Convention's Annexes I and II when the United Nations Convention on Climate Change (UNFCCC) was adopted in 1992. Its name was deleted from the Annex II of the Convention (Decision 26 / CP.7) at COP 7 in Marrakech, 2001. Thus, Turkey remained in the list of Annex I Parties of the UNFCCC, in a position that is different

than that of other Annex-I countries. Turkey was not a Party to the UNFCCC, when the Kyoto Protocol (KP) was adopted. Therefore, Turkey's name was not included in the Annex-B of the Protocol, which lists the individual targets for Annex I Parties, and, it did not take any quantified emission limitation or reduction commitment within the first commitment period of the Protocol. Turkey became a Party to the KP on 26 August 2009.

After the meeting (COP17) in Durban (Dec.2011), it is decided to continue with the second phase of the Kyoto Protocol including all mechanisms beginning from 2017 or 2020. The exact date will be clarified at the meeting (COP18) in Quatar (Dec.2012). There were 194 participants in this meeting. Working groups are formed in order to set new targets for all participants for the new period. Currently, there is no aggrement in sight but if another directive against global warming considering reduction of GHGs is constituted then the Government of Turkey has intention to join this union.

Turkey desires to integrate its climate change policies into development policies. Regarding to new targets which were set in the latest National Climate Change Action Plan (NCCAP)[1], Turkey aims for extending the use of clean and renewable energy sources and participating actively in the international negotiations on climate change within the scope of the NCCAP.

Turkey's Ninth Development Plan (2007-2013) states that 'Within the scope of Turkey's circumstances, a National Action Plan setting greenhouse gas emission decrease policies and measures with the participation of all related stakeholders will be prepared to fulfill her commitments under the UN Framework Convention on Climate Change.' Turkey, moving forward and fulfilling its commitments in line with this statement, showed her ambition and determination in this matter by completing the Climate Change Action Plan.

Consequently, as it is apparent from the National Action Plan of Turkey, the objectives of the Turkish Government (TG) against GHGs reveals its intention on

[1] The Ministry of Environment and Urbanization, General Directorate of Environmental Management, Climate Change Department, *"National Climate Change Action Plan 2011-2023"*, Odak Offset, Ankara, July 2011.

this topic. However, the majority of industrial owners are not sharing the same view as it is adopted by the TG. Turkey is accepted as one of the fast developing countries and new restrictions considering new environmental policies against global warming intimidate the manufacturers. Therefore, a conflict appeared between these two opposing views, whether to take actively part in Kyoto Protocol or not. The subject is reviewed in this scope to find a significant answer to the discussion.

In this study, carbon market and its implications in reduction of GHGs in Turkey is investigated under four chapters. In the very first chapter, a brief introduction is performed in order to clarify the overall picture, motivations to choose this subject and the intention behind the ultimate goal. In the second chapter, the useful and summarized, as far as possible, information is provided which is mostly the basis of carbon trading, its structure and its implementation with respect to current code of conduct. In the third chapter, it is outlined and argumenated more in detail by considering the main question "Should Turkey join an environmental union and regulate its structure with respect to directives set out by this association in the near future considering the effects of Kyoto Protocol and carbon trading?". Advantages and disadvantages of a participation are discussed in detail in this section to reach a logical decision.

In this context, govermental surveys are researched and studies are reviewed. The effects of emission trading to Turkey, despite the fact that without any obligation at all, are examined in order to answer the proposition of this study. In the fourth chapter, a brief summary is done to designate the most rational and persuasive choice in response to the proposition of this study.

1.2. Reasons for study

Regarding to the presented summarizer of World Energy Outlook 2011 by International Energy Agency on 9th of November 2011 in London, it is once again underlined that rising incomes and population will push higher energy demands in near future[2].

[2] http://www.iea.org/weo/docs/weo2011/homepage/WEO2011_Press_Launch_London.pdf

Electricity is consumed primarily by users in the residential, commercial, and industrial sectors for lighting, heating, electric motors, appliances, electronics, and air conditioning.

Most electricity is generated by burning fossil fuels like coal, oil and natural gas. These are all non-renewable sources of energy. This burning releases carbon dioxide in the atmosphere. This is contributing to global warming. Additionally, global warming by means of electricity is only a share among other causers.

Social awareness should be actively raised and deterrent sanctions should be immediately imposed. To this extent, the Kyoto Protocol was prepared in 1997 and came into force in 2005. The most important outcome of the Kyoto-Protocol was the commitment to binding targets for reducing or stabilising GHG emissions for the industrialised countries. Besides a really new approach was the implementation of the flexible mechanims, including International Emission trading, Clean Development Mechanism (CDM) and Joint Implementation (JI).

The three Kyoto Protocol “flexibility mechanisms” are designed to enable emission reductions to occur in the cheapest locations across the globe. The first mechanism, international emissions trading, can take place between countries with binding targets, so that countries can meet their domestic targets by purchasing credits from other countries that have exceeded their targets. The largest implementation of a scheme of emissions trading (but not under the Kyoto-Protocol) to date has been the EU ETS. Second, the CDM is a project-based mechanism that allows credits from emission reduction projects in developing countries to be used by industrialised countries to meet their own commitments under the Kyoto Protocol. Third, JI is also a project-based mechanism that enables countries with binding targets to get credit from projects carried out in other countries with binding targets.

1.3. Purpose of study

The purpose of this study is to address the following issues:

- ✓ Kyoto Protocol and its implementation worldwide
- ✓ Carbon trading and its implementation in Turkey
- ✓ Overall effects of carbon trading in Turkey
- ✓ A proposal for the future orientation of Turkey in this area

2.Background

2.1. Greenhouse Gases and Global Warming

A greenhouse gas (GHG) is a gas in the atmosphere that absorbs and emits radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect.

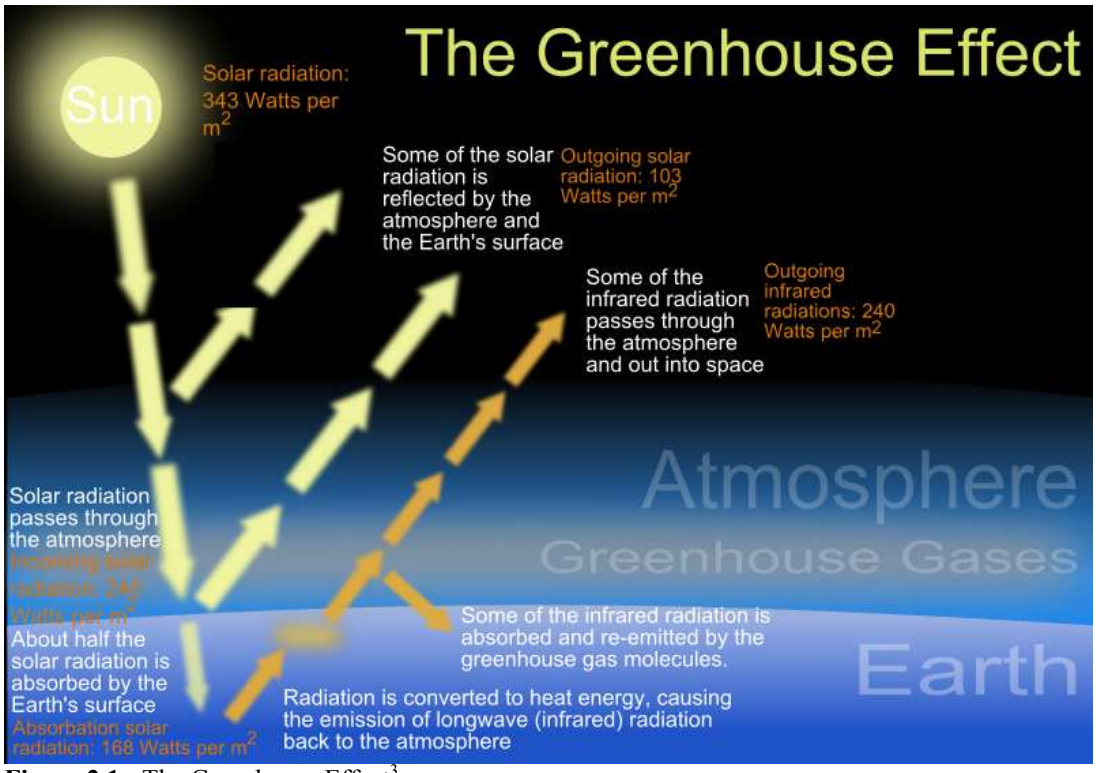

Figure 2.1 : The Greenhouse Effect[3]

Many natural and human-made gases contribute to the greenhouse effect that warms the Earth's surface. Water vapor (H_2O) is the most important, followed by carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and the chlorofluorocarbons (CFCs) used in air conditioners and many industrial processes.

The increasing atmospheric CO_2 concentration is likely the most significant cause of the current warming. Global warming refers to the rising average temperature of Earth's atmosphere and oceans which is caused by increasing concentrations of

[3] http://en.wikipedia.org/wiki/Greenhouse_effect

greenhouse gases produced by human activities such as deforestation and burning fossil fuel.

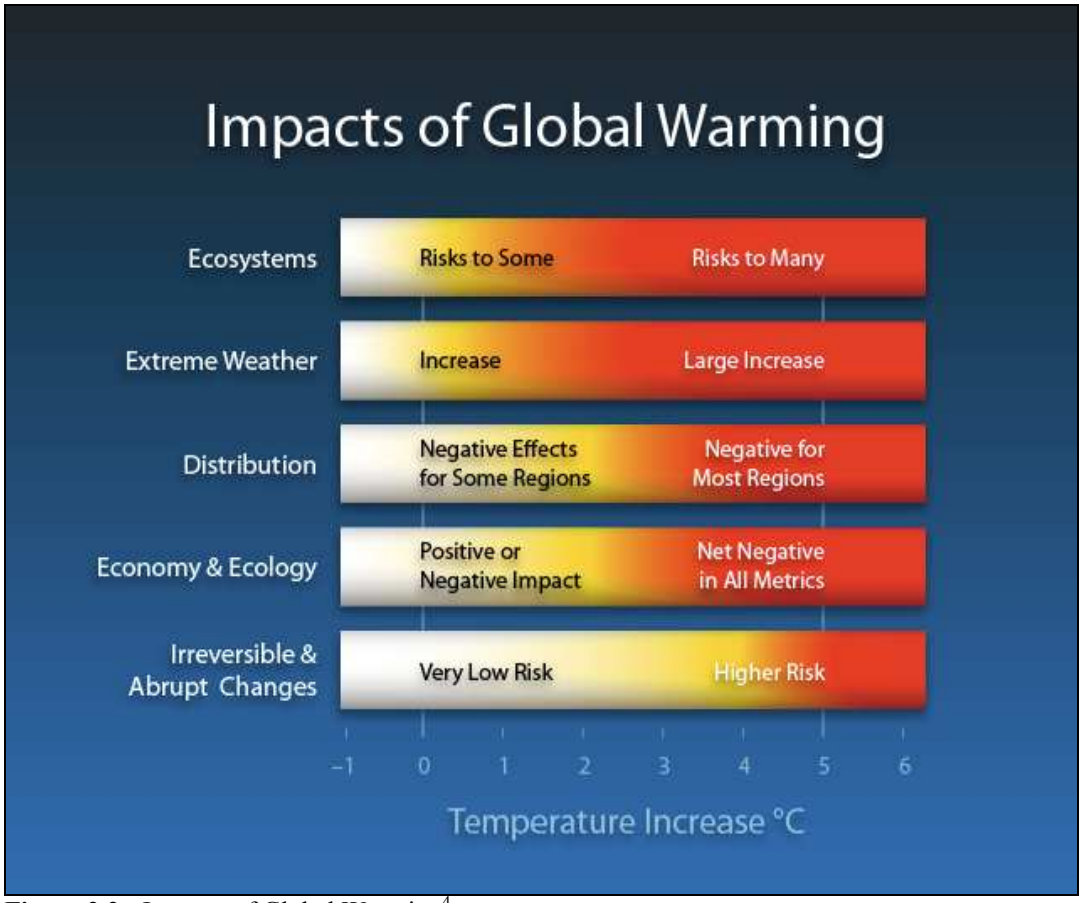

Figure 2.2 : Impacts of Global Warming[4]

2.2. Policy Background

2.2.1. The United Nations Framework Convention on Climate Change

The United Nations Framework Convention on Climate Change (UNFCCC) is an international environmental treaty produced at the United Nations Conference on Environment and Development (UNCED), informally known as the Earth Summit, held in Rio de Janeiro from June 3 to 14, 1992. The objective of the treaty is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

[4] http://en.wikipedia.org/wiki/Greenhouse_effect

Briefly, the UNFCCC outlines a system to cope with the climate change which will be implemented globally. Here the term “global” is important regarding to the fact that the climate system is a common resource which could be affected by all kinds of emissions world-wide.

Herewith the governments that joined this union should cooperate with this Convention under the topics of greenhouse gas emissions, national policies and best practices, by gathering and sharing information, determining environmental national strategies and adapting them in convenience with the impacts of climate change, considering the provision of financial and technological support to developing countries.

The UNFCCC brings parties to the convention into three distinct groups together each with different commitments:

Annex I Parties: are industrialised countries and economies in transition who are required to adopt policies and measures to reduce greenhouse gas emissions to combined emissions to 5% below 1990 levels by 2008 - 2012. Annex I Parties have to submit annual GHG inventories and implementation reports, called national communications, usually every three years, to the UNFCCC supreme body called Conference of the Parties (COP).

Annex II Parties: are industrialised countries within the Annex I group with special responsibilities to provide financial resources to developing countries to help them adapt to climate change and undertake emissions reduction activities. Annex II parties are also charged with the responsibility of assisting countries that are vulnerable to climate change meet the cost of adaptation.

Non-Annex I Parties: are developing countries. Within this group is a smaller group of 48 least developed countries (LDCs) recognised as being especially vulnerable to climate change. Non-Annex I parties have limited obligations under the UNFCCC. Non-Annex I Parties refers to the developing countries that negotiate as a bloc called G-77. Other countries such as Mexico, Korea, China, and countries from Central Asia, such as Kazakhstan are included in G-77.

The Convention establishes institutional machinery to oversee the implementation of these commitments and to ensure that further action is taken by Parties.

The main convention institutions are as follows:

· Conference of the Parties (COP);

· Secretariat;

· Subsidiary Body for Implementation (SBI);

· Subsidiary Body for Scientific and Technological Advice (SBSTA); and

· Financial Mechanism operated by the Global Environment Facility (GEF)

Under the UNFCCC umbrella, the COP is the main policy-making body. It meets annually and provides the principal forum for international discussions premised on climate change. The Intergovernmental Party on Climate Change (IPCC) is an independent scientific network with a separate legal existence.

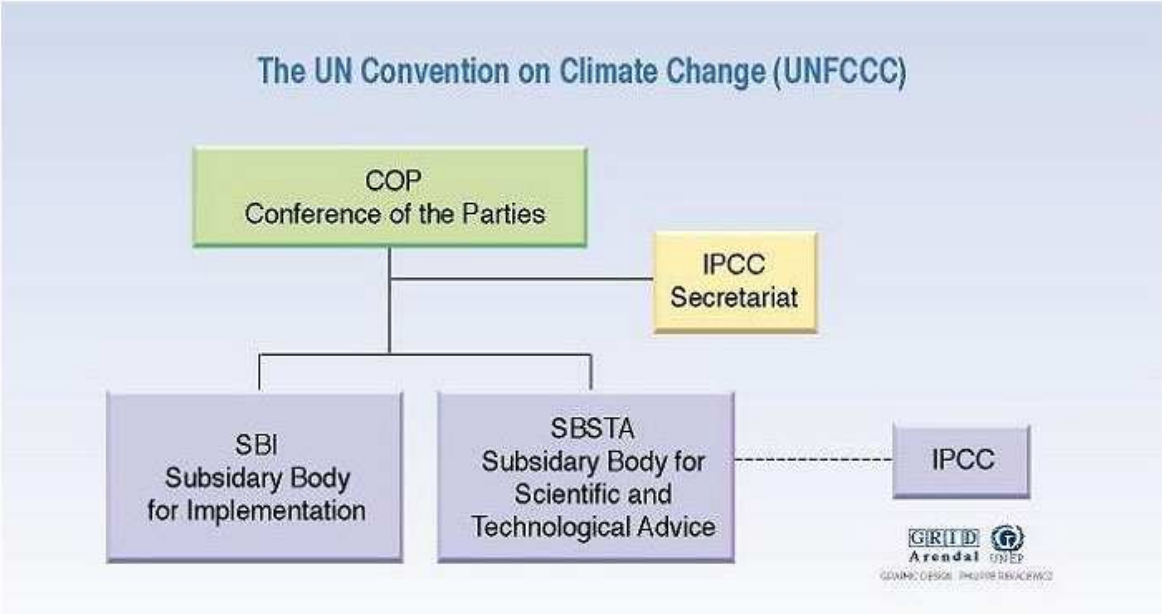

Figure 2.3 : UNFCCC OrganigramSource**:** Enviromental Knowledge for Change[5]

2.2.2. Kyoto Protocol

The Kyoto Protocol is a protocol to the United Nations Framework Convention on Climate Change (UNFCCC). It also justifies sections of the UNFCCC. Countries which affirm this protocol should take the responsibility to decrease or stabilize their emissions of carbon dioxide and five other greenhouse gases.

[5] http://www.grida.no/publications/vg/climate/page/3068.aspx

The major feature of the Protocol is that it sets binding targets for 37 industrialized countries and countries in transition (the Annex I Parties to the Protocol) to reducing six major greenhouse gas (GHG) emissions - carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). The Parties to the Protocol have agreed to lower overall emissions by 5.2% calculated as an average over the five-year period of 2008-12. The Protocol places a heavier burden on developed nations, who are principally responsible for the current high levels of emissions in the atmosphere, under the principle of "common but differentiated responsibilities." National targets for developed countries range from 8% reductions for the European Union (for the 15 countries that were EU members in 1997) to 7% for the US, 6% for Japan, 0% for Russia, and permitted increases of 8% for Australia and 10% for Iceland compared to 1990 levels. Developing countries, including India and China, do not have to commit to specific targets. They do, however, have to report their emissions levels and develop national climate change mitigation programs.

A Party's assigned amount is accepted as the maximum amount of emissions (measured as the equivalent in carbon dioxide) that a Party may emit over the commitment period in order to comply with its emissions target. The Protocol involves provisions for the review of its commitments, so that these can be empowered over time.

There are six main greenhouse gases which are covered by targets :

• Carbon dioxide (CO_2);

• Methane (CH_4);

• Nitrous oxide (N_2O);

• Hydrofluorocarbons (HFCs);

• Perfluorocarbons (PFCs); and

• Sulphur hexafluoride (SF_6)

The basic principle for the acceptance of the Protocol was to empower the mitigation of commitments of Annex 1 Parties. This is realized by the establishment of the

legally binding objectives for Annex I Parties[6]. These targets are set to achieve the goal of reducing the six GHGs from various sources and sectors between the years 2008 to 2012 with a certain necessity on Annex I Parties to have made progress by 2005.

The Protocol also sets a collective objective for Annex 1 Parties amounting to 5 per cent below 1990 levels in the commitment period 2008-2012.

Turkey, as a member of the OECD, was included in Annex-I and Annex-II of the UNFCCC together with the developed countries when it was adopted in 1992. At the COP7 held in Marrakech in 2001, the name of Turkey was removed from Annex-II of the Convention (Decision 26/CP.7) because of its request to recognize its economy as an advanced developing country and Turkey remained as an Annex-I Party of the UNFCCC, in a position that is different than other Annex-I countries. As a later comer to the Kyoto Protocol, Turkey does not have any reduction commitment in the first commitment period of 2008-2012. The uniqueness of Turkey's status within the climate change regime emanates from this position.

Turkey acceded to the UNFCCC as the 189th Party on 24 May 2004. Turkey became Party to the Kyoto Protocol on 26 August 2009, after the deposit of instrument of accession to the United Nations following the adoption of the Law (No. 5836) approving Turkey's accession to the Kyoto Protocol to the United Nations Framework Convention on Climate Change by the Turkish Grand National Assembly on 5 February 2009 and adoption by the Council of Ministers of the Cabinet Decree (No. 2009/14979) on 13 May 2009. As Turkey was not a Party to the UNFCCC at the time the Protocol was adopted, it was not included in the Annex B of the Protocol which defined quantified emissions limitation or reduction commitments for Annex I parties. Therefore, Turkey does not have a quantified emissions limitation or reduction commitment in the first commitment period between the years 2008-2012 under the Protocol[7].

[6] COP, 6th Session, Part 2

[7] www.iklim.cob.gov.tr

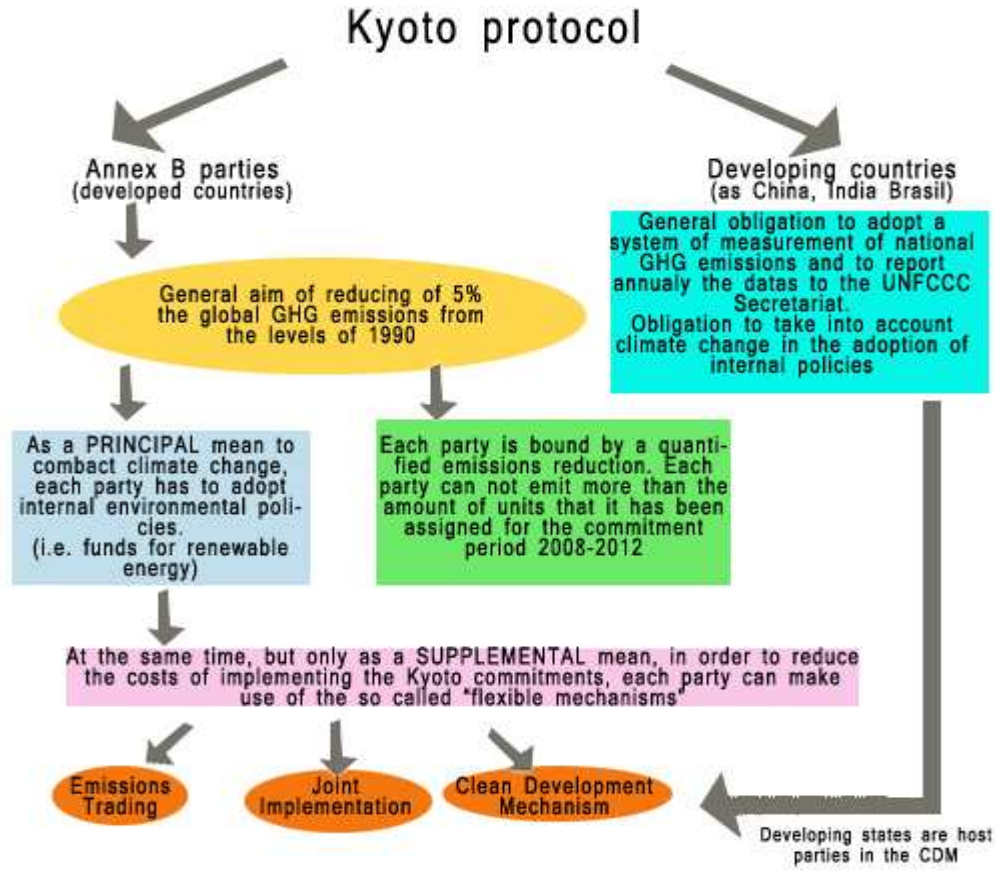

Figure 2.4 : Kyoto Protocol Source: Kyoto Chiama Italia[8]

2.2.3. Kyoto Mechanisms

Three “mechanisms” were implemented in the protocol which are namely the clean development mechanism, joint implementation and emissions trading.

Clean Development Mechanism (CDM):

The Clean Development Mechanism (CDM) is one of the "flexible" mechanisms defined in the Kyoto Protocol (IPCC, 2007). The main objectives of the CDM are to encourage the development and utilization of activities and technologies that produce less greenhouse gas emissions in non-Annex I countries and to diminish the economic burden of the emission reductions constraint for Annex I countries. Additionally it should foster the sustainable development in the host country as well as technology transfer to developing countries.

[8] http://www.kyotochiamaitalia.com/faqs/langswitch_lang/en/

The CDM is a project mechanism and it allows emission-reduction projects in developing countries to earn certified emission reduction (CER) credits, each equivalent to one tonne of CO_2. These CERs can be traded and used by industrialized countries to meet a part of their emission reduction targets under the Kyoto Protocol.
The mechanism stimulates sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction targets.
The CDM is the main source of income for the UNFCCC Adaptation Fund, which was established to finance adaptation projects and programmes in developing country Parties to the Kyoto Protocol that are particularly vulnerable to the adverse effects of climate change. The Adaptation Fund is financed by a 2% levy on CERs issued by the CDM.
An example of a CDM Project would be a biomass or solar plant in a developing country like India, with technology and know-how from an Annex I country like Germany rather than adopting a lower cost incineration plant or coal power station. The reduction emissions are credited towards the Annex I country's/company's emission reduction commitment.
CDM provides the opportunity to Annex I and non-Annex I countries, to design projects which reduce more greenhouse gas emissions than under business-as-usual conditions. The aim of these tools is to provide support to Annex I Parties in cost reduction. These costs emerge during meeting their emissions objectives by taking benefits of opportunities to reduce emissions which cost less in other countries than at home.
Below some requirements are given in order to participate in the mechanisms by Annex I Parties[9]:
Ratification of the Kyoto Protocol, calculation of their assigned amount in accordance with Articles 3.7 and 3.8 and Annex B of the Protocol in terms of tonnes of CO_2-equivalent emissions, establishment of national valid regulation in order to anticipate emissions and removals of greenhouse gases within their territory,

[9] http://unfccc.int/kyoto_protocol/mechanisms/items/1673.php

Establishment of national valid registry to define, record and track the creation and movement of ERUs, CERs, AAUs and RMUs and annual reporting the information to the secretariat, report information on emissions and removals to the secretariat annually.

Joint Implementation (JI):

It is also known as a "Project Mechanism". This is the combined effort by Annex I countries to enable these countries to obtain emission credits by investing in an emission reduction project from another Annex I country, which in return receives the financing and the technology transfer[10].

A JI project might involve, for example, replacing a coal-fired power plant with a more efficient combined heat and power plant. Most JI projects are expected to take place in so-called "economies in transition," noted in Annex B of the Kyoto Protocol. Emission reductions credits which are awarded are called Emission Reduction Units (ERUs), where one ERU represents an emission reduction equaling one tonne of CO_2 equivalent. The ERUs come from the host country's pool of assigned emissions credits, known as Assigned Amount Units, or AAUs. Each Annex I party has a predetermined amount of AAUs, calculated on the basis of its 1990 greenhouse gas emission levels. By requiring JI credits to come from a host country's pool of AAUs, the Kyoto Protocol ensures that the total amount of emissions credits among Annex I parties does not change for the duration of the Kyoto Protocol's first commitment period.

Emissions Trading (ET):

Greenhouse gas emissions – a new commodity. Parties with commitments under the Kyoto Protocol (Annex B Parties) have accepted targets for limiting or reducing emissions. These targets are expressed as levels of allowed emissions, or "assigned

[10] As it is assumed that some countries will have lesser emissions than their commitments, such as several countries with economies in transition (EITs) that do not have to reduce greenhouse gases.

amounts," over the 2008-2012 commitment period. The allowed emissions are divided into "assigned amount units" (AAUs).

Emissions trading, as set out in Article 17 of the Kyoto Protocol, allows countries that have emission units to spare - emissions permitted them but not "used" - to sell this excess capacity to countries that are over their targets. Thus, a new commodity was created in the form of emission reductions or removals. Since carbon dioxide is the principal greenhouse gas, people speak simply of trading in carbon. Carbon is now tracked and traded like any other commodity[11]:

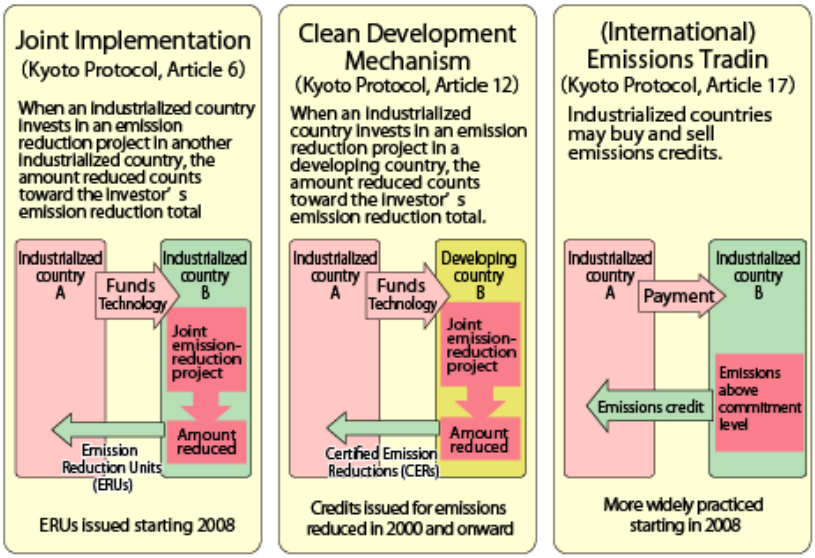

Figure 2.5 : Kyoto Mechanisms[12]

2.3. European Emissions Trading System (EU ETS)

The EU ETS was inspired by the Kyoto Protocol but it is also independent of it. The EU ETS would not exist if it were not for the Kyoto Protocol and it is the "flagship measure" by which the member states of the EU will meet their obligations under the Kyoto Protocol during the first commitment period from 2008 to2012[13].

Yet, the EU ETS exists independently of the Kyoto Protocol. It was enacted before the Kyoto Protocol became legally binding in international and EU law and it would

[11] http://unfccc.int/kyoto_protocol/mechanisms/emissions_trading/items/2731.php

[12] Japan's Ministry of the Environment: http://www.snm.co.jp/recruit/lecture/biomass_03.html

[13] Delbeke (ed.),2006

have become operational even if the Kyoto Protocol had not entered into force in February 2005. In particular, the trial or first trading period from 2005 to 2007 was wholly outside of the Kyoto Protocol, although conceived as a means of ensuring the EU's compliance with the Kyoto Protocol during 2008-12. Finally, the EU ETS has been revised through the adoption of Directive 2009/29/EC. The revised Directive takes effect from 1 January 2013 to 31 December 2020.

The EU ETS is a classic cap-and-trade system. However, it also contains some significant design differences from those reflected in cap-and-trade systems for other emissions that have been implemented in the U.S. The common features are that 1) an absolute quantity limit (or cap) on CO_2 emissions has been placed on some 12,000 emitting facilities located in the European Union, 2) tradable allowances have been distributed to these facilities (typically for free) in an amount equal to the cap, and 3) these facilities must measure and report their CO_2 emissions and subsequently surrender an allowance for every ton of CO_2 they emit during annual compliance periods. The primary differences from U.S. experience with cap-and-trade mechanisms relate to how the cap is set, the process for allocating emission allowances, banking and borrowing provisions, the monitoring, reporting, and verification procedures, and the linking or off-system provisions.

While the basic outline of the EU ETS was established during the trial period, significant changes in the design of the system have been proposed by the European Commission in a set of amendments to the Emissions Trading Directive, the authorizing legislation for the EU ETS, which was made public in late January 2008. These proposed amendments resulted from a process that was mandated by the Directive, known as the ETS Review.

The Cap-setting Process

A first important difference between the EU ETS and the classic cap-and-trade model is the decentralized nature by which the cap has been determined. There was no initially determined overall limit; it was the sum of 25 (now 27) separate decisions concerning the total number of European Union Allowances (EUAs) that each member state could distribute to affected installations within its jurisdiction.

Each member state proposed a quantity of EUAs, but that quantity was subject to review and approval by the European Commission according to procedures and criteria specified in the EU Emissions Trading Directive.

A second significant difference is that the long-term trajectory of the overall cap and of the member state allocations was not known initially since the decentralized cap-setting process is repeated for relatively short sequential multi-year "trading periods." The EU ETS Directive mandated a first, three year trading period for 2005-07, often called the pilot or trial phase, to be followed by a second, five-year trading period for 2008-12 that corresponds to the First Commitment Period under the Kyoto Protocol, and subsequent post-2012 trading periods. The cap for the first period was determined in mid-2005 and the 2008-12 cap was not finalized until late 2007, just before the second trading period began.

For the period after 2012, the European Council has declared that the EU's greenhouse gas (GHG) emissions will be at least 20 percent lower than the 1990 level by 2020. This goal has been translated into more concrete terms in the recently released amendments which shows that the next trading period be eight years long, from 2013 through 2020, and that the annual cap for the EU ETS will decline indefinitely at an annual rate of 1.74 percent.

Temporal Trading: Banking and Borrowing

Another notable feature of the EU ETS is that effectively there is no restriction on banking or borrowing of allowances within any given multi-year trading period. Allowances are issued annually but they are valid for covering emissions in any year within the trading period. Moreover, each year's issuance of allowances occurs at the end of February, two months before allowances must be surrendered for the preceding year. As a consequence, installations can cover shortages in any given year by allowances issued for the next year. This arrangement effectively allows year-ahead borrowing within the trading period. The rules governing trading between trading periods are, however, more complicated. Most importantly, no banking or borrowing was allowed between the first (2005-2007) and second (2008-2012) trading periods. This limitation effectively made the trial period self-contained and it

is one of the major design flaws of the trial period. However, the reason it was adopted is understandable: to prevent any compliance failures during the trial period from spilling over into the second trading period and thereby complicating the attainment of the EU's commitments under the Kyoto Protocol. For the second and subsequent trading periods, unrestricted inter-period banking, but not borrowing, will be allowed.

The Linking Directive

An important but less noticed complement to the Emissions Trading Directive is the Linking Directive, which was formally adopted in November 2004. Up to a certain limit, it allows affected installations to comply by submitting qualifying credits for emission reductions accomplished outside of the European Union. The only credits allowed are those created through the provisions of the Kyoto Protocol relating to the Clean Development Mechanism (CDM) or Joint Implementation (JI) and known respectively as Certified Emission Reductions (CERs) and Emission Reduction Units (ERUs). Even so, credits generated by certain CDM activities cannot be used for compliance in the EU ETS, namely, those associated with nuclear power and from CO_2 sinks. Interestingly, however, credits generated by non-CO_2 GHG emission reduction projects outside the EU are acceptable.

The use of these credits by EU ETS installations for meeting compliance requirements is limited to be consistent with the supplementarity criterion of the Kyoto Protocol. This criterion aims at ensuring that a significant proportion of the expected reduction of emissions occurs within each country. While no specific limit is specified in the Kyoto Protocol, this criterion is generally understood to imply that at least half of the reduction implied by the country's assigned limit must be accomplished domestically. In the case of the EU ETS, this limit on CER and ERU use is specified as a percentage of the allocation to an installation for most member states. Thus, if an installation's allocation were 100, its emissions 115, and the limit on CER/ERU use 10 percent, it could use only 10 CERs or ERU's for compliance. The remaining 105 allowances must be EUAs. This limit is specified in each member

state's National Allocation Plan (NAP) and it varies among member states and, in some cases, even by sectors within a member state.

While the Linking Directive concerns only project-based credits, the ETS Directive anticipates future links with other compatible cap-and-trade systems whereby the allowances from the two systems would be interchangeable without limit. Moreover, the pre-existing Agreement with the European Economic Area (Norway, Iceland, and Liechtenstein) establishes a procedure whereby new Community legislation can become part of the national legislation of these countries. Pursuant to the latter, Norway's pre-existing but now expanded CO_2 cap-and-trade system was effectively linked to the EU ETS as of January 1, 2008.

2.4. Coverage

Coverage in emission trading deals with the sources or categories of emitters that are involved in the emission trading scheme as well as the gases covered. There are six different greenhouse gases from a wide range of sources listed in Annex A of the Kyoto Protocol.

The selection of the coverage of gases through a trading regime is mostly interconnected with the coverage of the sources and the measurability of the emissions of gases by those sources, which is determined by the diffuse nature of the sources of the emissions and the uncertainty related to the estimation or measurability of the quantities of those emissions[14].

The reason for this is that some of the greenhouse gases are only emitted in small quantities by the source covered by the regime, while some greenhouse gas emissions from specific sources also have a considerable degree of uncertainty in relation to the measurement of their emission. There are also different political motivations for covering certain sectors[15]. The EU Emission Trading Directive, for example, limited so far the coverage of gases to CO_2.

[14] Lefevere, Jurgen, The EU Greenhouse Gas Emission Allowance Trading Scheme, 2005

[15] Baron, R. & S. Bygrave, Towards International Emissions Trading, 2002

More recently, Phase III of the EU ETS is accepted and will run from 1 January 2013 to 31 December 2020. In the context of 2020 climate change package, a new Directive reforms the structure of the EU ETS for Phase III different from the first two phases. In the new period, there will be more challenging emission reduction targets on installations subject to the EU ETS. Additionally, free allocation of allowances which took part in the first two phases will be gradually phased-out and will be replaced with a system of allowance allocations through auctions and moreover the coverage of gases will not be limited to CO_2. Coverage will be broadened to other greenhouse gases.

2.5. Carbon Market

The carbon market is the whole market including EU-ETS, JI and CDM transactions as well as transactions between countries under Art.17 of the Kyoto-protocol.

The basic objective of carbon markets is the achievement of an environmental target at the lowest cost possible for participants. Political choices are thus vital regarding to the scope of the market, the definition of the effort required and the allocation methodology. These choices can be made by different regulators: at the international level in the context of international negotiations between countries (e.g. the Kyoto Protocol); at a multinational level to achieve a common objective (e.g. the EU ETS in Europe); or at a national or local level to achieve domestic emissions reductions (e.g. RGGI, Norway's ETS from 2005 to 2007).

In all of these cases, the design of carbon markets has to take into account four parameters. It should define the permit volumes through initial allocation, should ensure a reliable measure and control of emissions, should set up a registry that keeps track of all permit exchanges and should allow flexibility both over time, through budgeting, banking and borrowing, and over space through offset mechanisms.

Figure 2.6 and Figure 2.7 show the rapid development of carbon markets between years 2005 to 2010. Then, this acceleration stalls due to economical causes.

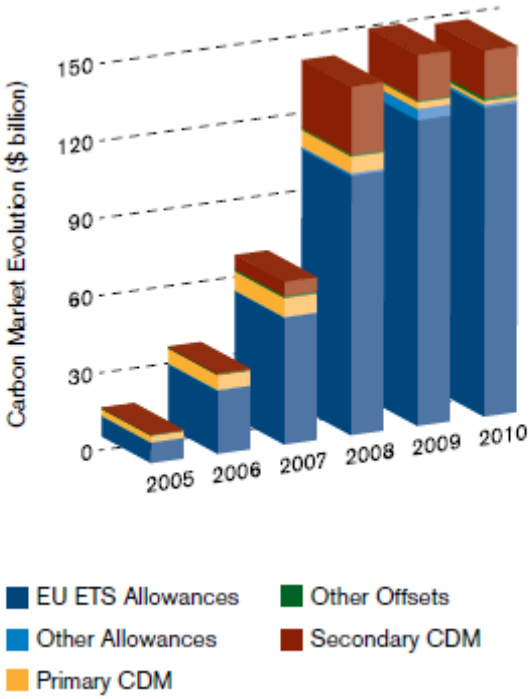

Figure 2.6: Carbon Market at a Glance, Market Values, 2004-2010[16]

Carbon Market Evolution, values ($ billion), 2004–10						
	EU ETS Allowances	Other Allowances	Primary CDM	Secondary CDM	Other Offsets	Total
2005	7.9	0.1	2.6	0.2	0.3	11.0
2006	24.4	0.3	5.8	0.4	0.3	31.2
2007	49.1	0.3	7.4	5.5	0.8	63.0
2008	100.5	1.0	6.5	26.3	0.8	135.1
2009	118.5	4.3	2.7	17.5	0.7	143.7
2010	119.8	1.1	1.5	18.3	1.2	141.9

Figure 2.7: Carbon Market at a Glance, Market Values, 2004-2010[17]

According to analysis by Thomson Reuters Point Carbon, the volume of carbon traded globally will continue in 2012 to grow, by 13%. It will reach to the level of 9.5 Gt CO_{2e}, despite depressed prices. Most of this year's growth in volumes will come from the 7bn EU Allowances (EUAs) and 2.2bn Certified Emissions Reductions (CERs) that will change hands this year, up from 6bn and 2bn in 2011. Activity within the EU ETS will be higher as utility hedging and portfolio

[16] [17] Carbon Finance at the World Bank, State and Trends of the Carbon Market, 2011

management transition from phase 2 of the scheme, which ends this year, to phase 3. For phase 3, CERs from industrial gas projects are banned, which should lead to higher secondary trading of the credits this year.

According to Point Carbon, volumes traded on global carbon markets will stall as the market awaits the next wave of emission reduction programmes in 2015. The overall value of the markets will drop in 2012 to €61bn ($80bn). It was €96bn in 2011. It means a 36% of reduction is expected.

Figure 2.8 : EUA Market Prices Development (16.01.2012: 6,64€/tCO_2 -15.02.2012: 7,89€/tCO_2)
Source: http://www.carbonplace.eu (15.02.2012)

Figure 2.9 : CER Market Prices Development (16.01.2012: 3,64€/tCO_2 -15.02.2012: 4,02€/tCO_2)
Source: http://www.carbonplace.eu (15.02.2012)

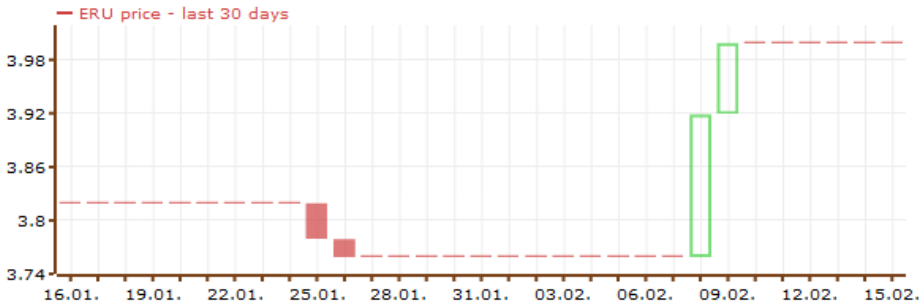

Figure 2.10 : ERU Market Prices Development (16.01.2012: 3,82€/tCO_2 -15.02.2012: 4,00€/tCO_2)
Source: http://www.carbonplace.eu (15.02.2012)

Some actual data are collected in order to show current market prices for EUA, CER and ERU and given in the above figures.

EUAs versus CERs

There are two main differences. The EU ETS only covers carbon dioxide emissions while the CDM covers all Kyoto GHG emissions. The EU ETS has only one aggregate market while CDM is divided into a primary and a secondary market where CERs have different pricing levels.

CERs or ERUs, the Kyoto credits linked to CDM and JI projects, also cover one ton of CO_2 and are valid in the EU-ETS. For compliance purposes, an installation can use EUAs, CERs and/or ERUs. Under Phase II of the EU ETS (2008-2012) the Governments have set a limit (%) on the use of project credits (CERs) at an installation level. This limit is based upon allocation not amount emitted. What is interesting when comparing the prices for EUAs and CERs is that always the trend of the prices is parallel, but CERs are 2-3 Euro cheaper than EUAs.

Actual Analysis of the Carbon Market

Cold weather conditions strengthened emissions. Economic and political situation in the EU kept limiting EUAs' up-sides. Much was driven by the prevailing uncertainty related to the protracted negotiations on sovereign debt restructuring in Greece.

One of the most important consequences of the nuclear disaster at Fukushima is the effect on carbon dioxide emissions. Two of the world's six largest emitters are switching off their nuclear power stations, leaving them needing to source energy from elsewhere. Germany has permanently shut eight of its older nuclear reactors and promised to close the remaining nine by 2022. The US and UK still intend to resume building nuclear power after a long pause. China, India and France all aim to carry on as before. Italy and Switzerland have decided to abandon plans for future plants, but existing plants will live out their remaining lives.

Some analysts say the shutdowns will push up German CO_2 emissions by between 40 million and 60 million tonnes a year - about 6 per cent - depending on what replaces them. In Japan, a permanent shutdown would boost annual CO_2 emissions by 60

million tonnes - or more than 5 percent - as the nation draws extra power from burning fossil fuels, according to the country's Institute of Energy Economics.

A wave of cold weather in Europe, however, may support allowances for a while. With decreasing temperature in Europe demand returned to the emission markets with increased activity from the European utilities.

Despite the coal prices strengthening over the last 10 days by $ 2, recent months saw price of coal in terms of euro hold steady in the range between € 81 to € 86/t. Likewise, Brent prices stabilized in the recent weeks, moving between $ 110-115/barel. In spite of unfavorable economic developments in the world, oil continues to hold above $ 100, affected by social unrest in Nigeria and the international pressure on Iran. After last week's approval of the EU sanctions on Iranian oil, Teheran threatened that it could stop oil supplies to Europe immediately. Iran, however, needs to sell oil and such a move could jeopardize its reputation as a reliable oil exporter.

Higher prices of energy commodities limited EUAs' downsides. EUA prices dec12 strengthened from € 6.99 to € 8.23 during the past week, even though EUAs auctions by Germany, Greece and Lithuania flooded market with 2.6 million new emissions. Surprisingly, these auctions reached good prices and showed that the market is still able to absorb some more EUAs.

The prices of CERs largely tracked the movement of EU allowances. Yet they responded slowly to the market developments, what extended the EUA-CER spread to almost € 4. In the first weeks of 2012 almost 36 million new CERs were issued, while the price moved between € 3.6 and € 4.

Growing supply of credits in the EU ETS raises concerns among many policymakers. There is growing support for the withdrawal of allowances from the EU ETS cap, but given the current economic situation in Europe, higher prices of carbon can be hard to digest by some national politicians. However, even the EU admits that current prices do not incentivize companies to invest in the decarbonisation and green investments. As it also admits, current overallocation in the EU ETS might reach between 2008 and 2020 almost 2.4 billion tons and hence removing some EUAs from the overall cap seems to be inevitable.

So far there are two discussed alternatives how to withdraw EUAs from the market. The first proposal is to remove EUAs from the overall cap in 2013-2020 through the Directive on energy efficiency. This was discussed by the EP in December 2011. Proposals to withdraw either 1.4 billion tons or significant amount of EUAs are waiting for further discussion and consent from the Industrial committee of the EP. The second option is related to deepening the EU's commitment to reduce emissions from 20 pc to 30 pc by 2020, what is partially supported by 8 EU countries. Both options, however, require a lengthy legislative process.

As it can be seen from the statements above which were taken from Green Weekly, the market prices are tightly connected with macro-economical, micro-economical, environmental, political and legal issues.

2.6. Allocation of Allowances

The cumulative emissions allowed in a trading system is shared through allocation in the forms of permits, rights or allowances. There are two typicalallocation methods in a trading scheme as free allocation and auctioning[18].

A free allocation is generally based on historic emissions – 'grandfathering'- or on a baseline relative to actual activity as in baseline-and-credit scheme. In process of grandfathering, the allocation of allowances is costless and is closely related to the levels of the past emissions. The base period or historical emissions principle begins from emissions in a selected period such as a year or an average over a couple of years. The meaning of "grandfathering" refers to allocations utilizing different benchmarks, for example on an historical basis related emissions per unit output. On the other side, the term "auctioning" defines the auctioning of the allowances to the sources covered under the regime, where the amount allocated to a source depends on the price it is willing to pay for the allowances. Participants of auctions in the trading system should purchase the allowances from the government in order to achieve their targeted emissions. The revenues of this kind of transaction are then returned back into the economy, for example by means of reducing other taxes or using the money for climate measures. One of the advantages of auctioning

[18] Steffen Brunner, et.al., Emission Trading Systems, 2008

allowances is that it avoids the difficult negotiation of source-by-source allocations. Alternatively, each source concludes how many allowances it requires to purchase to achieve its projected emissions, and bid for these allowances on the marketplace.

3. Carbon Trading for Combating GHGs and its Implementation in Turkey

3.1. Climate Change and Turkey

The Decision 26/CP.7 recognizing Turkey's circumstances which differentiate the country from other Annex I parties provides a relevant cause for Turkey in seeking a fair status for its participation in the long term cooperative action, based on the principles of equity and common but differentiated responsibilities and respective capabilities as laid down by the Convention and referred by the decision.

A series of indicators relevant for climate change policies suggest that Turkey has different national circumstances which need to be taken into consideration in sharing the burdens among Parties. Among the indicators to be used, Turkey's historical responsibility in terms of concentration of greenhouse gases in the atmosphere and temperature increase, level of economic development, energy use per capita, GHG per capita, population growth account for its special national circumstances. Moreover, many parties to the negotiations under both the AWG-LCA and AWG-KP submitted views proposing lists of indicators to be considered as a basis of any decision in differentiating responsibilities among the Parties. Those proposed indicators would also be used to place Turkey's special circumstances as distinct from other Annex I Parties. The table below provides a key set of indicators supporting the fact that the special circumstances of Turkey are immensely vital for Turkey's participation in the Post-2012 regime.

Indicator	Turkey vs. Annex-I Countries		Turkey vs. Non Annex-I Countries	
Average Population Growth Rate (1990-2005)	+	• Higher than the Annex-I countries • EIT countries have negative population growth rates. • Turkey has a value close to all other analyzed non-Annex-I countries, except for Israel and Malaysia.		
Average Urban Population Growth Rate (1990 - 2005)	+	• Higher than all Annex–I countries		• The growth rate in Turkey is lower than Malaysia and China, higher than South Korea and Argentina.
Human Development Index (2007)	-	• Turkey ranked 79th out of 182 countries in 2007.	-	• Turkey is lower ranked than many non-Annex–I countries.
Per capita GDP (2005)	-	• Lower than that of all Annex–I countries, other than Belarus • Furhermore, Turkey is not at a		• Some of the Non-Annex I Countries with emerging economies and with no

		comparable level with other OECD countries and countries included in Annex I to the UNFCCC in terms of industrialization level.		quantitative emissions reduction commitments under the Kyoto Protocol hold higher per capita GDP values than Turkey.
Cumulative GHG Emissions (1850 - 2002)	-	• Throughout the whole period of 152 years, the 30% of the total GHGs emitted by the USA, 27% by EU countries, 8.1% by Russia and 7,6% by China. Turkey stands 31st with emissions ratio of 0.4%. The developed countries were responsible for 76% of the CO_2 emissions in 2002.		• A considerable number of non-Annex I countries have higher cumulative GHG emission than Turkey.
Per Capita Emissions (1990-2005)	-	• All Annex-I countries, including EIT countries, have higher per capita emissions than those of Turkey. • Per capita greenhouse gas emission value for 2007 is equivalent to 5.3 tons of CO_2. In the same period, per capita emission was equivalent to 15,0 tons of CO_2 in OECD countries, and 10.2 tons of CO_2 in 27 Member States of the European Union.		
Emissions per Gross National Product Carbon Dioxide Emissions Per GDP (Average Value for the Years between 1990-2004; Kg CO / 2000 PPP $ GDP)	-	• The carbon intensity of Turkey's economy is not only equal to the average of the Annex–I countries, but also that Turkey has a high carbon density among the Annex-I countries in terms of "Greenhouse Gas Emissions per Total Primary Energy Production".		
Primary Energy consumption per capita	-	• Turkey had a primary energy consumption value per capita equivalent to 1.29 tons of oil while the world average of such value was equivalent to 1.80 tons, and OECD average was equivalent to 4.70 tons of oil based on 2008 energy indicators.		
Climate Vulnerability		• Turkey is located in the Mediterranean Basin which is one of the regions to be most affected by the negative impacts of Climate Change (IPCC 4th Assessment Report- 2007).		

Table 3.1 : Climate Change Related Facts about Turkey[19]

Following the Decision 26/CP.7, deleting the Turkey from Annex II and recognizing the special circumstances of Turkey (within Annex-1 countries), accepting that Turkey is in a different situation from that of other Parties included in Annex I, adopted in the 7th Conference of Parties (COP-7) of the United Nations Framework Convention on Climate Change (UNFCCC), which was held in 2001 in Marrakech,

[19] Ministery of Environment and Forestry, 2009, Republic of Turkey, 2009

Turkey became a part of the UNFCCC on May 24, 2004. Turkey is a member of this union but due to late coming, Turkey does not have any reduction commitment in the first commitment period of 2008-2012. Due to her economic status, Turkey needs flexible mechanisms as were introduced by the Kyoto Protocol.

In order to determine the policies to be followed, measures to be taken and activities to be conducted by Turkey in the field of climate change, the Coordination Board on Climate Change (CBCC) was established pursuant to the Prime Ministry Circular no 2004/13. Under the Chairmanship of the Ministry of Environment and Forestry, this board is composed of high level representatives (Undersecretary and President) from the Ministry of Foreign Affairs, Ministry of Public Works and Settlement, Ministry of Transport and Communication, Ministry of Agriculture and Rural Affairs, Ministry of Industry and Trade, Ministry of Energy and Natural Resources, Undersecretariat of the State Planning Organization, and the Union of Chambers and Commodity Exchanges of Turkey. Ministry of Finance, Ministry of Health and Undersecretariat of Treasury are included in this Board through CBCC decision. Besides, 11 Technical Working Groups exist under this Board.

"The Bill on the Endorsement of Turkey's Ratification of the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC)" was adopted in the General Assembly of the Turkish Grand National Assembly on February 5, 2009. The Law No. 5836 is published in the Official Gazette No. 27144, dated February 17, 2009. Following the publication of Cabinet Decree on the "Ratification Instrument" declaring Turkey's accession to Kyoto Protocol in the Official Gazette dated May 13, 2009, the depositary of this Protocol, the UN Secretary General, has been notified on May 28, 2009. In accordance with the Article 25 of the Kyoto Protocol, Turkey officially became party to the Protocol on August 26, 2009, which is the ninetieth day following the date of deposit of the Ratification Instrument.

National Vision

Turkey's national vision within the scope of Climate Change is to become a country which has integrated its climate change policies into the development policies, has let the energy efficiency become widespread, has increased the use of clean and

renewable energy resources, and actively participates in the efforts to tackle climate change within the framework of its "special circumstances".

Basic Principles

Turkey's primary objective within the scope of global combat against climate change is to participate in the global efforts in preventing climate change, which are co-determined in cooperation with international parties in the light of objective and scientific findings, in accordance with the sustainable development policies, within the framework of the principle of common but differentiated responsibilities and the special circumstances of Turkey (within Annex-1 countries).

Objectives

Turkey's strategic objectives within the scope of these basic principles can be expressed as follows:

• integrate the policies and measures on combat against the climate change and attain the adaptation into the national development programs in coordination with the principle of "common but differentiated responsibilities", established in the UNFCCC, within the framework of its special circumstances (within Annex-1 countries);

• contribute in a most possible extend to the global emission reduction policies and measures by limiting the growth rate of greenhouse gas emissions, without disrupting the development program, coherent with sustainable development principles;

• increase national capacitance and disposition level for global climate change mitigation and alignment in order to share experiences and knowledge for being acquired, throughout the entire term of such efforts, on an international level;

• be effective within international activities in order to take part in the implementation and design of global strategic objectives concerning subjects of mitigation, alignment, technology transfer and finance by above all taking into consideration the responsibilities of the different parties;

• increase access to financial resources required for mitigation and alignment activities;

• take into consideration the current level of technology and development and consequently create the national and international financial resources and incentive mechanisms, which are aimed at developing not only the clean production technology R&D, but also the innovation capacity with the goal to increase the own competitiveness and production;

• ensure the own continuity in order to establish a smart mechanism which will develop transparent, participatory decision-making mechanisms based on scientific and analytical studies in accordance to the principle of governance with a view of effective coordination of the climate change mitigation and alignment activities;

• enlarge the human resources and the institutional capacity in climate change;

• raise public awareness by changing consumption patterns to have a low-carbon print, in collaboration with all stakeholders including the public sector, private sector, universities and NGOs;

• generate "Information Management" for exchange and continuous information flow, based on an integrated system for the national climate change efforts.[20]

Strategies

• Actively be part of the negotiations carried out to establish a comprehensive and functional international cooperation mechanism in order not only to combat against climate change but also to adapt to the global climate change;

• improve the "National Climate Change Action Plan" with a 'dynamic' approach going along with the 'National Climate Change Strategy' and the 'Ninth Development Program';

• restructure the organization chart concerning the Climate Change;

• establish a national portal through the 'Information Management' and exchange the approach and methodology in the process.

Basic information

The population of Turkey is around 78 million people in 2011 and the GDP is 956,6 billion US dolar. This steady growing of population and fluctuations in GDP growth can be seen in the figures below. During international economical crisis, the

[20] TURKEY Greenhouse Gas Inventory,1990 to 2009, Ankara, 2011.

population was increasing while GDP was sinking. Due to high unemployement ratio, GDP affected negatively.

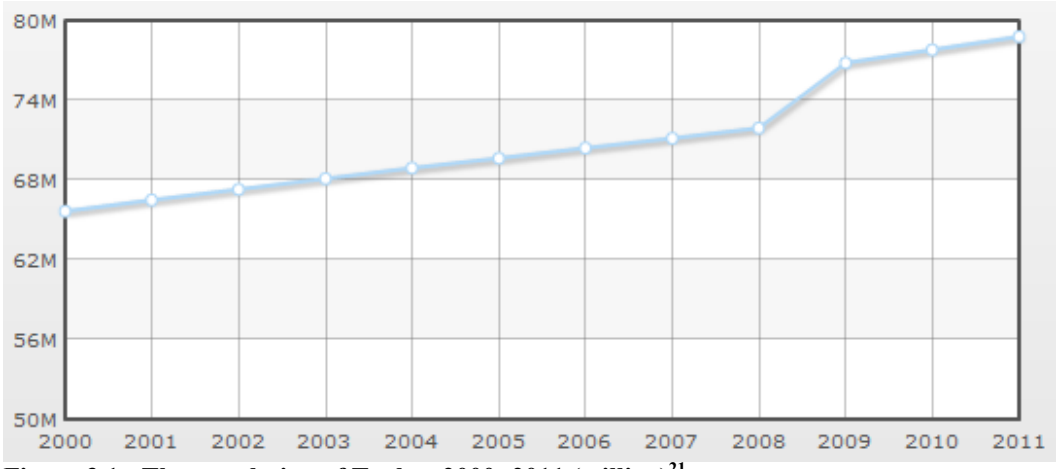

Figure 3.1 : The population of Turkey 2000 -2011 (million)[21]

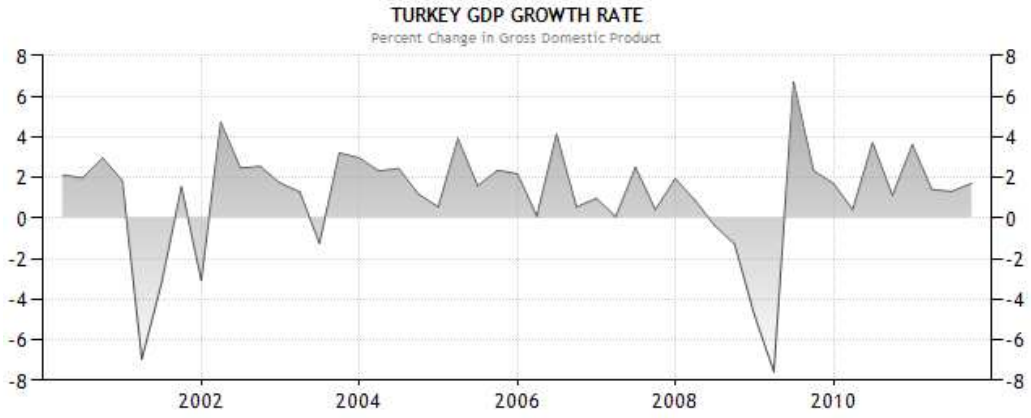

Figure 3.2 : Turkey GDP Growth Rate 2000 -2011 (million)[22]

[21] www.indexmundi.com **(25.12.2011)**

[22] **http://www.tradingeconomics.com/turkey/gdp-growth (25.12.2011)**

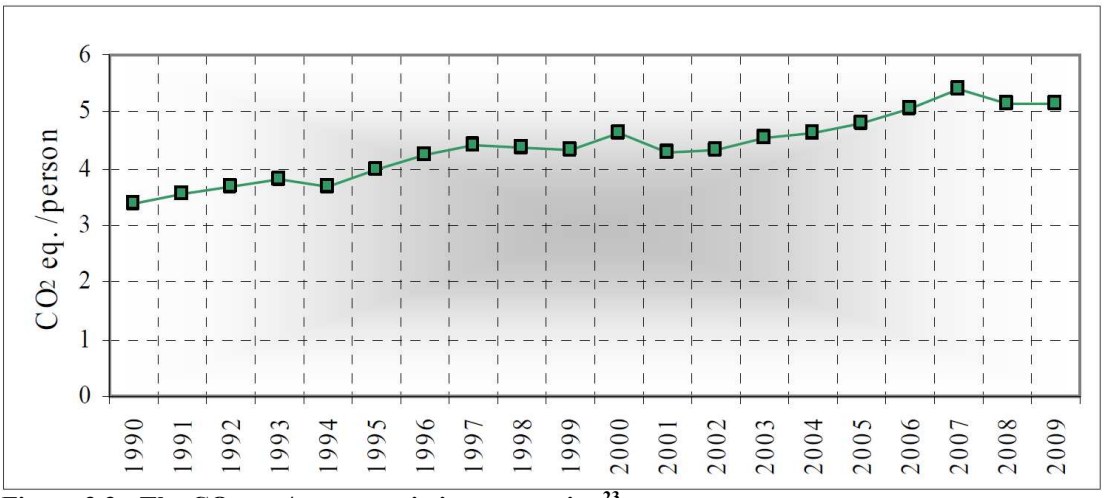

Figure 3.3 : The CO_2 eq. /person emission per capita [23]

The trend of the CO_2 emission per capita is increasing, regarding to upwards slope of industrial developments. The fluctuations throughout the years show a parallelism with the increase of total emissions of Turkey.

3.2. Turkey GHG Inventory, 1990 to 2009

In 2004, Turkey recognized the United Nations Framework Convention on Climate Change (UNFCCC). Turkey prepared its first national inventory report (NIR) and CRF tables for the period 1990 – 2004 and submitted to UNFCCC in 2006. Then in 2009, Turkey ratified the Kyoto Protocol. As an Annex I party of the Convention, Turkey is invited to prepare and originate annual inventories on emissions and removals of greenhouse gases (GHG), which are not taken in consideration by the Montreal Protocol, using the methodology approved by the UNFCCC. Turkey submits its national inventory report and CRF tables every year. National Inventory Report and CRF tables are prepared by Turkish Statistical Institute (TurkStat) and submitted to the UNFCCC Secretariat by TurkStat as the focal point of Turkish National Emission Inventory. Until now, Turkey has prepared its sixth NIR for the year 2009. Turkey is requested to periodically develop, update and make available national inventories of anthropogenic GHG emissions by sources and removals

[23] TURKEY Greenhouse Gas Inventory,1990 to 2009, Ankara 2011.

through the fact of sinking greenhouse gases, which are not taken in consideration by the Montreal Protocol, deploying comparable methodologies.

Emissions of the five direct greenhouse gases were mostly covered in the report. These were:

• Carbon dioxide

• Methane

• Nitrous oxide

• Hydrofluorocarbons

• Sulphur hexafluoride.

These gases contribute directly to climate change owing to their positive radiative forcing effect. Also the following four indirect greenhouse gases were reported:

• Nitrogen oxides (NOx)

• Carbon monoxide (CO)

• Non-methane volatile organic compounds (NMVOC)

• Sulphur dioxide (SO2)

In this National Inventory Report, the source categories according to the IPCC methodology, i.e. energy, industrial processes, agriculture, land-use, land use change and forestry (LULUCF), and wastes were considered.

The Turkish Statistical Institute (TurkStat) is designated to be responsible for the national inventory of greenhouse gases in Turkey. The inventory was prepared as a joint work by TurkStat, Ministry of Agriculture and Rural Affairs, Ministry of Environment and Forestry, Ministry of Transportation and Ministry of Energy and Natural Resources. The CRF reporter for each sub-source categories were prepared by related organizations and combined by TurkStat. The CRF data sets also contain key source, trend and uncertainty analysis. The key source category is one that is prioritised within the national inventory system because its estimate has a significant influence on a country's total inventory of direct greenhouse gases in terms of the absolute level of emissions and removals. In addition to key source analysis, the emission estimates have been prepared through the investigation of emissions trends. This trend assessment identifies source categories for which significant uncertainty in the estimate would have considerable affected on overall emission trends, and

therefore identifies source categories that diverge from the overall trend in national emissions.

Quantitative estimates of the uncertainties in the emissions were calculated using direct expert judgement. The total uncertainty is 12.1%, because of the high uncertain data of CO_2 uptake by forest.

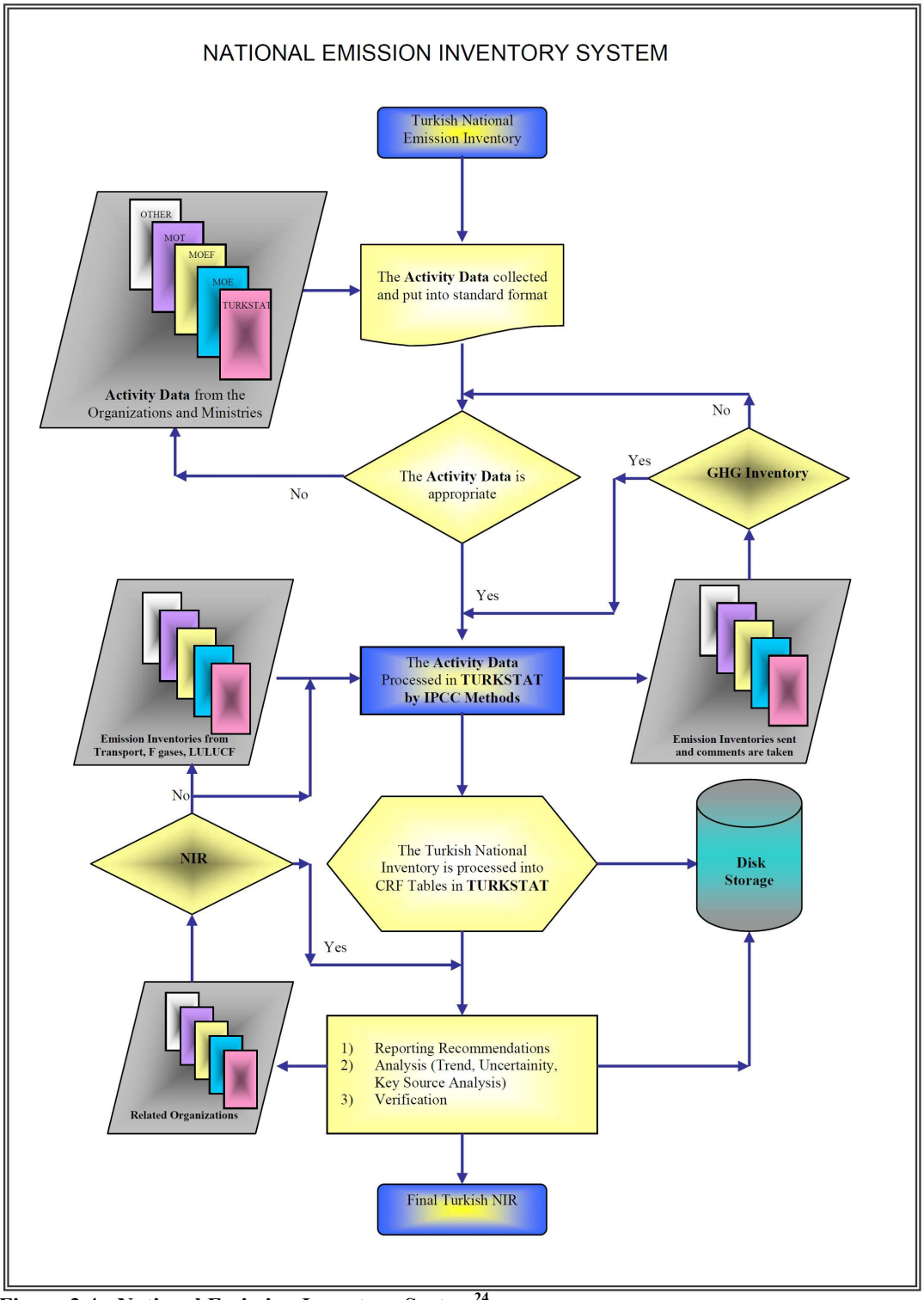

Figure 3.4 : National Emission Inventory System[24]

[24] TURKEY Greenhouse Gas Inventory,1990 to 2009, Ankara 2011

The table below gives summary data for greenhouse gas emissions for the years 1990-2009. The inventory for the year 1990 and 2009 revealed that the overall GHG emissions expressed in CO_2 equivalent were correspondingly 187.03 and 369.65 million tones not taking into account the sector Land use Change and Forestry (LUCF).

Total (million tones)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Energy	132.13	137.96	144.27	150.78	148.62	160.79	178.96	191.39	190.62	190.61	212.55	196.02	204.02	218.00	227.43	241.75	258.56	288.69	277.71	278.33
Industrial Processes	15.44	17.73	18.93	20.92	19.25	24.21	24.32	24.14	24.75	23.93	24.37	23.32	25.55	26.30	28.52	28.78	30.70	29.26	29.83	31.69
Solvent and Other Product Use	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Agriculture	29.78	30.35	30.33	30.51	29.19	28.68	29.10	27.66	28.36	28.61	27.37	25.96	24.51	25.36	25.01	25.84	26.50	26.31	25.04	25.70
Waste	9.68	13.09	16.70	19.46	20.09	23.83	26.24	28.69	30.31	31.62	32.72	32.81	32.12	33.09	31.30	33.52	33.88	35.71	33.92	33.93
Total (w/o land use)	187.03	199.13	210.23	221.66	217.15	237.51	258.62	271.88	274.05	274.78	297.01	278.11	286.20	302.75	312.26	329.90	349.64	379.98	366.50	369.65
Comp.to 1990 % (w/o land use)	**100.0**	**106.5**	**112.4**	**118.5**	**116.1**	**127.0**	**138.3**	**145.4**	**146.5**	**146.9**	**158.8**	**148.7**	**153.0**	**161.9**	**167.0**	**176.4**	**186.9**	**203.2**	**196.0**	**197.6**
Land use and land use change	-44.87	-56.31	-60.65	-60.26	-62.20	-61.84	-62.43	-64.34	-65.64	-66.45	-67.56	-72.12	-68.80	-67.56	-75.10	-69.53	-75.94	-76.27	-80.58	-82.53

Unit: Million tones

Table 3.2: Aggregated GHG emissions by sectors (CO_2 eq.)[25]

The analysis of above table shows that in 2009 the emissions from the energy sector was the largest portion with 75.3%, the emissions from waste disposal was the second largest with a value of 9.2%, and the emissions from industrial processes with an 8.6% shares the third place.

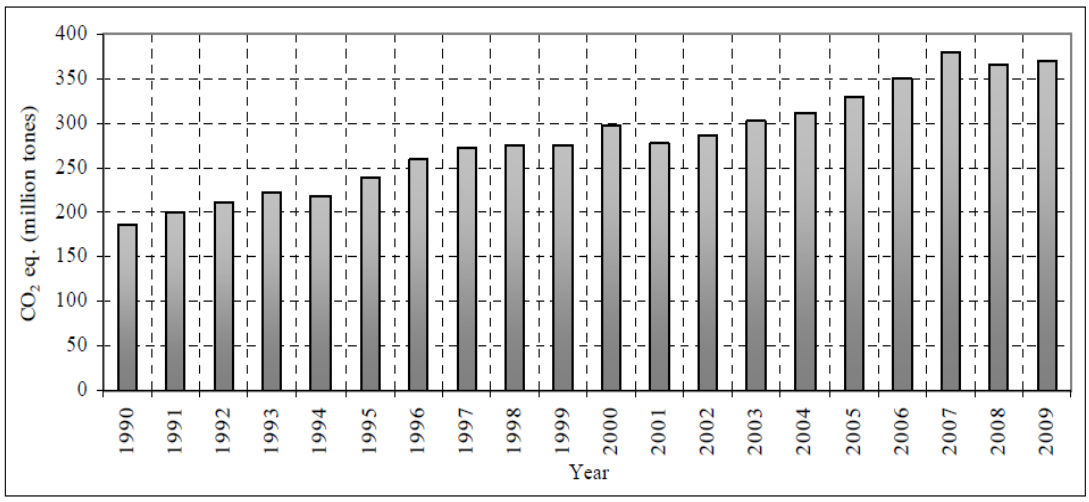

Figure 3.5 : Overall greenhouse gases emission trend (without Land use Change and Forestry[25]

[25] TURKEY Greenhouse Gas Inventory,1990 to 2009, Ankara 2011

Above figure presents the trend of the overall emissions during the period 1990-2009. It can be seen that the emissions for the year 2009 were 97.6% more than the emission of year 1990.

Total	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
CO_2	141.36	148.31	153.95	162.55	160.82	173.90	192.01	205.18	204.32	203.68	225.43	208.99	218.04	232.64	243.43	259.61	276.72	307.92	297.12	299.11
CH_4	33.50	37.56	41.02	43.33	43.71	46.87	49.31	50.59	51.90	53.14	53.30	52.74	50.43	51.63	49.37	52.38	53.33	55.58	54.29	54.37
N_20	11.57	12.51	14.58	15.10	12.02	16.22	16.40	14.98	16.65	16.93	16.62	14.69	15.32	15.67	16.00	14.18	15.55	12.35	11.57	12.53
PFCs	0.60	0.74	0.68	0.69	0.60	0.52	0.52	0.52	0.52	0.51	0.52	0.52	0.52	0.52	0.52	0.49	0.40	0.00	0.00	0.00
HFCs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.82	0.87	1.42	1.81	2.23	2.38	2.73	3.17	2.67	2.84
SF_6	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.61	0.66	0.52	0.32	0.31	0.48	0.48	0.70	0.86	0.91	0.95	0.84	0.80
Total (without LUCF)	187.03	199.13	210.23	221.66	217.15	237.51	258.62	271.88	274.05	274.78	297.01	278.11	286.20	302.75	312.26	329.90	349.64	379.98	366.50	369.65

Unit: Million tones

Table 3.3 : Aggregated GHG emissions without LUCF (CO_2 eq.)[26]

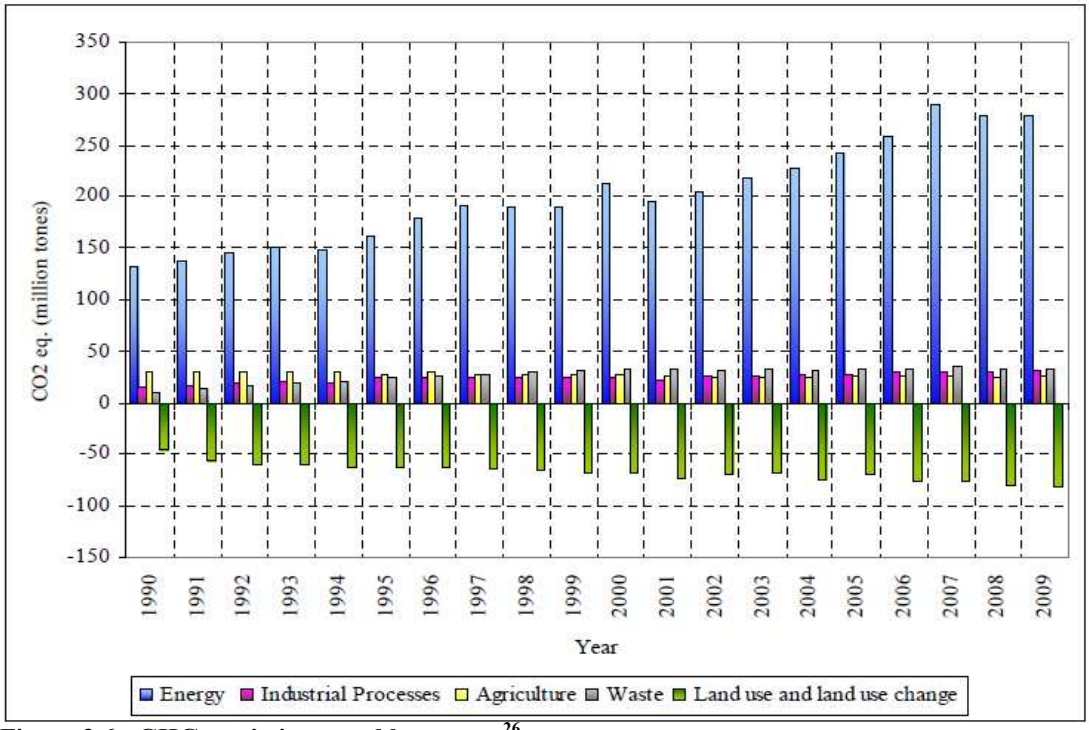

Figure 3.6 : GHGs emission trend by sectors[26]

Above figure presents the energy sector that forms the largest share of the overall emissions between the year 1990 and 2009.

[26] TURKEY Greenhouse Gas Inventory,1990 to 2009, Ankara 2011

%	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Energy	92.9	96.6	96.5	93.4	95.9	91.5	91.2	92.2	91.5	91.5	92.6	95.2	93.8	92.7	95.9	92.9	94.5	95.1	97.1	96.9
Industrial Processes	10.9	12.4	12.7	13.0	12.4	13.8	12.4	11.6	11.9	11.5	10.6	11.3	11.8	11.2	12.0	11.1	11.2	9.6	10.4	11.0
Agriculture	20.9	21.2	20.3	18.9	18.8	16.3	14.8	13.3	13.6	13.7	11.9	12.6	11.3	10.8	10.5	9.9	9.7	8.7	8.8	8.9
Waste	6.8	9.2	11.2	12.1	13.0	13.6	13.4	13.8	14.5	15.2	14.3	15.9	14.8	14.1	13.2	12.9	12.4	11.8	11.9	11.8
LUCF	-31.6	-39.4	-40.5	-37.3	-40.1	-35.2	-31.8	-31.0	-31.5	-31.9	-29.4	-35.0	-31.6	-28.7	-31.7	-26.7	-27.7	-25.1	-28.2	-28.7

Unit: (%)

Table 3.4: Contribution of sectors to the total emission (CO_2eq.)[27]

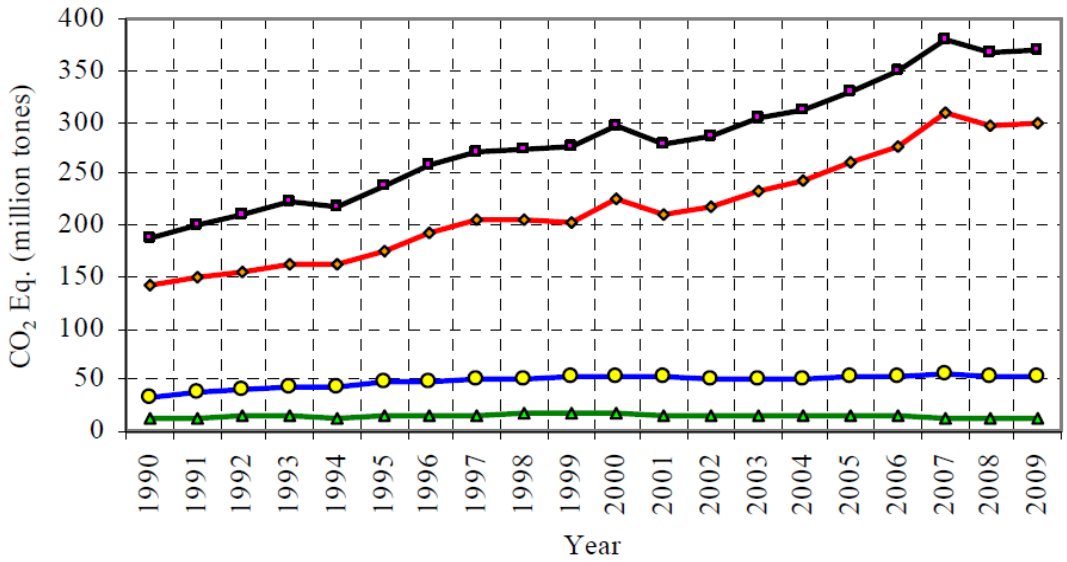

Figure 3.7: Emission trend of main GHGs (CO_2 eq.)[27]

It can be seen from the above figure that the trend of GHGs shows an increase up to the year 2007. This change was mainly the result of the changes occurring in energy sector and industrial processes. As Turkey is one of the fastest developing countries in recent years, due to new investments in industrial areas, the number of power plants using fossil fuels is increased. Additionally, due to high range of productions, transportation and the number of trucks on the roads has also increased. Therefore, GHGs emissions are augmented. The emission from the waste was constant compared to other sectors. However, the agricultural emission was decreasing throughout the years.

[27] TURKEY Greenhouse Gas Inventory,1990 to 2009, Ankara 2011

3.3. GHG Emission Control Action Plan 2011 Turkey

Depending upon country vision, basic principles, objectives and strategies, purposes and objectives of the National Climate Change Action Plan are determined in several areas such as energy, building, industry, transportation, waste, agriculture and land use & forestry.

Accordingly, as an example, the purposes of energy field are considered with several objectives. For instance; reducing energy intensity, increasing the share of clean energy in energy production and use, limitting GHG emissions originating from use of coal in electricity production by using clean coal technologies and taking efficiency-increasing measures, reducing losses and illicit use in electricity distribution are purposes of NCCAP in area of energy. Correspondingly, there is a range of objectives are specified in order to realise these purposes. Below given tables are illustrated for purposes and objectives of NCCAP 2011.

PURPOSE	OBJECTIVE
PURPOSE E1. Reducing energy intensity	OBJECTIVE E1.1. Reduce primary energy intensity by 10% compared to 2008 by 2015 as a result of implemented and planned policies and measures
	OBJECTIVE E1.2. Develop the capacity for energy efficiency by 2015
	OBJECTIVE E1.3. Support R&D activities on energy efficiency
	OBJECTIVE E1.4. Increase the amount of incentives given by MENR for energy efficiency applications by 100% until 2015
PURPOSE E2. Increase the share of clean energy in energy production and use	OBJECTIVE E2.1. Ensure that the share of renewable energy in electricity production is increased
	OBJECTIVE E2.2 Develop capacity by 2015 so as to increase utilization of renewable energy resources
	OBJECTIVE E2.3 Ensure technological development by 2020 for energy production from renewable energy resources
PURPOSE E3. Limit GHG emissions originating from use of coal in electricity production, by using clean coal technologies and taking efficiency-increasing measures	OBJECTIVE E3.1. Increase the average cycle efficiencies of existing coal-fired thermal power plants until 2023
PURPOSE E4. Reduce losses and illicit use in electricity distribution	OBJECTIVE E4.1. Reduce nationwide electricity distribution losses to 8% by 2023

Table 3.5: Purposes and Objectives of NCCAP in area of Energy[28]

[28] National Climate Change Action Plan 2011-2023, Republic of Turkey Ministry of Environment and Urbanization, Pg.84/196, July 2011, Ankara, ISBN: 978-605-393-097-6

PURPOSE	OBJECTIVE
PURPOSE B1. Increase energy efficiency in buildings	OBJECTIVE B1.1. Establish heat insulation and energy-efficient systems meeting standards in commercial and public buildings with usable areas larger than 10 thousand square meters and in at least 1 million residential buildings by 2023
	OBJECTIVE B1.2. Effective implementation of the Regulation on Energy Performance in Buildings (EPB) and other energy –efficiency regulations until 2017
	OBJECTIVE B1.3. Develop instruments that will provide the necessary financial support with regard to energy efficiency, renewable energy and EPB until the end of 2013
	OBJECTIVE B1.4. Issuing "Energy Performance Certificates" to all buildings until 2017
	OBJECTIVE B1.5 Decrease annual energy consumption in the buildings and premises of public institutions by 10% until 2015 and by 20% until 2023
PURPOSE B2. Increase renewable energy use in buildings	OBJECTIVE B2. 1. At least 20% of the annual energy demand of new buildings met via renewable energy resources as of 2017
PURPOSE B3. Limit greenhouse gas emissions originating from settlements	OBJECTIVE B3.1. Reduce greenhouse gas emissions in new settlements by at least 10% per settlement in comparison to existing settlements (which are selected as pilot and the greenhouse gas emissions of which are identified until 2015) until 2023

Table 3.6 : Purposes and Objectives of NCCAP in area of Building[29]

PURPOSE	OBJECTIVE
PURPOSE S1. Increase energy efficiency in the industry sector	OBJECTIVE S1.1. Making legal arrangements for energy efficiency and limitation of greenhouse gas emissions
	OBJECTIVE S1.2 Limiting GHG emissions originating from energy usage (including electrical energy share) in the industry sector
PURPOSE S2. Decrease the CO_2 equivalent intensity per GDP produced in the industrial sector until 2023	OBJECTIVE S2.1. Developing the financial and technical infrastructure for limitation of GHG emissions
	OBJECTIVE S2.2. Develop and use new technologies for limitation of GHG emissions in the industry sector until 2023
PURPOSE S3. Strengthen the capacity of the industry sector for combating climate change	OBJECTIVE S3.1. Building the information infrastructure for limitation of GHG emissions in the industry sector until 2015

Table 3.7 : Purposes and Objectives of NCCAP in area of Industry[30]

[29] National Climate Change Action Plan 2011-2023, Republic of Turkey Ministry of Environment and Urbanization, Pg.85/196, July 2011, Ankara, ISBN: 978-605-393-097-6

[30] National Climate Change Action Plan 2011-2023, Republic of Turkey Ministry of Environment and Urbanization, Pg.85/196, July 2011, Ankara, ISBN: 978-605-393-097-6

PURPOSE U1.Developing an intermodal transport system and ensuring balanced utilization of transport modes in freight and passenger transport	OBJECTIVE U1.1. Increasing the share of railroads in freight transportation (which was 5% in 2009) to 15% and in passenger transportation (which was 2% in 2009) to 10% by 2023
	OBJECTIVE U1.2. Increasing the share of seaways in cabotage freight transportation (which was 2.66% in ton-km in 2009) to 10%, and in passenger transportation (which was 0.37% in passenger-km in 2009) to 4% as of 2023
	OBJECTIVE U1.3. Decreasing the share of highways in freight transportation (which was 80.63% in ton-km in 2009) below 60%, and in passenger transport (which was 89.59 in passenger-km in 2009) to 72% as of 2023
	OBJECTIVE U1.4. Preparing and putting in practice the "Transportation Master Plan" until 2023
PURPOSE U2: Restructuring urban transportation in line with sustainable transport principles	OBJECTIVE U2.1. Limiting emission increase rate of individual vehicles in intracity transport
	OBJECTIVE U2.2. Developing the necessary legislation, institutional structure and guidance documents until the end of 2023 for implementation of sustainable transport planning in cities
PURPOSE U3: Dissemination of the use of alternative fuels and clean vehicle technologies in the transport sector	OBJECTIVE U3.1. Making legal arrangements and building capacity to increase use of alternative fuels and clean vehicles until 2023
	OBJECTIVE U3.2. Taking local measures to encourage use of alternative fuel and clean vehicles in urban transport until 2023
PURPOSE U4. Increasing efficiency in energy consumption of transportation sector	OBJECTIVE U4.1. Limiting the energy consumption in transport until 2023
PURPOSE U5. Developing the information infrastructure in the transport sector	OBJECTIVE U5.1. Building a well-organized, reliable and sustainable information infrastructure with transport and travel data including GHG emission data, until the end of 2016

Table 3.8 : Purposes and Objectives of NCCAP in area of Transportation[31]

PURPOSE	OBJECTIVE
PURPOSE A1. Ensure Effective Waste Management	OBJECTIVE A1.1. Reduce the quantity of biodegradable wastes admitted to landfill sites, taking year 2005 as a basis, by 75% in weight till 2015, by 50% till 2018 and by 35% till 2025
	OBJECTIVE A1.2. Establish integrated solid waste disposal facilities across the country, and dispose 100% of municipal wastes in these facilities, until the end of 2023
	OBJECTIVE A1.3. Finalize Packaging Waste Management Plans
	OBJECTIVE A1.4. Establish the recycling facilities foreseen within the scope of the Solid Waste Master Plan with the EU-aligned Integrated Waste Management approach
	OBJECTIVE A1.5. Termination of uncontrolled disposal of wastes 100% by 2023

Table 3.9 : Purposes and Objectives of NCCAP in area of Waste[32]

[31] National Climate Change Action Plan 2011-2023, Republic of Turkey Ministry of Environment and Urbanization, Pg.86/196, July 2011, Ankara, ISBN: 978-605-393-097-6

[32] National Climate Change Action Plan 2011-2023, Republic of Turkey Ministry of Environment and Urbanization, Pg.86/196, July 2011, Ankara, ISBN: 978-605-393-097-6

PURPOSE	OBJECTIVE
PURPOSE T1. Increase the sink capacity of the agriculture sector	OBJECTIVE T1.1. Determine and increase the quantity of carbon stock captured in the soil
	OBJECTIVE T1.2. Identifying and increasing topsoil and subsoil biomass
PURPOSE T2. Limitation of greenhouse gas emissions from agriculture sector	OBJECTIVE T2.1. Identify the potential GHG emissions limitation in agriculture sector
	OBJECTIVE T2.2. Decrease the increase rate of GHG emissions originating from vegetal and animal production
PURPOSE T3. Develop information infrastructure and capacity in the agriculture sector	OBJECTIVE T3.1. Build the information infrastructure that will meet the needs of the agriculture sector in adapting to and combating climate change

Table 3.10 : Purposes and Objectives of NCCAP in area of Agriculture[33]

PURPOSE	OBJECTIVE
PURPOSE O1. Increase the amount of carbon sequestered in forests	OBJECTIVE O1.1. Increase the amount of carbon sequestered in forests by 15% of the 2007 value by 2020 (14,500 Gg in 2007, 16,700 Gg in 2020)
PURPOSE O2. Reduce deforestation and forest damage	OBJECTIVE O2.1. Reduce deforestation and forest damage by 20% of the 2007 values by 2020
PURPOSE O3. Limit the negative impact of land uses and changes such as forests, pastures, agriculture and settlements on climate change	OBJECTIVE O3.1.Integrate the climate change factor in land use and land use changes management strategies by 2015
	OBJECTIVE O3.2. Increase the amount of sequestered carbon as a result of agricultural forestry activities by 10% of the 2007 values by 2020
	OBJECTIVE O3.3. Identify the amount of sequestered carbon in pastures and meadows in 2012, and increase carbon stock 3% by 2020
	OBJECTIVE O3.4. Identify the existing carbon stock in wetlands in 2012, and maintain the level until 2020
	OBJECTIVE O3.5. Identify the quantity of carbon stored in settlement areas in 2012, and increase stored carbon 3% by 2020 through green planting
PURPOSE O4. Strengthen legal and institutional structure for combating climate change with regard to land use and forestry	OBJECTIVE O4.1. Make necessary legal arrangements for combating climate change with regard to land use and forestry by the end of 2013
	OBJECTIVE O4.2. Strengthen institutional capacity in institutions involved in land use and forestry on climate change by 2014

Table 3.11 : Purposes and Objectives of NCCAP in area of Land Use and Forestry[34]

[33] National Climate Change Action Plan 2011-2023, Republic of Turkey Ministry of Environment and Urbanization, Pg.87/196, July 2011, Ankara, ISBN: 978-605-393-097-6

[34] National Climate Change Action Plan 2011-2023, Republic of Turkey Ministry of Environment and Urbanization, Pg.87/196, July 2011, Ankara, ISBN: 978-605-393-097-6

3.4. Pros and Cons of Carbon Trading

Due to growing worries about global warming with respect to higher carbon emissions in the atmosphere, governments and other organizations have been studying for effective solutions in order to solve pollution problems. Throughout various strategies for getting rid of this problem, carbon trading and carbon offset have been widely accepted.

Firms buy carbon credits that are sold in the carbon trading market. The credits cap the amount of greenhouse gases that companies can release into the atmosphere without having to pay any fine for it.

The main benefit of the carbon trading concept is the encouragement that it gives for releasing less amounts of gases. The system wants companies to understand that the cost of adopting eco-friendly ways of doing business is lesser than the cost of carbon credits. If the firm is made to bear the costs of damage to the environment then it will use practices that are eco friendly to score over its rivals.

A further benefit of carbon trading is the application of a market model which is open to all and allows organizations to freely trade in carbon credits. As a result of non intrusion from the governments such as imposition of fines or creating regional legislations, this system is more successful.

The biggest drawback of carbon trading is the lack of a comprehensive worldwide framework for trading. As almost all of the trading takes place in the international markets, it is also hard for some local companies to follow this system.

Further, numerous small enterprises are not capable of affording the expenditure on purchasing the machinery or implementing state-of-the-art techniques that would reduce their emissions. Therefore, they are caught in a situation that forces them to bear the costs of carbon credits continuously and thus they fall behind in the race against larger companies. The effectiveness and costs of any carbon trading scheme depends on its structure and method of permit distribution[35].

[35]http://www.wikinvest.com/concept/Carbon_Trading/- 29/12/2011

General Costs versus Benefits:

When permits are not distributed by an auction, the costs of polluting are reduced, lowering the effectiveness and economic impact of the scheme. The costs and benefits of carbon trading are, therefore, looked at in two ways both by the governments but mainly by the companies. One, in the benefits accrued in the future versus the costs borne in the present, and two, the effectiveness of carbon trading versus the effectiveness of other forms of regulation, like carbon taxes, federal grants or tax incentives for research into clean energy and energy efficiency.

In terms of the first, although there is scientific consensus that global warming is occurring and that it will cause a loss of agricultural output, a loss of biodiversity, an increase in water scarcity, an increase in the spread of disease, an increase in coastal flooding and shoreline erosion, and an increase in environmental insurance expenses, there is no consensus on the magnitude of said changes. According to the Stern Review, the costs of global warming will reach numbers like $9 trillion dollars, well above the costs of carbon reducing technologies[36]. The below illustrated table expresses the costs of carbon-reducing technologies relative to a "marker", i.e. the technology that would be displaced by the "new" technology. In the longer term, the costs remain above the marker technologies by the same margin other than for solar photovoltaic in regions where there is fairly high levels of sunlight. The fact that the costs of most of these technologies remain above the current technologies means that the present free (or, rather, quasi-regulated) market will not bring about their natural substitution. That substitution must be managed, first by judging whether the extra costs of these technologies is smaller or greater than the money value of the environmental benefits they bring, and second, by designing incentive systems to accelerate the diffusion of these technologies. However, combined with the reality of peak oil, there is scientific consensus that global warming mitigation strategies like carbon trading deserve serious and possible implementation.

[36] http://www.abc.net.au/worldtoday/content/2006/s1776868.htm

Technology	Marker	Cost unit	Cost of Marker	Cost of Substitute	Net cost
Near term estimate (10 years time)					
Nuclear	NG/CC	c/kWh	3.5	6.0	2.5
Hydrogen from coal or gas + CCS	NG	$/GJ	4.0	8.0	4.0
Electricity from fossil fuels + CCS	NG/CC	c/kWh	3.5	5.0	1.5
Wind	NG/CC	c/kWh	3.5	5.0	1.5
Photovoltaic (solar input = 2000kWh/m²)	Grid electy.	c/kWh	10.0	15.0	5.0
Biofuels	Petrol	$/GJ	12.0	15.0	3.0
Distributed generation	Grid electy.	c/kWh	10.0	15.0	5.0
Long term estimate:					
Nuclear	NG/CC	c/kWh	4.0	5.0	1.0
Hydrogen from coal or gas + CCS	NG	$/GJ	5.0	10.0	5.0
Electrolytic Hydrogen (onsite & distributed)	NG (distributed)	$/GJ	10.0	30.0	20.0
Electricity from fossil fuels + CCS	NG/CC	c/kWh	4.0	6.0	2.0
Wind	NG/CC	c/kWh	4.0	6.0	2.0
Photovoltaic (solar input = 2000kWh/m²) [w]	Grid electy.	c/kWh	10.0	8.0	-2.0
Biofuels	Petrol	$/GJ	12.0	15.0	3.0
Distributed generation	Grid electy.	c/kWh	10.0	10.0	0.0

Table 3.12: Illustrative Costs of Emissions Reducing Technologies[37]

Carbon Trading versus Carbon Taxation:

As an alternative option for Turkish Government, Carbon trading's largest competitor is carbon taxation. Taxation is simpler. Find out how much fossil fuels a company is using and a government can accurately estimate its level of carbon emissions. Then, apply a fixed fee for every ton of estimated emissions. There are fewer outcomes involving failure, where the cost of pollution becomes disproportionately high or low. On the other hand, carbon trading schemes involve an implicit or explicit cap in emissions, while estimating the long-term impact of a tax on polluting behavior would involve a lot of guesswork. Furthermore, it can make sense for a company – depending on the price of CO2 - in a hard environmental situation to simply pay another company to reduce carbon emissions, rather than spending the resources required to do so for itself. Also, carbon trading already has a lot of support internationally (the Kyoto Protocol as well as the European Emission Trading

[37] Select Committee on Economic Affairs 2nd Report of Session 2005-06 : The Economics of Climate Change Volume I: Report Ordered to be printed 21 June 2005 and published 6 July 2005 Published by the Authority of the House of Lords *London* : The Stationery Office Limited £price HL Paper 12-ING = natural gas; NG/CC is natural gas - combined cycle power plant; CCS is carbon capture and geological storage; GJ = gigajoule; kWh = kilowatt hour; c = US cents

System). More important than all of that, however, is the design of the strategy picked, rather than the type of strategy. Both strategies have the potential to fail (or succeed) depending on the details. For the market, both strategies make emitting carbon more expensive, with the key difference that taxation would cut financial intermediaries out of the picture[38].

3.5. Effects of Emission Trading to Turkey

Turkey became a party to UNFCCC in 2004 and to Kyoto Protocol(KP) in 2009. However, Turkey has not benefited from the KP. JI enables industrialized countries to carry out joint implementation projects with other developed countries, while the CDM involves investment in sustainable development projects that reduce emissions in developing countries. Here, the position of Turkey under UNFCCC plays the main role as it is explained in Introduction part. As an advanced developing country Turkey wants to have CDM status for projects but due to its specific situation, Turkey can only sell Voluntary Emission Reductions or Verified Emission Reductions (VERs).

Carbon Trading Systems exist both under compliance schemes and as voluntary programs. Compliance markets are formed and structured by mandatory regional, national, and international carbon reduction regimes, such as the Kyoto Protocol and the European Union's Emissions Trading Scheme. Voluntary Emission Reduction markets function outside of the compliance markets and enable companies and individuals to purchase carbon offsets on a voluntary basis.

Important differences exist between the mandatory and voluntary market. Unlike the mandatory, voluntary markets do not implement any particular policy mandates. The mandatory and voluntary markets occupy different but overlapping niches. The voluntary offset market is currently fed by two distinct offset streams: offsets that originate in the compliance market (e.g.CERs from CDM projects) and offsets that are created in the voluntary market (Verified Emissions Reductions – VERs). In

[38] http://www.wikinvest.com/concept/Carbon_Trading/- 29/12/2011

other words, voluntary offset buyers can choose if they want to buy offsets that come from CDM or JI projects or offsets that come from projects implemented exclusively for the voluntary offset market. Credits from the voluntary market are cheaper but cannot be used for compliance under the Kyoto-Protocol or the European Emission Trading Scheme.

In short term, the project based voluntary market in Turkey developed very rapidly through renewable energy investments utilizing wind, hydro etc. and it is very beneficial within the current structure of Turkey, but Turkey needs to set its carbon market strategy also for long term. In long term Turkey is targeting a structure like the ETS. Despite the unsecure outcomes of the COP in Durban, the Government of Turkey is working together parallel with United Nations Development Programme. Turkey is also planning to benefit from NAMAs (National Appropriate Mitigation Action).

Carbon, just like any other commodity, is being tracked and traded for some time now. Though Turkey is experienced in the voluntary carbon markets, an institution to steer Turkey through the carbon marketplace is essential for the country to carve out a niche for itself within the new climate regime. Developments of infrastructure components such as database, human capacity (both at government and NGO levels), legal and operational framework and well organized institutions are required.

Although there is not any present emission reduction system in Turkey which is determined with spesific rules, there are more than 77 projects (see chart below) benefiting from wind, geothermal, hydro and solid wastes in order to reduce green house gases and derive a profit from trading of these certificates acquired from reduction of GHGs. Since beginning of 2006, the emission certificates, which are acquired by the owner of projects or companies, are processed over the counter markets. These certificates are called VER (Voluntary Emission Reduction). Basically, ERUs and CERs are standards within the compliance carbon market, and VERs relate to offset units used in the voluntary carbon market. Each certificate equals an emission reduction of 1 ton CO_2 eq.

Voluntary Emission Reductions, or Verified Emission Reductions, as they are known interchangeably, are in essence the same thing as their compliance accredited cousins

CERs and ERUs. The main difference is that they may not be used by parties within the compliance carbon market as an emissions offset. Therefore, they market themselves towards parties, such as non-governmental organizations, companies and individuals who would like to voluntarily offset their carbon footprint.

Due to the reason that there is not any legal and corporate infrastructure in Turkey, the capacity of the market, parties and emission reduction could be not calculated accurately. Accordingly, financial values of projects, emission reductions and certificates could not be recorded and followed. Despite the fact that the financial values of certificates are confidential business information, but for the reason that this revenue exists as an additional value in project revenue list, this revenue is of capital importance in credit agreements with creditors. Therefore, the required infrastructure, namely database, human capacity (both at government and NGO levels), legal and operational framework, well organized institutions should be immediately established.

Although there is not any legal infrastructure with respect to emission trading, the emission trading based on voluntary approach is continously developing because of widespread renewable energy sources in Turkey. For instance, between the years 2006 – 2010, totally 6.5 mio. tonnes of emissions are reduced and additional 2.235 MW power is generated.

Type of Facility	# of Projects	Installed Power (MW)	Annual Emission Reduction (CO_2eq./year)
Wind	39	1.668	3.738.046
Geothermal	2	17	75.750
Hydro	31	520	1.039.577
Biogas	5	30	1.659.611
Total	77	2.235	6.512.984

Table 3.13: Projects for Voluntary Emission Trading and Gains (2006-2010) [39]

[39] İklim Değişikliği ile Mücadelede Emisyon Ticareti ve Türkiye Uygulaması, İzzet ARI, Sosyal Sektörler ve Koordinasyon Genel Müdürlüğü, DPT–Uzmanlık Tezleri, Ankara 2010, Yayın No: 2817, ISBN: 978-975-19-4873-1

There are three main areas selected in Turkey to determine the emission trading potential. These are "Energy Efficiency, Renewable Energy and Solid Waste Industries". Followingly, the potential emission reduction is estimated for these three industries between the years 2010-2020. 467,85 mio. tonnes of CO_2 eq. emission reduction by energy efficiency, 387,69 mio. tonnes of CO_2 eq. emission reduction by renewable energy and 431,52 mio. tonnes of CO_2 eq. emission reduction by solid waste and totally 1.287,06 mio. tonnes of CO_2 eq. emission reduction are estimated by the government. This potential corresponds to approximately 22% GHG emissions of Turkey between the years 2010 – 2020[40].

Four different calculations were realized about the unit prices of emission certificates between the years 2010-2020 specifically for the situation of Turkey by the Turkish Government. The first price forecasting (PX) is carried out regarding to the rapid acceleration of voluntary carbon trading in recent years, the second price forecasting (PEUA) is performed considering actual price prognosis in EU Emission Trading Market. The third price forecasting (PY) is done by paying attention to possible changes in climate regimes after 2012 and the last price forecasting (PZ) is implemented with respect to the price band between PX and PY.

More explicitly, these assumptions can be described as below:

PEUA: The most optimistic. Full membership of TR to EU.

Px: VERs. Assumptions for 2015 and 2020 are made with respect to increasing ratio in past years. Namely, between 2002-2008 : % 9,75.

Py and Pz are some possible variations instead of Px.

Py: Increase between 2010-2012 as Px. After conferences with some binding liabilities, globally emission reductions will increase and therefore supply of emission certificates will also increase. No supply problem between 2013-2020, for this reason steady price level.

Pz: Increase with yearly ratio of 4,74%, lower than Px but not steady like Py.

[40] Source: Same as given in footnote 39

Prices	2010	2012	2015	2020
P_X ($/Ton)	8,84	-	14,08	22,42
P_{EUA} ($/Ton)	32,93	-	40,47	48,02
P_Y ($/Ton)	8,84	10,65	10,65	10,65
P_Z ($/Ton)	8,84	-	12,36	14,05

Table 3.14: Comparison of calculated assumptions of different price levels[41]

Accordingly, total trading potential is separately calculated for these four different unit price estimations between the years 2010 – 2020. 67,23 billion US$ with PX price, 166,56 billion US$ with PEUA price, 40,90 billion US$ with PY price and 49,81 billion US$ with PZ price. PEUA seems not realistic but it is calculated with respect to the assumption that Turkey is a member of EU, in order to see the picture from a bigger frame. On the other hand, calculations are also performed to foresee the emission reduction costs in three various sectors. According to the results, the cost of emission mitigation will be much higher than the revenue from emission trading. For instance, the emission trading revenue from the renewable energy sector would be between 12 and 49 billion US Dollars, but the incremental cost of investment in the renewable energy sector is approximately 100 billion US Dollars. The proposed emission trading system for Turkey, which is presented in 2009 by the government[42] would have a crucial role in mitigation of climate change and would provide financial support to the projects developed for this objective in Turkey. The key factor to succeed with this proposed system is firmly interconnected with the presence of supporting political will in Turkey. This proposed system would be connected with the EU-ETS but details of this system are still not present. More attention should be paid and appropriate budget should be set in order to develop this kind of system.

[41] Source: Same as given in footnote 39 and these price developments have been done, when the carbon market prices have been in other dimesions (2010) – it should be mentioned that these prices do not reflect the noawdays price situation –neither for the voluntary market nor for the complimentary market!!!

[42] www.dpt.gov.tr/DocObjects/View/5065/IFM_Stratejisi_ve_Eylem _Plani.pdf

	Revenue with respect to Emission Trade, Billion$	Additional Investment Costs for Renewable Energy, Billion$	Coverage Ratio
PX	20,28	100,31	20%
PY	12,31	100,31	12%
PZ	14,99	100,31	15%
PUEA	49,36	100,31	49%

Table 3.15: Revenue Expected From Emissions Trading vs. Coverage Ratio[43]

As a consequence, there are three main options for Turkey on the Carbon Market. One of them is, as it is already explained, the voluntary carbon market. The actual state of affairs is very positive and has a promising future.

More importantly is establishing an Emission Trading System which could be directly connected with the European System. This will enable quick orientation to the Carbon Market. There are a great number of European Countries which invested in Turkey and are expecting long term reliable business models. These companies will determine and dominate the future of developing Turkey. On the other hand, because of its geographical position, Turkey is always in connection with EU countries and acting like a bridge between EU and eastern countries. Therefore, working essentials and standards should be alike with European Standards. Correlatively, the volume of trade between Turkey and EU Countries is increased in 2011 by 16% to 120,3 billion Euro (Import: 72,7 billion Euro; Export: 47,6 billion Euro[44]). Turkey is clearly connected and tightly binded to EU Market and vice versa. As a developing country, Turkey should principally establish an Emission Trading System which could be connected with the European System and followingly as a long term action after constituting sufficient and smoothly working structure, it will be meaningful to integrate with project related flexible mechanisms soon after

[43] İklim Değişikliği ile Mücadelede Emisyon Ticareti ve Türkiye Uygulaması, İzzet ARI, Sosyal Sektörler ve Koordinasyon Genel Müdürlüğü, DPT – Uzmanlık Tezleri, Ankara 2010, Yayın No: 2817, ISBN: 978-975-19-4873-1

[44] http://trade.ec.europa.eu/doclib/docs/2006/september/tradoc_113456.pdf; http://www.usiad.net/

reaching to the level of developed countries. Gaining adaquate experience from European Carbon Market would be a good advantage for Turkey for future activities in International Carbon Market.

Concludingly, there are two main exits for Turkey for the current being under current economical circumstances. Turkey is a developing country and nowadays Turkey is fully going with VERs since many years. But it should develop its contribution to carbon reduction, not only for climatical reasons but also economically. In addition to VERs, next step should be matured EU-Markt.

4. Conclusion

Climate change represents an urgent and nonignorable enormous threat to every living being on the face of the earth. The main reason for climate change is global warming. The global warming is the slow and steady increase in temperature of earth and its atmosphere. One of the major causes for global warming can be attributed to the activities of human being. The activities of human being has lead to an increase in the so called greenhouse gases which include carbon dioxide, methane, nitrogen oxide etc. The gases have created an effect of green house on the earths surface which prevents the reflection of the rays from sun and thus causes the increase in temperature. Carbon dioxide concentration in the air has increased due to the emissions from power plants, cars, airplanes, industries etc. another important reason for it is deforestation.

The starting point of this study was to give a satisfactory answer to the question "Should Turkey join an environmental union and regulates its structure with respect to directives set out by this association in the near future considering the effects of Kyoto Protocol and a functioning carbon trading?".

Turkey has a developing country profile and needs to be more competetive than the developed countries. This does not mean that investing in environmental technologies and plants would bring harm to ascending economy. Long term plans in these investments would bring numerous benefits. On the other hand, Turkey is transforming and restructuring itself with respect to EU Membership Criteria. It is also expected from Turkey to take responsibilities devoted to climate regime.

As a consequence, these indicators provide a sound basis for concluding that Turkey's competitiveness, when described thoroughly, is likely to benefit from the decision by the government to ratify the Kyoto Protocol or a successor of the Kyoto Protocol for new periods. In reply to the proposition of this study, Turkey should join an environmental union and regulate its structure. In this context, EU-ETS appears as a beneficial system. Additionally, a continual Voluntary Carbon Market should be developed as an alternative beneficial environmental system correspondingly.

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