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Report on global and local policies and on the implementability of climate policies

Name of all participants to the redaction of the report ^a

- ^a Fondazione Eni Enrico Mattei (FEEM)
Energy research Centre of the Netherlands (ECN)

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1. Introduction

Climate change is a major challenge faced by human society (IPCC 2007; Stern 2007; World Bank 2012). This was already recognized by the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, which main objective is to “stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.” Within this framework the legally binding Kyoto protocol was established during the third annual Conference of the Parties (COP3) in 1997 in which countries committed to reduce greenhouse gas emissions on average with 5% for the period 2008-2012 with respect to 1990.

While there is increasing recognition of the challenge of climate change around the world, the international climate negotiations have faced only slow progress in recent years, and a global climate treaty mandating comprehensive greenhouse gas emissions reductions has remained illusive. The proposal of limiting global warming to 2°C above preindustrial levels was recognized as a guiding principle for the long-term objective of the UNFCCC and was initially laid down in the Copenhagen Accord. However, while the Accord was agreed upon by 141 countries by the end of 2012 including all major emitters, it was never adopted as a legally binding agreement under the UNFCCC. Elements of the Accord were brought under the roof of the UNFCCC in Cancun in 2010. This included the recognition of the 2°C target as well as the Copenhagen pledges on 2020 emissions reduction targets made by 16 Annex I countries (UNFCCC Technical paper 2012).

Several Non-Annex I countries also submitted Copenhagen pledges which – under the name of nationally appropriate mitigation actions (NAMAs) – are of voluntary nature (Kriegler et al, 2013).

This document gives an overview of energy and climate policies that have been implemented or proposed in major economies to reduce emissions or emission intensities. In Chapter 2 an overview of the Copenhagen pledges under the UNFCCC framework are given. In Chapter 3 the most important policies supporting the achievability of the target are given for China, the European Union, India, and the USA. In Chapter 4 the compatibility of the policies and the targets is reviewed.

2. Global and regional GHG mitigation targets

The GHG emission reduction as implemented in the weak and stringent policy scenario in the LIMITS project are given in Table 1. They are based on the unconditional and conditional reduction target under the Copenhagen pledges and NAMAs of several countries and regions. Since some regions given in the table are junction of countries with different national targets, the targets reported are estimations for the whole region computed by extrapolating the target of larger regions to the whole country under the assumption that neighboring countries follow the example of regional leaders. Moreover, in cases, where the Copenhagen pledges appeared to be ambitious, for example in developing countries due to emissions reductions relative to unrealistic high baseline emissions, plausibility considerations lead to the specification of emissions reduction targets that are weaker than their Copenhagen pledges. For the USA, the 2020

emissions reduction target was taken from an assessment of the impact of existing US regulations (Kriegler et al, 2013).

Table 1 *Unconditional and conditional GHG emission reduction target in Copenhagen Pledges. Source: (Kriegler et al, 2013).*

Region	Unconditional GHG emissions reduction in 2020 ⁽¹⁾ (weak)	GHG intensity reduction in 2020 ⁽²⁾ (weak)	Conditional GHG emissions reduction in 2020 (stringent)	GHG intensity reduction in 2020 ⁽²⁾ (stringent)
EU27	-15% (2005)	N/A	-25% (2005)	N/A
China	N/A	-40%	N/A	-45%
India	N/A	-20%	N/A	-25%
Japan	-1% (2005)	N/A	-12% (2005)	N/A
USA	-5% (2005)	N/A	-17% (2005)	N/A
Russia	+27% (2005)	N/A	+12% (2005)	N/A
Australia and New Zealand (AUNZ)	-13% (2005)	N/A	-22% (2005)	N/A
Brazil	-18% (BAU)	N/A	-36% (BAU)	N/A
Mexico	-15% (BAU)	N/A	-30% (BAU)	N/A
Latin America (LAM)	-15% (BAU)	N/A	-30% (BAU)	N/A
Central Asia (CAS)	N/A	N/A	N/A	N/A
South Korea (KOR)	-15% (BAU)	N/A	-30% (BAU)	N/A
Indonesia (IDN)	-13% (BAU)	N/A	-26% (BAU)	N/A
Sub-saharan Africa (SSA)	N/A	N/A	N/A	N/A
Canada (CAN)	-5% (2005)	N/A	-17% (2005)	N/A
Eastern Europe (EEU)	N/A	N/A	N/A	N/A

European Free Trade Association (Lichtenstein, Iceland, Norway, and Switzerland) (EFTA)	N/A	N/A	N/A	N/A
Middle East (MEA)	N/A	N/A	N/A	N/A
North Africa (NAF)	N/A	N/A	N/A	N/A
Pakistan (PAK)	N/A	N/A	N/A	N/A
South Africa (SAF)	-17% (BAU)	N/A	-34% (BAU)	N/A
South Asia (SAS)	N/A	N/A	N/A	N/A
South-east Asia (SEA)	N/A	N/A	N/A	N/A
Turkey (TUR)	N/A	N/A	N/A	N/A
Taiwan (TWN)	N/A	N/A	N/A	N/A

⁽¹⁾ Including Land-use Change, Land-use Change and Forestry (LULUCF) and relative to 2005 or business as usual (BAU) as specified in brackets. (If GHG emissions in baseline is lower, baseline trajectory is adopted for the region concerned.)

⁽²⁾ Including LULUCF and relative to 2005 (If GHG intensity reduction in baseline is higher, baseline trajectory is adopted for the region concerned.)

⁽⁶⁾ %/year; GHG intensity improvement rates calculated based on Kyoto GHG equivalent emissions including LULUCF relative to GDP. (If GHG emissions (intensity) reduction in baseline is higher, baseline trajectory is adopted for the region and period concerned.)

3. Supporting policies

To reach the emissions reduction targets given under the Copenhagen pledges countries and regions have developed their own global or regional and national policies. This section gives an overview of the most important energy and climate policies that have been implemented or proposed in the major economies to reduce emissions and stimulate sustainable growth. These policies cover the increase of renewable energy sources, energy efficiency improvement, promoting energy demand reductions and changes to less carbon intensive technologies. In this section the most important policies and measures for China, the European Union, India and the USA are summarized. For all other regions only the national renewable energy targets as used in the weak and stringent climate policies scenarios in this study are included see Table 2.

Table 2 *Renewable energy targets as implemented in weak and stringent policy scenario. Source: (Kriegler et al, 2013).*

Region	Modern Renewable share in electricity ⁽³⁾ (weak)	Installed renewable capacity in 2020 ⁽⁴⁾ (Wind, solar) (weak)	Modern Renewable share in electricity ⁽³⁾ (stringent)	Installed renewable capacity in 2020 ⁽⁴⁾ (Wind, solar) (stringent)
EU27	20% (2020)	-	20% (2020)	-
China	25% (2020)	200 GW; 50GW	25% (2020)	300 GW; 80GW
India	-	20 GW; 10GW	-	40 GW; 20GW
Japan	-	5 GW; 28GW	-	5 GW; 28GW
USA	13% (2020)	-	25% (2020)	-
Russia	4.5% (2020)	-	4.5% (2020)	-
Australia and New Zealand (AUNZ)	10% (2020)	-	20% (2020)	-
Brazil	-	-	-	-
Mexico	17% (2020)	-	35% (2020)	-
Latin America (LAM)	N/A	-	35% (2020)	-
Central Asia (CAS)	N/A	N/A	N/A	N/A
South Korea (KOR)	-	8 GW; -	N/A	16 GW; -
Indonesia (IDN)	7.5% (2025)	-	15% (2025)	-
Sub-saharan Africa (SSA)	N/A	-	N/A	-
Canada (CAN)	13% (2020)	-	25% (2020)	-
Eastern Europe (EEU)	N/A	N/A	N/A	N/A
European Free Trade Association (Lichtenstein, Iceland, Norway, and Switzerland) (EFTA)	N/A	N/A	N/A	N/A
Middle East (MEA)	N/A	-	N/A	-
North Africa (NAF)	20% (2020)	-	20% (2020)	-
Pakistan (PAK)	N/A	N/A	N/A	N/A
South Africa (SAF)	N/A	N/A	N/A	N/A
South Asia (SAS)	N/A	-	N/A	-
South-east Asia (SEA)	15% (2020)	-	15% (2020)	-
Turkey (TUR)	-	20 GW;-	-	20 GW;-
Taiwan (TWN)	N/A	N/A	N/A	N/A

⁽³⁾ Reference quantity is always electricity production except for EU27 where it is final energy.
^{(4),(5)} Capacity targets are minimum targets; target year is specified in brackets.

Next to energy and climate policies for reducing the greenhouse gas emissions this document also reports, if available, policies and measures for the reduction of air pollution. It is more and more recognised that one should investigate the co-benefits of climate and air pollution policies on each other. In the table below an overview of possible policies and measures for OECD and non-OECD as reported in Chapter 17 of the Global Energy Assessment is given.

Table 3 *Policies and measures for air pollution control, current legislation*

	Transport	Industry and power plants	International shipping	Other
Sulfur dioxide (SO ₂)	OECD: Directives on the sulfur content in liquid fuels; Non-OECD: National legislation on the sulfur content in liquid fuels	OECD: Emission standards for new plants from the Large Combustion Plant Directive (LCPD) (OJ 1988) Non-OECD: increased use of low-sulfur coal, increasing penetration of flue gas desulfurization (FGD) after 2005 in new and existing plants	MARPOL Annex VI regulations	Reduction in gas flaring, reduction in agricultural waste burning
Nitrogen oxides (NO _x)	OECD: Emission controls for vehicles and off-road sources up to the EURO-IV/ EURO-V standard Non-OECD: National emission standards equivalent to approximately EURO III-IV standards (vary by region)	OECD: Emission standards for new plant and emission ceilings for existing plant from the LCPD (OJ 1988). National emission standards on stationary sources– if stricter than in the LCPD Non-OECD: Primary measures for controlling of NO _x	Revised MARPOL Annex VI regulations	Reduction in gas flaring, reduction in agricultural waste burning
Carbon monoxide (CO)	As above for NO _x			Reduction in gas flaring, reduction in agricultural waste burning
Volatile organic compounds (VOC)	End-of-pipe measures as described above for NO _x	Solvent Directive of the EU (COM(96)538, 1997); 1999 UNECE Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone		Reduction in gas flaring, reduction in agricultural waste burning
Ammonia (NH ₃)		End-of-pipe controls in industry (fertilizer manufacturing)		
PM2.5 ⁽¹⁾		EU and national legislation on power plants and industrial sources limiting stack concentrations of PM		Reduction in gas flaring, reduction in agricultural waste burning

⁽¹⁾ Legislation is for PM2.5 only, but black carbon and organic carbon emissions can be expected also to decline as a result.

3.1. China

Chinese policies and initiatives on climate mitigation, adaption and science and technology are described in China's National Climate Change Program and the Five-Year Plans. The Australian department of Climate change and energy Efficiency has published a comprehensive overview of the policies in major economies, including China, which is very useful especially because it refers

to the original sources. The text below is a hard copy of their text which we extended with some new developments from the 12th Five-Year Plan, written in *italic* font. For the original sources we refer to the document (AUS DCCEE, 2010). As a reference for the 12th 5-Year Plan we used the full English translation prepared by the Delegation of the European Union in China (British Chamber, 2011).

GHG Mitigation

In China, thirteen areas (eight cities/municipalities and five provinces) have been selected to participate in a national low-carbon pilot program by submitting plans to reduce carbon emissions and energy intensity. Participating governments have been asked to examine the use of market mechanisms to promote emissions reductions. These mechanisms are expected to be developed during the 12th Five Year Plan period (2011-15).

In June 2010, China introduced a value-based tax on coal, oil and gas extraction in China's largest gas-producing province (Xinjiang Uighur Autonomous Region) and plans to extend it to all other western provinces.

In line with the Copenhagen pledge emissions intensity decrease target of 40 till 45 percent by 2020 with respect to 2005, a binding target of a reduction of 17% per unit of GDP over 5 years (2010-2015) is set in the 12th Five-Year Plan.

Power sector

Reducing emissions from non-renewable electricity generation

- Refreshing power generation assets: the 11th Five-year plan included a target to shut down 50 GW of small, inefficient generation capacity. By mid 2009 this target was achieved (54.07 GW).
- By 2011, China plans to close all plants below 50 MW of capacity, and old plants below 100 MW. Between 2011 and 2020, many plants between 100 and 200 MW will also be closed. As a result, the International Energy Agency (IEA) estimates that by 2011, 80 percent of China's coal-fired power plants will be modern plants above 300 MW in capacity and this number will rise above 90 percent by 2020.
- China participates in a number of joint research activities on carbon capture and storage technologies, including the China-EU partnership under the Sixth Framework Program of the EU and research on post combustion capture with the CSIRO. It joined the Global Carbon Capture and Storage Institute in 2009 and the Carbon Capture, Use and Storage Action Group of the Clean Energy Ministerial in 2009.
- Cooperative research with United States was agreed in January 2011, including between General Electric (GE) and Shenhua Energy Company on gasification and cleaner power generation technology.

Renewable Energy

- In 2009-10, China ranked first in the world in newly-installed wind power capacity (13 Gigawatts in 2009), nuclear power capacity under construction and photovoltaic cell

production. To date, China ranks first in installed hydropower capacity (more than 200 GW).

- *In the 12th Five-Year Plan expresses the ambition to increase normal hydro power capacity to 284 GW and pumped storage hydro power capacity to 41GW by 2015.*

Policies that drive the uptake of existing technologies (feed-in tariffs, renewable energy targets):

- Target to raise the proportion of non-fossil fuels in primary energy consumption to 10 percent in 2010 and 15 percent by 2020. *In the 12th Five-Year Plan this has been adjusted from the real percentage of 8.3 percent in 2010 to 11.4 percent in 2015.*
- Subsidies and financial incentives to support the manufacture and installation of renewable energy generators and associated infrastructure, including:
 - Subsidies for energy produced (600 yuan/kW) from the first fifty wind power units produced by a “qualified enterprise”
 - Subsidy for the application of photovoltaic solar energy in buildings (20 yuan/wp in 2009)
 - Subsidies to solar power projects connected to the grid equivalent to 50 percent of the total investment in its generation units and the accessory systems for power transmission and distribution. For independent power units at remote areas with no access to power, the percentage subsidy extends up to 70 per cent.
 - A measure stipulating the benchmark prices of wind-generated power to standardise the administration of the wind power price.
- An amendment to the Renewable Energy Law in December 2009 requires electricity grid companies to purchase all the power produced by renewable energy generators.

Research and Development

- China already has the ability to design and manufacture independently internationally advanced 3MW-class wind power generation units and is now researching and developing 5MW-class units.
- A USD10 million renewable energy licensing deal was signed in January 2011 to introduce waste conversion technology from Scotland.
- Over the 11th Five Year period (2006-10), the Central Government invested RMB 200 billion in energy-saving and emissions reduction projects, generating investment worth an estimated RMB 2 trillion.

Energy efficiency

- Smart grid development between 2011-15 aims to increase electric power supply efficiency, including through a nationwide Ultra High Voltage transmission network (200 GW capacity).

Overarching energy efficiency target

- Economy wide target of 20 per cent reduction in energy intensity of GDP below 2005 levels by 2010.

- *For the period under the 12th Five-Year Plan the aim is to further decrease energy intensity with 16% in 5 years.*

Buildings energy efficiency

- The 11th Five-year plan mandates a 50 per cent reduction in the operational energy load of new buildings nationally and up to 65 per cent in four major municipalities (Beijing, Shanghai, Tianjin and Chongqing) between 2006 and 2010.
- Regulations on Energy Conservation for Civil Buildings require central government departments and local government to allocate funds to energy-conserving renovations and renewable energy in civil buildings.
- China's 2007 Energy Conservation Law requires all local governments to submit plans for increased urban energy efficiency, including buildings and public transportation, to the central government.

Equipment and appliance energy efficiency

- Minimum energy performance standards: around forty standards are in place covering six product categories: lighting products, commercial equipment, industrial equipment, traffic tools, office equipment and home appliances.
- Mandatory energy labelling currently covers over twenty products, 3,000 manufacturers and 140,000 models.
- The PILESLAMP project is an 84 million USD program to phase out production of high energy use incandescent lamps in China.
- China subsidises energy efficient light bulbs and air conditioners for consumers and businesses; between 2009 and 2010, 20 million air-conditioners and 300 million light bulbs were sold.

Industrial energy efficiency

- The Top 1000 Enterprises Program apportions a significant part of the overall 20 per cent energy intensity target directly to China's 1,000 largest state-owned enterprises, most of which are in heavy industry. Specific targets are set for the individual enterprises which are then required to develop energy efficiency action plans. Data collected for the scheme shows total energy savings of 132 million tonnes of coal equivalent between 2006 and 2009, exceeding the collective target by 37 per cent.
- Decommissioning inefficient industrial plants, e.g. cement, steel and iron, saved 110 million tonnes of coal equivalent between 2006 and 2009.

Transport

Vehicle emissions standards

- Chinese Fuel Economy Standards have been in place since 2005. In 2009, China released plans to increase fuel efficiency in passenger vehicles by 18 per cent by 2015. The Phase III fuel consumption regulation for passenger cars aims to improve the fuel efficiency of new passenger vehicles to 7 litres per 100 kilometres (167 gCO₂/km) by 2015.

Other

- China adopted a gas-guzzler structure for taxes on new vehicles on 1 September 2008, effectively doubling taxes on large vehicles while reducing them on small vehicles – forty per cent on cars with engines above 4 litre capacity, 15 to 25 per cent for engines between 3 and 4 litres, and 1 to 3 per cent for engines less than 1 litre capacity.
- The Central Government is promoting electric vehicles in 25 pilot cities. China aims to have more than 500,000 ‘new energy vehicles’ – including electric, hybrid and fuel cell vehicles – on the road by 2015 and 5 million by 2020.
- Central Government policies prioritise mass rapid transit development in major cities and promoting public transport, including through fare subsidies, during the 11th Five Year period (2006-10).
- Central Government offers subsidies for purchase of hybrid vehicle (RMB 50 000) or electric/battery-electric vehicle (RMB 60 000) in Shanghai, Changchun, Shenzhen, Hangzhou and Hefei.

Forestry and Agriculture

- National target to increase forest cover by 40 million hectares and forest stock volume by 1.3 billion cubic metres by 2020 from 2005 levels.
- Abatement measures in rice production – promotion of low-emission/high-yield rice breeds, irrigation techniques, paddy field and ruminant methane emission strategies, and dissemination of the straw silage ammoniating technology.

Air pollution

For air pollution policies and measures for China we refer to the Chinese GAINS ASIA model and the study carried out with this model on scenarios for cost-effective control of air pollution and GHG in China (Amann, 2008). In the Baseline scenario of the study the currently existing policies and regulations on air pollution control measures were implemented. In the Table below these measures are described. In the 12th Five-Year Plan, China has set reduction targets over a period of 5 years for major pollutants: 8% Sulphur Oxide, 10% Nitrous Oxides and 10% of Ammonia Nitrogen.

Table 3.2: Emission control measures assumed in the baseline

Stationary sources	Mobile sources
<ul style="list-style-type: none"> • Large combustion plants: <ul style="list-style-type: none"> ○ Electrostatic precipitators (ESP) at large combustion plants to control emissions of particulate matter, with high removal efficiency (99%) for all plants built after 2005 ○ Less efficient ESP for large plants built before 2005 ○ Increasing penetration of flue gas desulphurization (FGD) after 2005 in new and existing plants • Small to medium combustion plants in the power sector and industry: <ul style="list-style-type: none"> ○ Cyclones or less efficient ESP for plants built before 2005 ○ Significant share of plants using low sulphur coal (0.6% S) already in 2005 ○ Increasing penetration of in-furnace sulphur controls (limestone injection) and to some extent also FGD after 2005 in new plants 	<ul style="list-style-type: none"> • Two-wheelers: <ul style="list-style-type: none"> ○ Euro-II (Stage-II) controls after 2003 ○ Euro-III (Stage-III) controls after 2006 • Light duty and heavy duty vehicles^(*): <ul style="list-style-type: none"> ○ Euro-1/I after 2000 ○ Euro-2/II after 2004 ○ Euro-3/III after 2006 ○ Euro-4/IV after 2010 ○ Euro V after 2012 • Off-road machinery (agricultural and construction): <ul style="list-style-type: none"> ○ Euro-1/I after 2007 ○ Euro-2/II after 2009 • Low sulphur gasoline (10 ppm) from 2010 • Low sulphur diesel (10 ppm) from 2010

^(*) In larger cities (e.g., Beijing, Shanghai) implementation of some measures occurs up to two years earlier

3.2. India

The initiatives of the Indian Government for reducing GHG emissions and sustainable development are described in the Indian National Action Plan on Climate Change (NAPCC) and the national Five Year Plans. The core of the NAPCC is formed by eight national missions representing a multi-pronged, long-term and integrated strategy for achieving key goals in the context of climate change. The national Five Year Plan contains specific objectives, policies and measures that are in place to reach these emissions. Again the work of the Australian department of Climate Change and Energy Efficiency is used as reference for policies and measures in the NAPCC and the 11th Five Years Plan. For the summary below we used their work but extensively supplemented it with some new policies and plans that are in place by now or announced for the reporting period in the Twelfth Five Year Plan that was published early 2013 (Narayan, 2013). Besides the major policies to reduce GHG emissions this overview also contains most important air pollution mitigation measures.

The Twelfth Five Year Plan has twelve focus areas for sustainable development which can be grouped into different sectors.

Power sector

Three of the focus areas concern the power sector.

Advanced Coal Technologies (Focus area 1)

- At least 50% of new to build coal power plants need to be super-critical units, which will reduce the use of coal per unit of electricity produced

National Wind Energy Mission (Focus area 2)

- In the timeframe of the 12th Five Year Plan 2012-2017 the government wants to set up a National Wind Energy Mission which should include among other things a mechanism for using the National Clean Energy Fund (NCEF)

National Solar Mission (Focus area 3)

- The Jawaharlal Nehru National Solar Mission (JNNSM) is an implementation of one of the missions of the NAPCC and aims to generate 20,000 MW of solar generation capacity by 2022. The government has facilitated incentives to stimulate the solar employment:
- Incentives for grid-connected solar plants in the form of feed-in tariffs valid for 25 years
- Incentive for state-level utilities to accelerate capacity addition by mandating a 3% solar power target by 2022 (National Tariff Policy) and by providing additional revenues streams through instruments such as Renewable Energy Certificates

To support the development of renewable energy and reduce the use of coal also more-purpose financial incentives are in place in India.

Coal Cess and National Clean Energy Fund

From 2010 an environment tax imposed by Government of India at an effective rate of `50 per tonne. The collected money from the Coal Cess is used to set up a National Clean Energy Fund (NCEF). The Government expects to collect `10,000 crore under the NCEF by 2015. The NCEF will support projects, programmes and policies that promote clean energy technologies. This fund can be used to establish a focused investment vehicle for companies investing in green technology, and environmentally supportive businesses such as renewable energy, green transport, and water and waste management among others, (Narayan, 2013).

Renewable Energy Certificate

Renewable Energy Certificate (REC) mechanism is a market-based instrument introduced to promote renewable energy, and facilitate renewable purchase obligations, which legally mandate a percentage of electricity to be procured by distribution companies from renewable energy sources. REC mechanism aims to address the mismatch between availability of renewable energy resources in a State and the requirement of the obligated entities to meet their renewable purchase obligations, (Narayan, 2013).

India's 11th Five Year Plan (2007-2012) aims to reduce energy consumption by 5 per cent by 2015 (for specified entities). It is proposed that 14,500 MW or almost 20 per cent of additional power generation capacity developed under the 11th Five Year Plan will come from renewable sources with the following resource break-up, (AUS DCCEE, 2010):

- Wind 10,500MW
- Small Hydro 1,400 MW
- Non-fuel wood biomass, Cogeneration and Waste to Energy 2,100 MW
- Distributed Renewable Power Systems 1000 MW

Energy efficiency

Other important focus areas are on energy efficiency in the industry, built environment and for appliances.

Technology Improvement in Iron and Steel Industry (Focus area 4)

- Plan to evolve a suitable policy framework to improve the efficiency of iron and steel industry in our country.

Technology Improvement in Cement Industry (Focus area 5)

- Plans to evolve a suitable policy framework to incentivise full realisation of the potential for reduction of energy intensity in the cement industry.

Energy Efficiency Programmes in the Industry (Focus area 6)

- To improve cost-effectiveness and enhance energy efficiency in energy-intensive large industries the Perform-Achieve-Trade (PAT) is developed under the National Mission for Enhanced Energy Efficiency (NMEEE), one of the missions under the NAPCC. The PAT is a market based mechanism based on cap and trade in which certificates for energy savings can be traded. Industries covered under the PAT are units and other establishments consuming energy more than the prescribed threshold in nine industrial sectors, namely Thermal Power Plants, Iron & Steel, Cement, Pulp and Paper, Textiles, Fertiliser, Chloralkali, Aluminium and Railways. The energy consumption targets set by the PAT are given in the Table below, (Narayan, 2013).

TABLE 4.2
Initial Estimate of Energy Consumption and Energy Reduction Targets

Sector	Energy Consumption in 2007 (mMtoe)	Share of Consumption in 2007 (%)	Apportioned energy reduction by 2015 (mMtoe) over 2007 levels	Number of probable DCs
Aluminium	2.42	1.05	0.11	11
Cement	14.47	6.25	0.6	83
Chlor-alkali	0.43	0.19	0.02	20
Fertiliser	11.95	5.16	0.51	23
Iron and Steel	36.08	15.58	1.56	101
Pulp and Paper	1.38	0.60	0.06	51
Textiles	4.5	1.94	0.2	128
Thermal power plants	160.3	69.24	6.92	146
Total	231.53	100	10.00	563

Source: BEE, 2011.

Source: Narayan, 2013.

Lighting, Labelling and Super-efficient Equipment Programme (Focus area 10)

- Energy efficiency labels for 13 appliances are introduced which are mandatory for frost-free refrigerators, room air conditioners, tube lights and distribution transformers. The labels for refrigerators and air conditioners are tightened in 2012 and will become tighter in 2014.
- During the Twelfth Five Year Plan period the Super-Efficient Equipment Programme (SEEP) for superefficient fans, LED bulbs and tube lights, seeks to increase the sales volumes and bring down their prices by a financial incentive for each super-efficient fan or light that is sold.

Faster Adoption of Green Building Codes (Focus area 11)

- The Energy Conservation Buildings Codes (ECBC) provides minimum requirements for the energy-efficient design and construction of buildings. The code is applicable to all commercial buildings having a connected electrical load of 100 kW or more (or a contract demand of 120kVA or more). The ECBC is mandatory in some states but will to become mandatory in all Indian states during the Twelfth Five Year Plan, (Narayan, 2013).
- The Indian Green Building Council (IGBC) programme is the major green building rating system currently in operation. The rating depends on a number of factors including energy consumption, the energy saving with respect to conventional building and the numbers of building currently in each category are listed in Table below. So far the IGBC is not adopted in whole India but is seen as one important goal within the Twelfth Five Year Plan.

Coverage of Green Building Rating System up to October 2012

Green Building Rating Level	Energy Saving vis-à-vis Conventional Buildings (%)	Number of Buildings rated	Built-up area (in sq.m)
Platinum	40–50	85	19,76,800
Gold	30–40	163	72,06,544
Silver	20–30	48	10,52,107
Certified	15–20	8	82,190

Source: Narayan, 2013.

Transport

Vehicle Fuel Efficiency Programme (Focus area 7)

- India sees the urgency of introducing fuel efficiency norms both with demand side vehicle labeling as well as supply side measures for by introducing fuel efficiency standards.

Improving the Efficiency of Freight Transport (Focus area 8)

- In order to improve the efficiency of freight transport the government is developing policies that incentivize modal shifts to more efficient modes of freight transport such as train transport.
- To improve the efficiency of road freight it is also necessary to take away practical bottlenecks such as sub-optimal utilizations of trucks, toll regimes etc. which make the system inefficient.
- The government wants to study how the usage of water-borne freight can be maximized without affecting other uses of the water or waterways.

Better Urban Public and Non-motorized Transport (Focus area 9)

- The government wants to focus on policy instruments to encourage greater use of public and non-motorized transport while discouraging the use of private motor vehicles. It needs to revisit the current taxation policy of vehicles and ensure that tax burden of bus

utilities is considerably lowered or consider refunding of fuel taxes collected from the bus utilities.

Air pollution policies and measures

For air pollution policies we refer to the GAINS ASIA model and the scenarios for cost-effective control of air pollution and GHG in India carried out with this model (Purohit et al, 2010). In this study, the, at that time, effective Indian legislation on air pollution controls, were reflected. Policies included were the emission standards for vehicles and particulate matter emissions control measures for large stationary sources: desired levels for power station of 150 mg/Nm³ for most of the 200 and 210 MW power, and of 100 mg/Nm³ for the 500 MW units. Not investigated were SO₂ and NO_x emissions control measures for power plants.

In the Twelfth Five Year Plan reduction of air pollution is seen as effects of other policies such as on vehicle fuel efficiency, appliances and equipment and building, but also part of the Environmental Performance Index (EPI). The Planning Commission is in the process of developing an EPI to incentivize states for environmental performance through budgetary allocations. The Planning Commission's EPI may be a positive incentive for efforts by the States and UT's towards pollution abatement, conservation and sustainable management of natural resources and tackling climate change. Selected air pollution indicators are Nitrogen Oxide (NO_x), Sulphur Oxide (SO_x) and Suspended Particulate Matter (SPM)/Respiratory Suspended Particulate Matter (RSPM), (Narayan, 2013).

Table 3.2: Emission control measures assumed in the baseline projection

Stationary sources	Mobile sources
<ul style="list-style-type: none"> • Large combustion plants: <ul style="list-style-type: none"> ○ Electrostatic precipitators (ESP) at large combustion plants to control emissions of particulate matter (TSP and PM2.5), with high removal efficiency (99%) for all plants built after 2005 ○ Less efficient ESP for large plants built before 2005 and all smaller plants • Small combustion plants in the power sector and industry: <ul style="list-style-type: none"> ○ Cyclones or less efficient ESP for large plants built before 2005 and all smaller plants • Domestic sector: <ul style="list-style-type: none"> ○ Low sulphur medium distillates: 0.25% S from 2000, 0.05% S from 2005, 10 ppm from 2015 ○ Slow penetration (0.4%/year) of improved cooking stoves using biomass 	<ul style="list-style-type: none"> • Two-wheelers: <ul style="list-style-type: none"> ○ Euro-II (Stage-II) controls after 2005 • Light duty and heavy duty vehicles: <ul style="list-style-type: none"> ○ Euro-1/I after 2000 ○ Euro-2/II after 2004 ○ Euro-3/III after 2006 ○ Euro-4/IV after 2010 • Low sulphur gasoline (10 ppm) from 2015 • CNG for buses and three-wheelers in urban areas

3.3. European Union

Within the European Union policy framework for energy and climate policies there are three central targets to be achieved by 2020: (1) an EU based target for GHG emission reductions of 20% relative to emissions in 1990; (2) a 20% share for renewable energy sources in the energy consumed in the EU with specific target for the Member States; (3) 20% savings in energy consumption compared to projections (EC Green Paper, 2013). Many legislation instruments and policies are implemented to achieve these targets under several directives. In the Green Paper published in March 2013 (EC Green Paper, 2013), which is looking ahead to a new framework for 2030, a comprehensive overview of all current directives and regulations is given. Next to the Green Paper, the main source for the policy summary below is again the report from the Australian Department of Climate Change and Energy Efficiency (AUS DCCEE, 2010), text copied from this report is given in *italic* font.

GHG mitigation

The 20% GHG reduction target for 2020 compared to 1990 is implemented through the EU Emissions Trading System (EU ETS) and the Effort Sharing Decision. Sectors cover under the ETS are the large industrial installations, the power sector and the aviation sector, which together

produce almost 50% of all EU GHG emissions. The Effort Sharing Decision (ESD) sets national targets for GHG emissions in the sectors not covered by the ETS. The aggregate target is a 10% emission reduction at EU level in 2020 compared to 2005 and its achievement is supported through EU and national policies to reduce emissions.

- *The EU has adopted a legal framework for the environmentally safe geological storage of carbon dioxide. The Framework covers all CO₂ storage in geological formations in the EU and lays down requirements covering the entire lifetime of a storage site.*

Power Sector

Policies to drive uptake of existing technologies (feed-in tariffs, renewable energy targets)

- European Renewable Energy Directive (2009/28/EC): 20% share for renewable energy sources of the (final) energy consumption in the EU with specific Member States targets and specifically a 10 percent share of renewable energy for the transport sector. National plans how countries foresee to achieve their targets are given in National Renewable Energy Action Plan (Beurskens et al, 2011).
- In the Green paper the European Commission reports progress towards meeting the targets, however, most Member States will need to imply new measures to reach 2020 targets.

Research and development

- The EU's 7th Framework Programme for Research and Technological Development is the EU's main instrument for funding research in Europe and it will run from 2007-2013. The broad range of research areas includes renewable energy.
- The Intelligent Energy – Europe programme supports policies for a more sustainable energy future in areas as varied as renewable energy, energy-efficient buildings, industry, consumer products and transport and will run until 2013.
- From 2014 the 8th Framework programme for research and innovation “Horizon 2020” will start and run till 2020.

Energy Efficiency

Overarching energy efficiency target

- The 2020 target for energy efficiency comprises a 20% savings in energy consumption compared to projections made in 2007. The target is not legally binding for Member States.
- In 2012 a new Energy Efficiency Directive was adopted. Member States need to implement this in 2013 and provide National Energy Efficiency Action Plans.

Building energy efficiency

- EPBD: the Energy Performance of Buildings Directive establishes the common general framework for a methodology for calculating the integrated energy performance of buildings and building units; including:

1) the application of minimum requirements for the energy performance of existing and retrofitted buildings:

2) by 2011 all new building should have been “nearly zero- energy buildings”.

In the Green Paper the European Commission reports that due to delays and incomplete national measures this is not the case and the building sector will probably not reach full the potential counted for emission and energy reduction.

Equipment and appliance energy efficiency

- Ecodesign and Energy Labelling Directives: mandatory labelling and standard product information of the consumption of energy and other resources by energy-related products.

Industrial energy efficiency

- Targets for energy efficiency improvements in the industry sector are given in the Energy Efficiency Directive

Transport

Vehicle emissions standards

- *The EU has legislated for emission performance standards for new passenger cars, production of transport fuels and energy-efficient road transport vehicles.*
- *EU regulation establishes CO₂ emissions performance requirements for new passenger cars achieve the overall objective of the European Community of 120 g CO₂/km as average emissions for the new car fleet.*
- *From 2020 onwards, this Regulation sets a target of 95 g CO₂/km as average emissions for the new car fleet.*

Infrastructure

- In early 2013 the European Commission proposed a directive on alternative fuels infrastructure which includes Member State targets for number of electric recharging stations and other filling stations.

Forestry and Agriculture

- *A Decision of the European Parliament and the Council (April 2009) aims to reduce greenhouse gas emissions from sectors not included in the EU Emission Trading, including agriculture, by setting out emission limits for individual member states.*

Energy security and internal energy markets

- Next to its internal comprehensive legislation on the internal energy market for electricity and natural gas, the EU adopted regulation on security of gas supply.
- The proposed regulation on Trans-European Energy Infrastructure Guidelines addresses the challenges in infrastructure such as interconnections in the internal market, integration of renewable energy in the system and improving security of supply.

Air pollution

For the air pollution policies in the EU we refer to (Amann et al, 2012). In this study on future air pollution emissions under the current legislation and the possibilities for further reduction are examined. Below the policies, measures and relevant directives reported and used in the study by Amann et al are given (see Boxes 6-11).

Box 5: Policies and regulations affecting CO₂ emissions that are considered in the baseline

- EU directives and regulations aiming at efficiency improvements, e.g., for energy services, buildings, labelling, lighting, boilers
- Regulation on new cars (involving a penalty for car manufacturers if the average new car fleet exceeds 135 g CO₂/km in 2015, 115 g CO₂/km in 2020, 95 g CO₂/km in 2025 – in test cycle) (DIR 443/2009/EC)
- Provisions for reducing the GHG intensity of fuels for road and non-road use (DIR 30/2009/EC)
- Biofuels directive
- National policies with regard to nuclear power
- Strong national policies supporting use of renewable energy; however compliance with the 20% target share of renewable energy is not mandatory
- Co-generation directive
- Carbon Capture and Storage (CCS) demonstration plants
- Harmonisation of excise taxes on energy
- The Emission Trading Scheme (ETS) directive, including aviation

Box 6: Legislation considered for non-CO₂ GHG emissions

- Landfill directive
- Waste directive, EU waste treatment hierarchy
- Nitrates directive
- Common Agricultural Policy (CAP) reform and CAP health check
- F-gas directive
- Motor vehicles directive
- The European Emission Trading System (ETS)
- Other relevant legislation:
- Regulation on using specific F-gases in mobile air conditioning systems (DIR 40/2006/EC)

Box 7: Legislation considered for SO₂ emissions

- Directive on Industrial Emissions for large combustion plants (derogations and opt-outs are considered according to the information provided by national experts)
- BAT requirements for industrial processes according to the provisions of the Industrial Emissions directive.
- Directive on the sulphur content in liquid fuels
- Fuel Quality directive 2009/30/EC regarding quality Directives on quality of petrol and diesel fuels, as well as the implications of the mandatory requirements for renewable fuels/energy in the transport sector
- MARPOL Annex VI revisions from MECP57 regarding sulphur content of marine fuels
- National legislation and national practices (if stricter)

Box 8: Legislation considered for NO_x emissions

- Directive on Industrial Emissions for large combustion plants (derogations and opt-outs included according to information provided by national experts)
- BAT requirements for industrial processes according to the provisions of the Industrial Emissions directive
- For light duty vehicles: All EURO-standards, including adopted EURO 5 and EURO 6, becoming mandatory for all new registrations from 2011 and 2015 onwards, respectively (DIR 692/2008/EC)
- For heavy duty vehicles: All EURO-standards, including adopted EURO V and EURO VI, becoming mandatory for all new registrations from 2009 and 2014 respectively (DIR 595/2009/EC).
- For motorcycles and mopeds: All EURO standards for motorcycles and mopeds up to EURO 3, mandatory for all new registrations from 2007 (DIR 2003/77/EC, 2005/30/EC, 2006/27/EC). Proposals for EURO 4/5/6 not yet legislated.
- For non-road mobile machinery: All EU emission controls up to Stages IIIA, IIIB and IV, with introduction dates by 2006, 2011, and 2014 (DIR 2004/26/EC).
- MARPOL Annex VI revisions from MECP57 regarding emission NO_x limit values for ships
- National legislation and national practices (if stricter)

Box 11: Legislation considered for VOC emissions

- Stage I directive (liquid fuel storage and distribution)
- Directive 96/69/EC (carbon canisters)
- For mopeds, motorcycles, light and heavy duty vehicles: EURO-standards as for NO_x, including adopted EURO-5 and EURO 6 for light duty vehicles
- EU emission standards for motorcycles and mopeds up to EURO 3
- On evaporative emissions: EURO standards up to EURO 4 (not changed for EURO 5/6) (DIR 692/2008/EC)
- Fuels directive (RVP of fuels) (EN 228 and EN 590)
- Solvents directive
- Products directive (paints)
- National legislation, e.g., Stage II (gasoline stations)

Box 9: Legislation considered for PM₁₀/PM_{2.5} emissions

- Directive on Industrial Emissions for large combustion plants (derogations and opt-outs included according to information provided by national experts)
- BAT requirements for industrial processes according to the provisions of the Industrial Emissions directive
- For light and heavy duty vehicles: EURO-standards as for NO_x
- For non-road mobile machinery: All EU emission controls up to Stages IIIA, IIIB and IV as for NO_x.
- National legislation and national practices (if stricter)

Box 10: Legislation considered for NH₃ emissions

- IPPC directive for pigs and poultry production as interpreted in national legislation
 - National legislation including elements of EU law, i.e., Nitrates and Water Framework Directives
 - Current practice including the Code of Good Agricultural Practice
- For heavy duty vehicles: EURO VI emission limits, becoming mandatory for all new registrations from 2014 (DIR 595/2009/EC).

3.4. USA

A comprehensive overview of federal and selected state legislation for the USA is reported in Appendix A of the Annual Energy Outlook of the U.S. Energy Information Administration (EIA, 2012). For a nice summary of the legislation and also other additional policies we again refer to the document published by the Australian Department of Climate Change and Energy Efficiency. The text below is a hard copy of their text. The original sources can be found in (AUS DCCEE, 2010). The text is extended with some additional policies and measures reported in (EIA, 2012) which are written in *italic* font.

GHG Mitigation

Market-based approaches have previously been proposed by the Obama administration as a means to achieve the provisional US emissions reduction targets of 17 per cent below 2005 levels by 2020 and 83 per cent below 2005 levels by 2050. These approaches have not passed the US Congress.

In the absence of comprehensive Federal climate legislation, the United States Environment Protection Agency (US EPA) is taking steps to regulate greenhouse gas emissions under the US Clean Air Act. From January 2011 large stationary sources that are obliged to obtain permits under the Clean Air Act will be required to begin addressing greenhouse gas emissions.

A number of US States (California, Montana, New Mexico, Oregon, Utah, Arizona and Washington) are partners in the Western Climate Initiative, which aims to introduce emissions trading progressively, starting in 2012: California and New Mexico have now approved legislation (in late 2010) for commencement of their emissions trading schemes on 1 January 2012 and 2013 respectively. The US has a number of other regional emissions trading scheme initiatives, including the Regional Greenhouse Gas Initiative (RGGI), an electricity generation cap and trade scheme which has been in operation since 2009.

Power sector

Policies to drive uptake of existing technologies (feed-in tariffs, renewable energy targets)

- Around 30 states have mandatory renewable energy standards (RES), requiring utilities to generate a certain amount of electricity or install a certain amount of capacity from renewable energy sources; an additional five have voluntary RES programs. Most states with a RES in place include a renewable energy credit (REC) program that allows utility companies to buy or trade RECs and use them toward compliance.
- A range of federal tax incentives, loan guarantees and grants are in place to promote renewable energy generation. *For example:*
 - *investment tax credit up to 15 MW of capacity in Combined heat and power system of 50 MW or less through 2016.*
 - *10% investment tax credit for solar water heaters in commercial sector.*
 - *30% investment tax credit for small wind turbines.*

Research and development

- There is a range of federal programs to support research, development and deployment of renewable such as wind, solar and geothermal.
- \$2.5 billion was allocated for energy efficiency and renewable energy research, development, demonstration and deployment under the American Recovery and Reinvestment Act of 2009. *Such as for example:*
 - *Funding for smart grid demonstration projects*

Reducing emissions from non-renewable electricity generation

- The Environmental Protection Agency phased in regulation for large stationary sources under the Clean Air Act on January 2 2011.
- The Environmental Protection Agency will issue regulations to control GHG emissions from electric generating units and petroleum refineries by mid 2011. The regulations will be finalised in mid to late 2012.
- The Federal Government funds applied research and development of advanced coal technologies.
- The Federal Government provides risk insurance for nuclear plants, loan guarantees for new plants and research and development support for advanced nuclear technologies.
- In his 2011 State of the Union address, President Obama committed to establishing a clean-energy standard (CES) to double the share of “clean” energy sources (renewable resources; nuclear power; coal with carbon capture and storage; and “efficient” natural gas) in the electricity supply mix from approximately 40 percent to 80 percent by 2035.

Energy efficiency*Building energy efficiency*

- Around 25 states have residential building energy codes equivalent to the 2006 or 2009 International Energy Conservation Codes; the US Department of Energy (DoE) promotes stronger model building energy codes and help states adopt, implement, and enforce those codes.
- The voluntary ENERGY STAR program uses a national performance rating system to evaluate building energy efficiency and help identify cost-effective opportunities for improvements for a range of commercial building types.
- In the residential sector, the voluntary ENERGY STAR program provides specifications for new home design and retrofitting.

Equipment and appliance energy efficiency

- DoE administers minimum energy efficiency standards for most major household appliances, major commercial building technologies and equipment and lighting.
- *Minimum energy efficiency levels also are applied to a variety of motor types and size for commercial sector.*

- ENERGY STAR labels distinguish energy-efficient products; the label is available on more than 60 product categories.
- Producers and purchasers of certain energy-efficient equipment or appliances can receive tax credits.

Industrial energy efficiency

- The voluntary Save Energy Now program undertakes energy assessments in industrial plants to assist industry to identify opportunities for energy savings, with a goal of achieving a 25 per cent reduction in US industrial energy intensity over 10 years.
- ENERGY STAR for Industry provides industry-specific energy management tools and resources.

Transport

Vehicle emissions standards

- The Energy Independence and Security Act of 2007 sets a minimum fuel efficiency target of 35 miles per gallon for the combined fleet of cars and light trucks by model year 2020.
- Light-duty vehicle emissions standards for model years 2012 to 2016 require a fleet average fuel economy of 35.5 miles per gallon and a fleet average 250 grams per mile of carbon dioxide in 2016.
- The President has directed the US Environmental Protection Agency (EPA) and the US Department of Transportation (DOT) to develop standards for light-duty vehicles for model years 2017-2025 and for medium- and heavy-duty trucks for model years 2014-2018.
- *Federal tax incentives are provided to encourage the purchase of electric, hybrid and or alternative fuel vehicles. For example, tax incentives for hybrid vehicles in the form of a \$2,000 income tax deduction.*
- *Approximately 20 States provide tax and other incentives to encourage the purchase of electric, hybrid and or alternative fuel vehicles. The tax incentives are in the form of income reductions, tax credits, and exemptions. Other incentives include use of HOV lanes and exemptions from emissions inspections and licensing fees. The incentives offered and the mix varies by State.*

Other

- Under the Renewable Fuel Standard, 36 billion gallons of renewable fuel must be used in transport fuel each year by 2022. Fuels must comply with lifecycle greenhouse gas performance threshold standards.
- The Federal Government supports research into aviation fuel efficiency

Forestry and Agriculture

- A range of support is available for voluntary actions that reduce GHG emissions or increase sequestration by private landowners, including financial incentives, technical

assistance, demonstrations, pilot programs, education and capacity building, and frameworks and tools for assessing reductions in GHG emissions.

Air pollution

Under the Clean Air Act (CAA), the United States Environmental Protection Agency (EPA) sets limits on certain air pollutants. This includes limits setting on how much can be in the air anywhere in the United States. The Clean Air Act also gives EPA the authority to limit emissions of air pollutants coming from sources like chemical plants, utilities, and steel mills. (internet source EPA). Documents providing a broad listing of potential emissions reduction measures were developed to provide information useful in the development of local emission reduction (EPA, 2012). Under the National Ambient Air Quality Standards (NAAQS) standards for six principal pollutants were set. Although for some of these pollutants the maximum level has declined over time, we couldn't find future education targets for these pollutants.

Table 4 *National Ambient Air Quality Standards for six principal pollutants in the USA.*

Pollutant [final rule cite]	Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide [76 FR 54294, Aug 31, 2011]		8-hour	9 ppm	Not to be exceeded more than once per year
		1-hour	35 ppm	
Lead [73 FR 66964, Nov 12, 2008]		Rolling 3 month average	0.15 $\mu\text{g}/\text{m}^3$ (1)	Not to be exceeded
		1-hour	100 ppb	
Nitrogen Dioxide		Annual	53 ppb (2)	98th percentile, averaged over 3 years Annual Mean
		8-hour	0.075 ppm (3)	
[75 FR 6474, Feb 9, 2010] [61 FR 52852, Oct 8, 1996] PM _{2.5}	primary	Annual	12 $\mu\text{g}/\text{m}^3$	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years annual mean, averaged over 3 years
	secondary	Annual	15 $\mu\text{g}/\text{m}^3$	
Ozone	primary and secondary	24-hour	35 $\mu\text{g}/\text{m}^3$	98th percentile, averaged over 3 years
	PM ₁₀ primary and secondary	24-hour	150 $\mu\text{g}/\text{m}^3$	
[73 FR 16436, Mar 27, 2008]		1-hour	75 ppb (4)	Not to be exceeded more than once per year on average over 3 years
	secondary	3-hour	0.5 ppm	

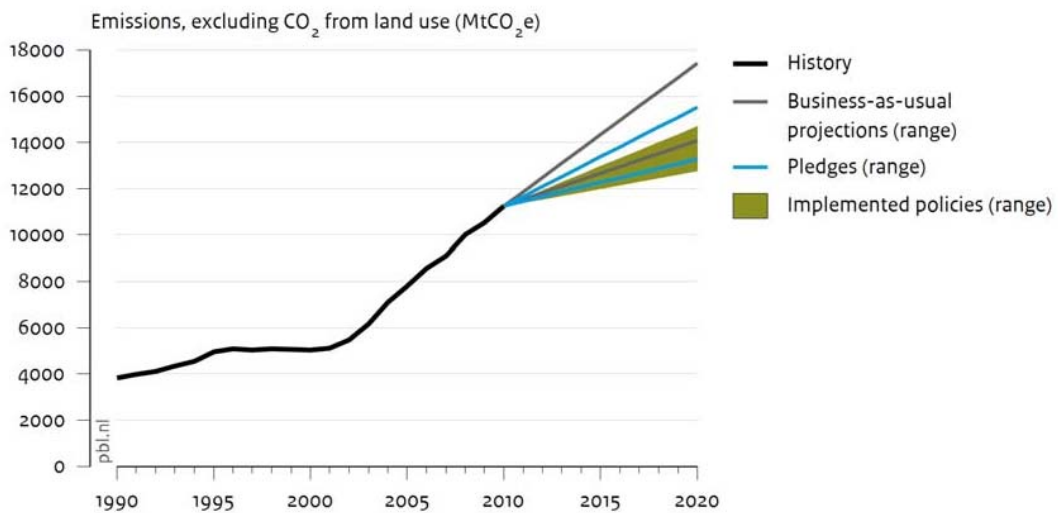
4. Compatibility of policies with national pledges and 2°C

How much greenhouse gas emissions will be reduced by the major policies described in the previous section and if these lead to the proposed reduction targets for 2020 of the national pledges is investigated by Höhne and others (Höhne et al, 2012). The assessment carried out in the study showed that the policies will likely reduce emissions with respect to Baseline projections. In some regions the reductions will be more than proposed in the pledges, while in other regions additional policy will be necessary to reach their mitigation commitments. We incorporated the main conclusions for the 4 major economies China, EU, India and USA in this document.

China

Chinese national policies implemented to reach the proposed reduction targets are developing fast. Since the reduction target stated in the pledge is an emissions intensity target, i.e. decrease of emissions per unit of GDP, the level is dependent of economic growth. The assessment carried out by Höhne et al took into account high these data uncertainty and concludes that the current implemented and proposed national policies will reduce emissions more than strict necessary for reaching the target of 40% to 45% emissions intensity reduction in 2020 compared to 2005.

Greenhouse gas emissions for China



Policies: CO₂ and energy intensity targets, non-fossil target, renewable and energy capacity targets

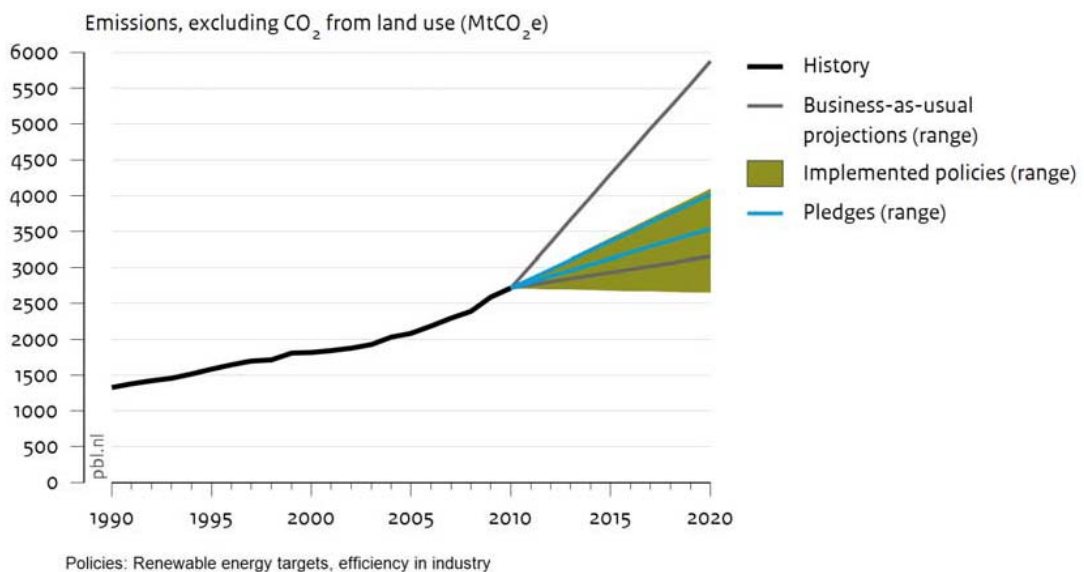
European Union

The national policies of the member states in the European Union implemented in the assessment carries out by are enough to reach the unconditional GHG reductions of 20% but will not be sufficient to reach also the conditional reduction of 30% with respect to 1990 by 2020.

India

Similar to China the emissions reduction target of the pledge is defined as a 20-25% decrease of emissions per unit of GDP. This leads to high uncertainties in the exact amount of emissions reduction on forehand. With the implementation of the renewable targets and the cap and trade system Perform-Achieve-Trade (PAT) for improving energy efficiency in industry the projections from Höhne et al show that the emissions will become below the Indian targets.

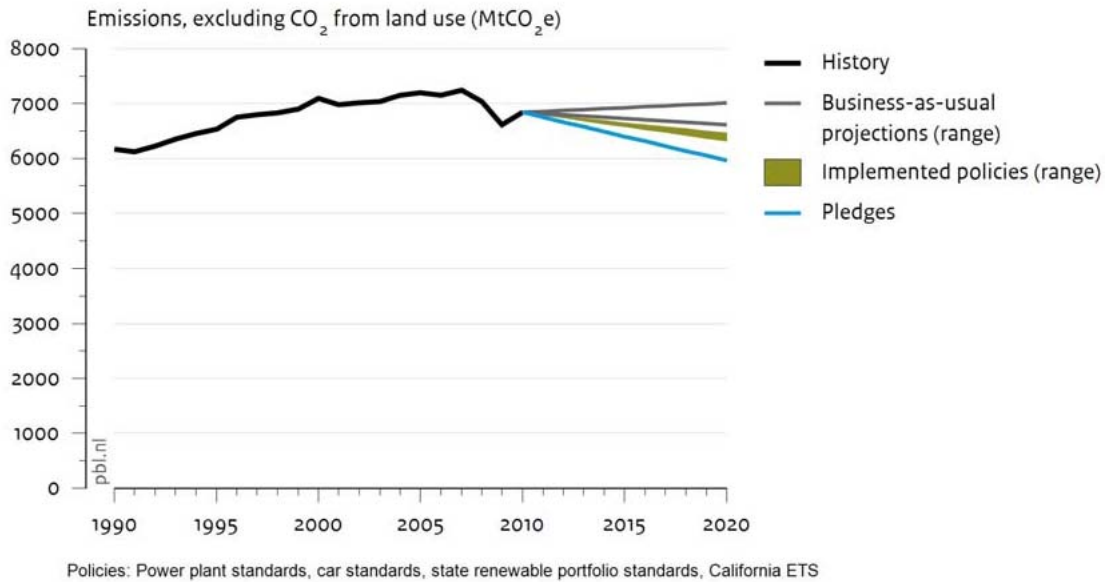
Greenhouse gas emissions for India



United States

According to Höhne et al the proposed and implemented energy and climate policies in the United States will not be sufficient to reach the proposed 17% emission reduction of the Copenhagen pledge. In the assessment for USA the power plant standards, car standards, renewable portfolio standards and the California ETS were taken into account. This would mean that the USA needs to develop additional measures to meet their ambitions.

Greenhouse gas emissions for the USA



The compatibility with the 2 °C target to limit the average global temperature increase to 2 °C by the end of the century depends of course on the assumptions for the years after 2020. In the model assessments carried out within this project the Copenhagen pledges were implemented as strict targets for 2020 and an decrease of carbon intensity after 2020. The model results showed that it is not likely that the 2 °C target will be reached under the unconditional and conditional Copenhagen pledges. Since for some regions the current and planned policies turned out not to be sufficient to meet the 2020 targets stated in the Copenhagen pledges, reaching the 2 °C target with current level of ambition of policies will be even more unrealistic. Therefore more effective measures needs to be considered and countries come up with additional policies to increase the use of renewable, improve energy efficiency and reduce energy consumption.

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