

EU Emission Trading Fact Book

Facts and trends related to the European Emission Trading Directive

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Although the Kyoto Protocol does not expire until 2013, preparations for a follow-up agreement have long been under way. While the global community convened in Bali December 2007, to lay the foundations to a Post-Kyoto framework, the EU is taking action: “The [EU] Commission considers that market-instruments should play a key role in the future international system.”¹ The Commission announced it will overhaul the European Emission Trading System (EU ETS) in time for the international debate, so the EU ETS may serve as the nucleus of an international carbon market. This linkage explains the importance the Commission places on the revision of the ETS: The Commission will publish a new draft in January 2008. This fact book gives an overview of the climate debate and the emission trading discussion. Underlined concepts and terms are explained in greater detail in the annexed glossary.

The basics: Climate change

On 17 November 2007, the International Panel on Climate Change (IPCC) published an up-to-date estimate of global warming’s progress. Since 1990, global CO₂ emissions increased by roughly a third. From 1995 to 2006, the world experienced the eleven warmest years since reliable temperature records became available in the 1850s. Depending on the further increase of the atmospheric greenhouse gas concentration, the IPCC expects global temperature will rise between 1.8 and 6.4 °C until 2100, causing increasingly severe weather phenomena, changes in precipitation, and rising sea levels.² These climate hazards will hit poor countries and coastal states especially hard; experts expect up to 500 million environmental refugees. Meanwhile, expectations are that Europe will experience regional droughts, severe flooding, an increase of heat-related health problems, as well as dismal harvests.³

The IPCC asserts that climate change is real and irreversible. Thus, the focus is on limiting global warming to 2 degrees Celsius above today’s temperatures in 2100. To achieve this goal, scientific evidence indicates that the global atmospheric CO₂ concentration must be stabilised

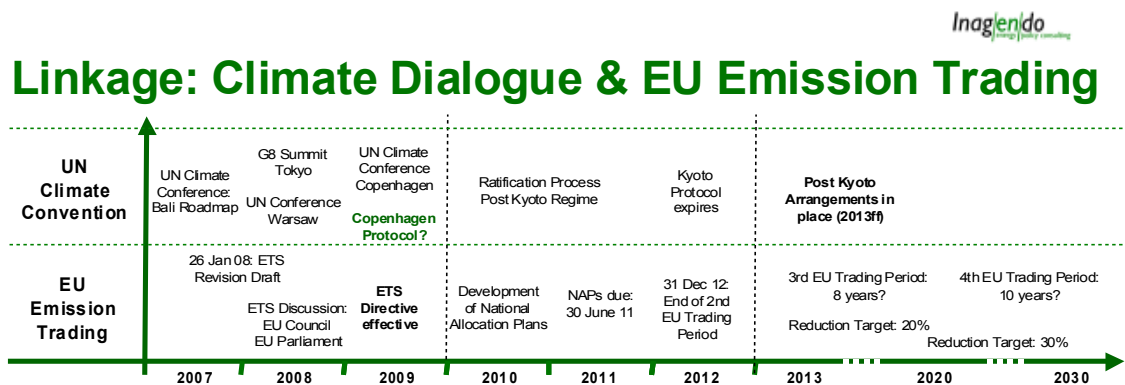


Fig. 1: Linking of EU Emission Trading Directive with the global climate dialogue

at 450 ppmv - parts per million air molecules by volume (fig.2). CO₂ increased by more than 35%, from 280 ppmv in pre-industrial times to the current level of 381 ppmv. Alarmingly, this increase appears to be accelerating from 1.6 ppmv per year in the 1990s to an annual 1.9 ppmv in this decade.⁴ To curb the CO₂ concentration, global emissions need to fall to half the 1990 level by 2050. This will not only require **industrial countries** to reduce their emissions by 60 to 80 percent: it also necessitates that **transition and developing countries**, which are extending their carbon footprint as they catch-up economically with the industrialised world, stabilise their emissions until 2020-2025 (fig.3).⁵

During its spring meeting in March 2007, the European Council agreed to take the leading role in international climate protection. It endorsed an EU objective of a **20% reduction** in greenhouse gas emissions by 2020 in comparison to 1990 levels. If other economically advanced countries committed to adequate measures as well, the EU promised to raise this goal to **30%**.⁶

While the correlation between man-made greenhouse gases and global warming is now unequivocally accepted, the economic consequences remain disputed. In 2006, Nicholas Stern, former chief economist at the World Bank, forecast that the economical damage of climate hazards would be 5 to 20% of the global GDP. The Stern report warned that – with no actions taken – climate change might cause a global **economic depression**.⁷ The damages inflicted would far outweigh the economic cost of counter measures, which Stern fixed at 1% of the global GDP.

Other research indicates that decisive action might only cost 0.12 to 0.41 percent of the annual GDP. At the Bali Conference, a study commissioned by the United Nations estimated that the developed world's climate protection investments alone must amount to an annual 86 billion US dollars by 2015. Essentially, most researchers agree that combating climate change will be cheaper than non-action, and the degree of climate damage depends on the timeliness and extent of counter measures.⁸

The debate, thus, shifted from the question of whether climate protection investments make sense to a discussion of **which** mitigation strategies are most effective. The United States, in particular, led the open debate on the existence of more efficient alternatives to the mechanisms of the Kyoto Protocol. In the Asia-Pacific Partnership on Clean Development and Climate, the USA, Australia, China, India, South Korea, Japan, and Canada agreed on a bundle of measures to curb climate gases without hurting their economies. Critics claim such non-bind-

2° C Stabilisation Target

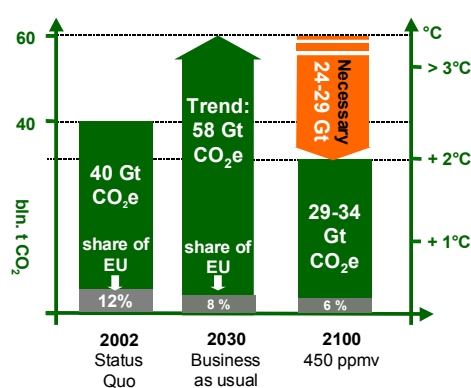


Fig.2: Necessary CO₂ reductions

Cumulative global CO₂ emissions

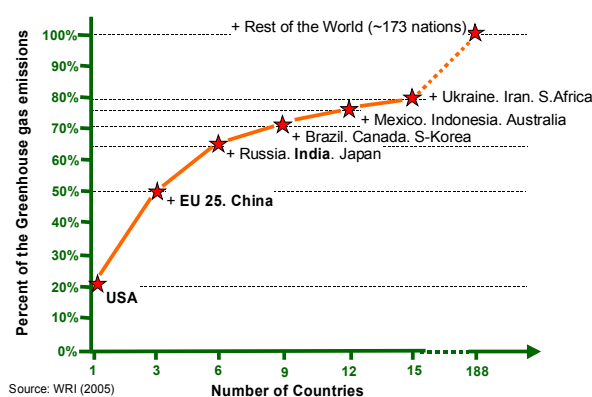


Fig.3: 15 countries + EU emit ~80% of the global CO₂ emissions

ing targets will not suffice. The EU entered the Climate Conference in Bali, asking for **binding targets** for all industrialised countries and a **global emission trading system** at its very heart.⁹

The Basics: Kyoto Protocol

In the **Kyoto Protocol (1997)**, the industrialised countries and successor states of the Soviet Union and Yugoslavia agreed to return their greenhouse gas emissions 5 percent below 1990 levels by 2012. The EU-15 committed to a joint reduction target of **8 percent**. The Kyoto Protocol names six greenhouse gases, known to contribute to global warming: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), fluorocarbons (H-FKW, FKW), and sulphur hexafluoride (SF₆). To allow for better comparison, climate impact of these gases is in CO₂ equivalents (CO₂e). The greenhouse effect of, i.e., one tonne of methane (CH₄) equals that of 25 tonnes of carbon dioxide, and is thus calculated as 25 tonnes CO₂e.

To mitigate these greenhouse gases, the Kyoto Protocol includes three mechanisms:

1. Internalisation (Pricing-in) of CO₂ emissions by means of emission trading,
2. Joint projects in-between industrialised countries (joint implementation), and
3. Projects between industrialized and developing countries (clean development mechanism).

Enforcement of the protocol required ratification by a minimum of 55 countries, representing at least 55% of global CO₂ emissions. Russia ratified the treaty in October 2004, fulfilling the second condition, and the protocol became effective 90 days later. The first compliance period under the Kyoto Protocol lasts from 2008 to 2012. The first trading period of the EU Emissions Trading System (EU ETS), from 2005 to 2007, precedes this Kyoto period and was meant as a learning phase.

For the years after 2012, the international community needs to negotiate a succeeding agreement. The Climate Conference (Conference of the Parties) convening in Bali, in December 2007, has advanced the negotiations on such a follow-up regime. Bali did not provide for **binding targets**, as the EU had insisted: The **Bali Roadmap** of 14 December 2007 installed a two year round of negotiations that will include the United States and developing nations such as China and India. It was agreed that a successor pact shall be developed until the 2009 Climate Conference in Copenhagen. The new agreement must be in place no later than 2009 in order to allow for a subsequent ratification process and become effective in 2013.

The basics: Principles of emission trading

Due to wind currents, atmospheric greenhouse gases disperse globally, making the exact location of emission reduction unimportant. Instead, the limitation of global total emissions is of paramount importance. In order to attain that goal, a market-based instrument such as emission trading has two advantages over fiscal or legal disciplinary provisions:

- It is possible to define exact binding **emission ceilings** (cap). Fiscal measures, on the other hand, run the risk of exceeding targets since companies and people may accept higher taxes.
- Mitigation may take place where reduction costs are lowest. Instead of a costly meeting of individual targets, companies buy emissions rights from locations where the same reduction is relatively inexpensive (trade).

As a **first step**, countries define the allowable emission level (**cap**) on a national basis. In the second step, this amount is broken down between sectors participating in the emission trading (energy and industry) and sectors outside the ETS (households, trade, transport). A **third step** brings the allocation of the resulting budget to the participants in the emission trading (Fig. 4). The reduction target (**cap**) creates a **scarcity situation** where there are fewer emission permits available than the market requires if it does not change its emission habits. Companies will need to reach the target through technical mitigation or abide by emission certificates acquired on the market (fig. 5).

In this way, CO₂ receives a **price tag**: Companies with relatively inexpensive mitigation options will invest in reduction measures and make additional profits by selling surplus emission rights. If their own mitigation efforts should prove more expensive than the CO₂ market price, companies will buy certificates. In effect, the required reduction will occur where the highest reductions are available at the lowest cost, thus maintaining economic equilibrium. Experts estimate that emission trading helps achieve climate protection for half the expense of regulatory laws. The EU Commission estimates the economic costs of the EU emission trading system at an annual **2.9 to 3.7 billion Euro**, in comparison to **6.8 billion Euro** for similar CO₂ reductions with no ETS in place.¹⁰

Clean development mechanism

The introduction of flexible project mechanisms to the Kyoto Protocol was initially suggested by the USA, which ultimately did not join the agreement. Flexible project mechanisms amend the low-cost approach of emission trading and provide for compensation of inexpensive mitigation options in other countries.

Joint implementation (JI) allows for joint mitigation projects between industrialised countries. Clean development mechanism (CDM) compensates emission reductions in developing countries. These projects generate “credits,” which are convertible to “normal” emission certificates. Companies may return certificates from JI (ERU) or CDM projects (CER) in order to comply with their emission obligations.

Flexible mechanisms need to abide by complex rules. An approval process needs to provide evidence that a project will actually result in “additional” emission reductions in comparison to a hypothetical scenario with no project in place (baselining). The generation of certificates only occurs when there are proven additional savings.

Principles of Emission Trading

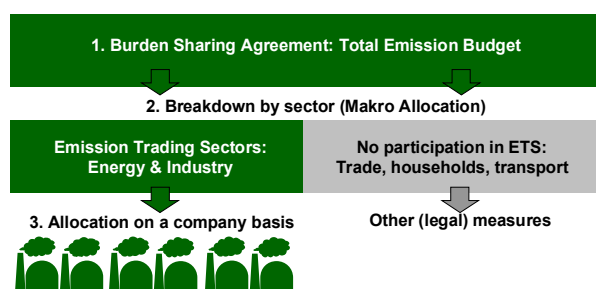


Fig.4: Breakdown of emission budgets to ETS sectors

Emission Trading between companies

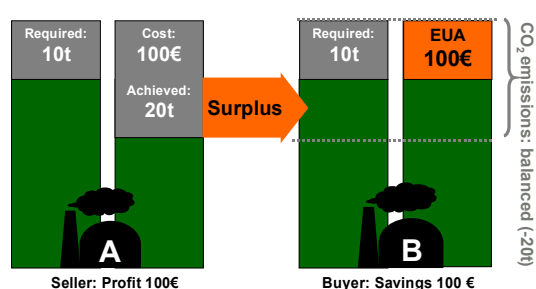


Fig.5: Emissions trading between installations

The sheer complexity of the admission process prevented the undertaking of more CDM projects. Thus, the initial supply of CDM certificates (CERs) did not meet the demands of the industrialised countries. By November 2007, the United Nations CDM Registry (UNEP) had registered 850 projects, with only 270 projects actually generating certificates, totalling 94 million CERs¹¹. Since some countries, like the **Netherlands, Ireland, and Luxembourg**, plan to purchase great amounts of CERs to abide by their Kyoto targets, the actual supply of CERs is, obviously, not up to demand.

The EU Commission estimates that the state-run CDM funds of the EU member states alone will require 500 to 600 million CERs. In addition, non-EU countries, such as Japan, and the private sector also compete for CERs. For example, Germany's RWE announced it would contract 90 million CERs over five years to abide by the company's targets. The EU Commission believes some member states will miss their Kyoto targets since CER supply does not meet demand.¹² In addition, the United Nation's Marrakesh Accords (2001) mandate that the developed countries must commit to **substantial domestic reduction efforts**.

China (26%), India (32%), and Brazil (12%) attract most CDM investments. The CDM Registry of the United Nations (UNEP) estimates that by 2012, these three countries will generate 75% of all CERs. The Bali Conference was critical of the fact that Africa's CDM potential goes mostly unused and urged investors to explore African opportunities. Typologically, the bulk of CDM projects come from water power, biomass, wind, and farming. In addition, many projects focus on greenhouse gases other than carbon dioxide. By reducing nitrous oxide or methane, which have 25 or 198 times the climate impact of CO₂, smaller projects generate a larger amount of CERs.

Joint implementation

CERs from CDM projects were already valid "currency" in the first European emission-trading period, while JI credits (ERUs) were not admitted before the Kyoto compliance period starting in 2008. The JI approval process is similar to CDM, adding the same obstacles due to complexity. Consequently, there were only 205 JI projects as of November 2007, a third from **Russia and Ukraine**.

Much like CDM, many JI projects focus on water power, biomass, and wind. Forty-three percent of all ERUs come from methane reduction projects (mostly from leaking gas pipelines). As a result, sanitising the former Soviet Union's pipeline system alone could yield 82 million tonnes of CO₂ equivalents. In October 2007, the total aggregated emission reduction of all registered JI projects amounted to only **32.5 million** tonnes of CO₂ equivalents.

The host country deducts JI certificates from its emission budget and transfers them to the purchaser/investor's country of origin. This prevents an overspill of the aggregated budget of all developed countries as set down in the Kyoto treaty. Since countries need to off-balance their accounts, they must provide for (bilateral) contracts. Due to the governmental change, negotiations in Ukraine stalled. Russia passed its JI legislation in October 2007. Observers note that JI projects mostly concentrate on mega projects and many mitigation options in smaller projects remain untapped.

The EU Emission Trading Directive

In the Kyoto Protocol the European Union committed to returning its emissions **8%** below 1990 levels by 2012. By then, the greenhouse gases of the EU-15 amounted to 4,252 million tonnes of CO₂. The resulting reduction target of about **265 million tonnes of CO₂** was broken down between member states in a Burden Sharing Agreement 1998, allowing for individual national emission targets.

While some countries accepted higher relative targets (i.e. Denmark, Germany, and the UK), other member states received permission to even increase their emissions over 1990 levels, to allow for their economic development (i.e. Portugal, Greece). The accession countries joining the European Union after this agreement share a reduction target of 8%. Exceptions are Hungary and Poland, which have a 6% target, and Cyprus and Malta with 0 percent targets (fig.6). Due to the transition of the eastern European economies, the emissions of the new member states are way down from their 1990 levels, with the notable exception of Slovenia.

Though the first compliance period under the Kyoto Protocol does not start until 2008, the European Union opted for an earlier commencement of its emission trading system (ETS), initially on a voluntary basis. By 2002, the observed emission trends suggested that the EU might miss its Kyoto targets (fig.7). Thus, the EU opted for a **mandatory system** instead, allowing for a more gradual approach to its 8% Kyoto goal for 2012. The first European emission trading period preceded the Kyoto compliance period and ran from 2005 to 2007 (fig. 7).

Legal framework

The **EU Emission Trading Directive** of 13 October 2003 set the legal framework for the introduction of the ETS. In the first phase, only large combustion installations above a certain size (>20 MW_{th}) from the energy and industry sectors were required to participate. The trade was limited to carbon dioxide (CO₂). Supported by “interpretation aids” (NAP Guidance), the Directive contains mandatory rules for the calculation of emission ceilings, allocation principles, and monitoring mechanisms. The application of the flexible Kyoto mechanisms JI and CDM is laid down in a Linking Directive ¹³.

Member states must notify the EU Commission of their emission budgets, the breakdown between trading and non-trading sectors, and the principles of allocating the emission rights in national allocation plans (NAP). The ETS Directive authorises the Commission with the power to grant or withhold final approval of the NAPs.

Burden Sharing Agreement 1998

Belgium	-7.5%	Netherlands	-6.0%
Denmark	-21.0%	Portugal	+27.0%
Finland	0.0%	Sweden	+4.0%
France	0.0%	Spain	+15.0%
Germany	-21.0%	UK	-12.5%
Greece	+25.0%		
Ireland	+13.0%	Accession States:	-8.0%
Italy	+13.0%	(Hungary, Poland)	-6.0%
Luxembourg	-28.0%	(Malta, Cyprus)	0.0%

➔ **EU Joint Target: 8 percent below 1990**

Fig.6: Burden Sharing Agreement, 1998

Burden Sharing: Target vs. reductions

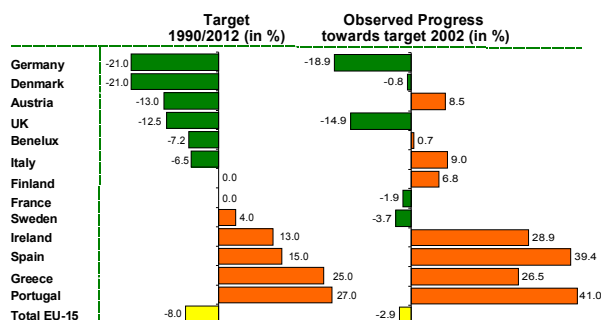


Fig.7: Observed distance to target of the EU-15 in 2002

The first notification process (NAP I) took place with much political discord between national governments and the EU Commission, especially after the later disqualified 14 NAPs as “too generous” and slashed them for **290 million tonnes**. With new emission records available, the UK sought to extend its emission budget at the end of 2004 for 20 million tonnes; the Commission refused to allow such an extension. 13 member states planned rules for a subsequent correction of allocated emission amounts, but the EU Commission prohibited such ex post adjustments, ruling instead that subsequent changes would add insecurity to the carbon markets and discourage investments. Germany challenged this provision at the European Court, which ruled against the EU Commission in November 2007. This bears little practical relevance, since the NAP II rules explicitly forbid any such ex post adjustment for the trading period starting on 1 January 2008.

The Directive requires that **allocation principles**, that is the allotment of certificates to installations or companies, must reflect technological mitigation potential. In addition, no economic sector must be unduly favoured or handicapped. The basic allocation principles are

- ◆ Grandfathering: Allocation on grounds of historical emissions;
- ◆ Benchmarking: Allocation on basis of a technical comparison among installations (BAT);
- ◆ Auctioning: State “sale” or “auction” of available emission rights to participants.

The European Directive had to become national law as well, resulting in a **patchwork** of about 60 national laws, provisions, and directives. Some member states, such as Portugal and Italy, bestowed one authority with ETS tasks. Other member states provide for up to six authorities (Sweden), regulating different aspects of emission trading.

Since the EU sought to avoid a cost shock to the economies with the introduction of the emission trading system, the Directive called for **free allocation** of emission rights: 95% of all certificates in the first, and 90% in the second trading period had to be allocated for free. In the first trading period, Denmark (5%), Ireland (0.75%), Hungary (2.5%), and Lithuania (1.5%) decided to auction minor shares. Germany (9%), the United Kingdom (7%), all Benelux countries, and Poland joined for the second trading period (2008-2012). The EU Commission supports the increased use of **auctioning** to gain experience with that instrument for the post-Kyoto period.

Lessons learned from the first trading period (2005-2007)

According to the Commission, “*the first period was always intended to be the learning phase.*”¹⁴ It concedes that the phase between issuance of the Directive in 2003 and the start of emission trading 2005 was too short for thorough preparations. The emission trading system started on 1 January 2005, with only 21 of 25 member states participating. It comprised roughly 9,000 installations all over Europe (now 11,500) and a total budget of **2,190.8 million tonnes of CO₂**.

At that time, there was a dearth of data availability and reliable emission records. Indeed, there was no accurate information about the actual degree of scarcity on the carbon markets. General complaints about the complexity of 25 sets of national rule set and the degree of red tape, especially for smaller participants were legion.¹⁵ Critics claimed that applying different rules to similar companies would **harm competition**. For example, a company in Germany might be required to participate in the ETS, while its competitor 30 miles away across the French border

would be exempt due to different plant definitions. Many member states, in turn, accused Germany of “draining” power plant investments from other member states by guaranteeing free CO₂ certificates for 14 years. The Climate Change Committee notified Germany that this provision would seriously impede the Internal Market ¹⁶.

The lack of transparency on the true degree of scarcity and the diminishing volume of actual trading led to **volatility of certificate prices**. While experts had expected CO₂ prices around 10 to 12 Euro, actual prices quickly surged to 29 € per tonne of CO₂.

Companies had to return their certificates for 2005 by 30 April 2006. The member states would then report their national data to Brussels. Unfortunately, information that there was a gross over-allocation in some member states leaked into the market prematurely, resulting in a free fall of certificate prices to 10 € per tonne of CO₂. In December 2007, CO₂ certificates for the first trading period are almost completely devalued at 0,01 € per tonne of CO₂. The major reason for this devaluation is a prohibition on transferral of certificates from the first to the second period. Hence, they lose any value at the end of 2007. Forward prices for the second trading period, starting in 2008, give a better indication of CO₂ price trends. As of December 2007, the right to emit 1 tonne of carbon dioxide in 2008 equals **22.58 €** (fig.8).

The evaluation of all 2005 emission records by 30 April 2006 provided for a major lesson during the first trading year: All EU member states together issued a surplus of **44 million CO₂ certificates** into the carbon markets. Supply of certificates thus far outnumbered demand ¹⁷. Only the United Kingdom, Spain, Italy, Austria, and Ireland issued appropriate amounts to their industries. Consequently, the Commission required **much tighter emission budgets** for the second EU trading period (see annex 1).

Opportunity costs and windfall profits

Perhaps the largest learning experience of all was the result of **price building**. Many non-economists expressed surprise at the effects of instant pricing-in. They had assumed companies would price-in only CO₂ certificates purchased at market value - the difference between the free allocation and the actual emission. In practice, companies sought to price-in **all** certificates at market value, even those received at zero cost. This is due to the economic rule of opportunity costs. No matter whether certificates are free or purchased, they constitute a real economic value, and may be used for production (i.e. power generation) or sold at market prices. A power plant will go on-line if it earns fuel costs plus the **market value** of CO₂ certificates. Oth-

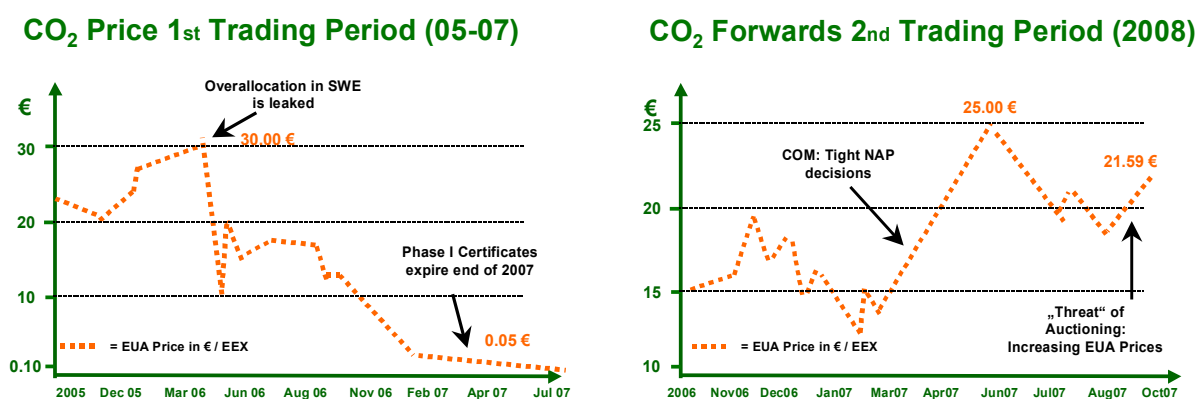


Fig.8: Development of CO₂ Certificate prices for the first (2005-2007) and second trading period (forwards 2008)

erwise, it is economically more attractive to shut down the plant and sell unused certificates over the exchange. The avoided fuel costs plus opportunity profits from the sale of emission rights add to the company's profitability. Opportunity costs, thus, are not "classic" costs, but rather foregone profits because viable alternatives remained unrealized.

This mechanism is well established in economic theory and defended by all economists. Pricing-in of CO₂ certificates is a core concept of emission trading: It is essential for CO₂ to receive a price tag and become an additional **production factor** in economic reasoning. According to an analysis from the EU Commission, 48% of all companies already consider CO₂ prices in their production decisions. Seventy percent announced they would price-in CO₂ certificates in the future, no matter whether freely allocated or bought.¹⁸

The pricing effect depends on the ability of companies to pass on that burden to their customers. This is difficult for companies operating in a highly competitive international environment, but less so in sectors with inelastic demand: Political upheaval, thus, focussed on the energy sector. Energy companies would receive free certificates, but pass them on to customers at real cost, thereby generating massive **windfall profits**.

Political discussion heated up exponentially when a spiralling price effect hit the European electricity and gas markets in the spring of 2005. CO₂ costs, however, can only explain a third of this price increase. The major reason for the **surge of energy prices** is the looming price of oil. Oil defines the reference price for other fossil resources, such as natural gas and coal. In 2005, gas prices, following oil, climbed to new price heights, resulting in increased capacity use of coal fired plants in the UK. Since these emit substantially more CO₂ the European carbon market saw an unforeseen additional demand for CO₂ certificates from the UK.

Lessons learned from the second trading period (2008-2012)

The political upheaval over undue profits spurred a discussion about shaving-off that profit (i.e. by a **windfall profit tax**). There is considerable pressure to end free allocation - at least for sectors that may pass emission costs to their customers - and **auction** off emission budgets. For the second trading period, some national allocation plans (NAPII) provide for tighter reduction targets for the energy sector, i.e. the Netherlands or Germany.

The NAPII process also resulted in an increased sophistication of allocation methods. Many second phase NAPs allocate on the grounds of **benchmarking** mechanisms rather than historical emissions (**grandfathering**). **Benchmarks** compare an installation's emissions to a state of the art plant (BAT), setting the standard. An installation receives only as many emission certificates as the best plant would receive. This adds to impartiality and rewards efficient companies; but it also increases the complexity of the allocation process since benchmarks must be regularly defined and updated.

The Commission was **markedly more restrictive** on the **National Allocation Plans** for the second emission-trading period (NAPII). It revised its **NAP Guidance**, formerly voiced in the tone of "suggestions", and set mandatory rules for all member states. Mandatory rules apply to the calculation of the national emission budgets (**caps**) as well as to core allocation principles. Importantly, the Commission ended ex-post adjustments, which had been a source of conflict during the NAPI process. It also announced that failure to comply with one criterion would lead to a rejection of the NAPII as a whole.

The national allocation plans for the second phase were due 30 June 2006. The primary approval process lasted until October 2007, accompanied by controversies between Brussels and individual member states, especially concerning the size of **national emission budgets (caps)**.

NAPII approval by the Commission

With the approval of the Romanian and Bulgarian NAPs on 26 October 2007, the Commission has essentially approved all 27 national allocation plans (see Annex 1). Taken together, these NAPs result in a European ceiling (cap) of roughly **2,083 million certificates**. That is 10 percent below the caps proposed by the member states, and 3.5 percent below the actual 2005 emission levels. That distinction is important since the new member states proposed emission ceilings for 2012 that substantially exceed their 2005 emission levels to allow for economic development.

In relative figures, the Commission made **severe cuts** of the proposed amounts for the Baltic countries (47-55%), Bulgaria (38.4%), Luxembourg (37%) and Malta (29%). In absolute figures, the proposed caps of Poland (-76 million tonnes), Germany (-29 million tonnes), Bulgaria (-25 million tonnes), Romania (-20 million tonnes), the Czech Republic (-15 million tonnes), and Italy (-13 million tonnes) were substantially slashed. Seven member states, among them Hungary, Poland, the Czech Republic, Latvia, Lithuania and Malta, appealed to the European High Court to challenge the Commission's cuts.

Revision of the EU Emission Trading Directive

The lessons learned from the first trading period will help in crafting provisions of the revised Emission Trading Directive. The most ambitious task, however, is to shape the emission trading system so its efficiency will convince sceptics from developing countries and the USA. 23 January 2008 will see the release of the revision draft, initially slated for November 2007.

A working group of the European Climate Change Programme (ECCP) had the task of evaluating the current emission trading system. Prior to June 2007, the working group issued four reports with topics and recommendations for a redraft. The central topics are:

1. Cap setting: Calculating emission budgets and assignment to member states
2. Harmonisation of allocation principles
3. Recognition and inclusion of JI and CDM
4. Inclusion of other sectors and greenhouse gases
5. Linkage to other international trading systems

Assignment of national emission budgets (Caps) as well as mandatory uniform allocation principles will likely be topics of debate in the political arena.

Cap setting

The ongoing controversy over the Commission's NAPII slashes suggests that the calculation of the individual national emission budgets will not go without **political conflicts**. This is especially so since the Kyoto target of 8% is relatively modest in comparison to the ambitious 20% target for 2020.

There is an ongoing debate **who** is to define the national emission ceilings: member states or EU Commission. The later will want to apply a formula integrating **economic development** and **energy productivity** to calculate appropriate emission budgets, an approach already used in the NAPII approval process. But the appeals against the Commission's NAPII decisions suggest that not all member states want to amend the Commission's current powers.

Austria, Belgium, Denmark, and Sweden favour a harmonised cap for the entire EU. The Netherlands, Italy, Ireland, and the UK opt for more subsidiarity. France, among others, seeks recognition of CO₂ reductions from non-fossil fuels, to reward the substantial CO₂ saving potential of its **nuclear energy** programme. Nevertheless, there is little argument that the current NAP process is too "political." Twenty-seven individual NAPs are simply incalculable, and some degree of harmonisation is necessary. If the European trading system is to provide the nucleus of a global emission trading system, the rules for assigning emission budgets and the underlying allocation principles need to be simple and transparent.

Harmonisation of allocation principles

The sharing of **jurisdictional powers** between the Commission and member states is an issue in another core area of the ETS as well - the allocation process: Rules of issuing emission certificates to companies. Within the bounds set by the NAP Guidance, the EU countries were relatively free to decide on the national breakdown of their budgets. The resulting cross-European patchwork of provisions caused much dismay.

Some harmonisation requirements are relatively undisputed, i.e. a uniform definition of plants to be included in the ETS. Depending on the national plant definition, this may vary by member state. The Commission seeks uniform legislation on which plants are required to participate. In addition, it promised better harmonisation of the central allocation mechanisms, favouring an allocation on grounds of benchmarking over grandfathering. The Commission supports benchmarking to add fairness to the allocation process and reward already efficient companies.

Some member states introduced varying degrees of benchmarking in their NAPII provisions for the second trading period of 2008–2012. The underlying principle here is that installations will receive as many certificates as the most efficient available plant (BAT). Still, the degree of efficiency differs by country, so that the Directive would need to define uniform, **harmonised benchmarks** for all of Europe. This will be a difficult engineering and political task. Some sectors, like the paper and pulp industry or refineries, produce thousands of products. It will be relatively complex to define benchmarks for any single product, let alone periodically updating benchmarks with technological progress.

Some countries want to define uniform EU benchmarks only for the largest emitters, the energy industry among them, and leave the allocation to smaller emitters in the jurisdiction of the member states. Yet, this leaves the open **political question** whether the benchmarks would provide for a compensation of national hardships due to a widely varying energy mix. Historically, the EU countries display vastly different **carbon intensities**. France, Austria, or Sweden, i.e., with their high share of water power or nuclear energy, have a very low carbon intensity. Poland, Greece, the Czech Republic, Bulgaria, and Germany, on the other hand, have a major share of coal-fired plants resulting in a high carbon intensity of their energy mix. Acknowledging these differences in the calculation of emission caps and setting harmonised benchmarks is certain to be controversial during the revision of the Directive.

In addition, there is an increasing preference to decrease the amount of free allocation and introduce a state auction of available certificates. Auctioning yields a **number of advantages** over the current free allocation that appear to make it the instrument of choice. It greatly reduces the current complexity of the allocation process. No longer is it a government authority that needs to determine the level of allocation. Instead, the market participants themselves will define their demand. Auctioning will thus end the need for complex benchmarking, the need to reserve certificates for new participants entering into the market (new entrant reserve), and will eliminate windfall profits. The generated auction returns could go into state budgets, go back to customers, or feed additional climate protection funds.

But auctioning also has a disadvantage. Designed with the energy industry in mind, it neglects competitive industries with little chance to pass through the additional cost. Auctioning will **instantly** transform all CO₂ costs – even those that have not yet or may not be redeemed – in **real costs**. Evidence suggests that to date only 48% of the CO₂ cost is actually *priced-in*, which is different from *passed-through*. Thus, the current effect for end-customers – not yet empirically evaluated by the Commission - is significantly lower. Increased complexity in a fair redistribution of these auction burdens to customers and industry thus offsets the diminished complexity of the allocation process.

Moreover, CO₂'s price tag will be higher for member states with high **carbon intensity** due to their energy mix. If the Directive does not off-balance these differences, the energy intensive economies of the EU accession states will experience considerable carbon cost pressure. Thus, the Directive faces the difficult task of thoroughly defining the **share of auctioning** and limiting it to sectors that may pass-through carbon costs without negative competition effects. Additionally, the Directive will need to define uniform rules for the **redistribution** of auction returns to avoid competitive distortions in the Internal Market.

Acknowledgment of Joint Implementation and Clean Development Mechanism

The definition of national emission budgets has close links with the recognition of **JI and CDM projects**. The Commission strongly prefers uniformly limiting the applicable share of CDM and JI projects in the national emission budgets to a proposed 22%. It fears that a further recognition of third country measures diminishes its grip on the European emissions targets. Additionally, Brussels is wary of the actual progress of CDM. It suspects that only 70% of all CDM projects yield factual emission reductions, while 30% are simple by-effects.

The Commission also maintains that overly generous recognitions will only delay domestic action on climate protection. Countries like Ireland, the Netherlands, or Finland, are already relying to a substantial degree on international measures to meet their Kyoto targets. Since the 2020 target of 20% is by far the most **ambitious goal** yet seen in the EU, more member states will want to extend on international activities in order to meet their targets. Thus, member states will require a looser approach to the limit on flexible project mechanisms.

This poses a **dilemma** for the Commission - either achieve ambitious caps and loosen the limits on CDM and JI or run the risk of distributional political conflicts. A possible solution to that dilemma might be better linking of emission stabilisations in transforming economies with CDM approaches of EU member states. The Directive could allow for bilateral and multilateral agreements between EU member states and developing countries, define transparent criteria for any such endeavour, and consider these measures when defining national emission targets.

Similarly, the Bali Conference calls for an increased transfer of funds and technology from the developed to the less developed world. There is little doubt that the European Union will **not be autonomous** on any such recognition, since the Directive will need to incorporate provisions agreed on during the international climate talks.

Inclusion of additional sectors and climate gases

Though emission trading is often viewed as the core mitigation instrument, it is limited to two sectors and 45% of the total European CO₂ emissions. The traded share of emissions differs vastly between the EU countries, ranging from only 30% in France or Luxembourg to over 70% in Lithuania or Estonia. Thus, 55% of the European Union's emissions do not fall under the emission-trading regime and need regulation by other legal means. To improve overall efficiency of the ETS, environmental policy considers the inclusion of **additional sectors**. There is also a preference to include additional **greenhouse gases**. Indeed, France and the Netherlands are in favour of including nitrous oxide (N₂O) from fertilizer production, as this is a greenhouse gas with 298 times the climate impact of CO₂.

While the industry displays stabilising trends, emissions from the **transport sector** are steadily increasing. The Commission, thus, considers including the commercial transport sector. It has decided to include European **aviation** beginning in 2011, and international flights to and from European destinations starting in 2012, a proposition challenged by the international aviation community. In practice, airlines would need to return certificates for flights and pay starting and landing fees related to their CO₂ emissions. It is yet unclear whether airlines would receive free allocation or need to auction their demand.

There is continued discussion on including further sectors, including **waterborne transport** and **waste incineration**. Few would argue that it is common sense to include only those sectors where resulting mitigation costs are lower than that of any other (legal) instruments.

Additional requirements for the revision

Currently, this common sense criterion is also evaluated for installations that already fall under the ETS. Some member states want the exclusion of **small installations**, maintaining that participation (administration, fees) results in excessively high mitigation costs. The Commission calculated the cumulative emissions of 3,500 installations, emitting less than 10,000 tonnes (31% of all installations), at less than one percent of the total emissions. Though their contribution to climate reduction is limited, participation in the ETS puts a burden on small installations.

In Denmark, Sweden, and the UK, annual administration costs for small installations range from 1,700 to 5,000 €. Consequently, the Commission may release small installations from the ETS and has discussed a threshold level of **25,000 tonnes maximum**. Applying such a threshold would release 57% of all installations from the ETS, but account for only 4% of all emissions. Critics warn that such a move would even diminish the share of emissions falling under the ETS regime, when an extension should be the policy goal. They advise covering fees and duties of small installations with auction returns.

Another requirement for the new Directive concerns the **duration of the trading periods**. There is a general understanding that five-year trading periods do not work well with the investment cycles of the industry. The Commission warns against overly long trading periods

since such a measure would result in a wait-and-see approach with mitigation actions postponed while companies bet on technological progress. Currently, there is a strong impetus to schedule the third EU trading period for **2013 to 2020**, which comprises eight years.

Other requirements are technical, i.e. whether to allow borrowing or saving from certificates for future trading periods. In addition, the Directive will need to contain provisions for the treatment of captured and stowed away CO₂ from coal-fired plants (CCS). The draft of the applicable CCS Directive, expected in January 2008, states that “CO₂ captured and stored will be credited as not emitted under the Emissions Trading Scheme.”¹⁹

Integrating the EU ETS into a post-Kyoto regime

By 2020, the European Union will account for only 8 to 10% of global emissions. The International Energy Agency (IEA) expects **China** to surpass the USA as the world's largest emitter in January 2008. **India** in turn, following current emission trends, will overtake China by 2012.²⁰ It is, thus, evident that the EU may only exert a leading role in climate protection if it successfully convinces other countries to move along. Otherwise, the European Union's ambitious policy will not only result in negligible contributions to climate protection, but also put isolated burdens on its own economies.

This means that the revision of the Directive must shape the EU emission trading system in a simple and efficient manner in order that it may prove its **superiority** in the upcoming climate negotiations. To do so, the EU emission trading system must refocus on the intrinsic mechanism: The basic principle of the ETS should be that policy nominates the emission ceilings, and emission trading identifies the most efficient mitigation strategies at the lowest overall cost. The European Union's current approach of micro managing the instrument at times is not necessarily in tune with this goal.

¹ Building a global carbon market – Report pursuant to Article 30 of Directive 2003/87/EC, COM(2006)676, 13 November 2006

² IPCC: Summary for Policymakers of the Synthesis Report of the IPCC Fourth Assessment Report, 17 November 2007

³ An overview about the looming prospects for Europe may, among others, be found in the EU Commissions Green Paper: Adapting to climate change in Europe – options for EU action, COM (2007) 354, 29 June 07

⁴ Global Carbon Project: Recent Carbon Trends and the Global Carbon Budget, 23 October 2007

⁵ Limiting Global Climate Change to 2 degrees Celsius. The way ahead for 2020 and beyond, COM(2007)2, 10/01/2007

⁶ Brussels European Council, 8-9 March 2007, Presidency Conclusions, 7224/1/07, 2 May 2007

⁷ Stern Review on the Economics of Climate Change (2006)

⁸ DIW: Costs of Inaction and Costs of Action in Climate Protection. See also: Edenhofer (2006)

⁹ Council Conclusions on Climate Change, 2826th Environment Council Meeting, Luxembourg, 30 October 2007

¹⁰ EU Commission, MEMO/06/452, 29 November 2006

¹¹ All data on CDM and JI follow the UNEP Risoe CDM/JI Pipeline Analysis and Database, October 2007

¹² The UNEP's CDM Registry expects roughly 2 billion CDM Certificates by 2012, based on the current trend in the CDM pipeline.

¹³ For an overview of the legal framework see Annex “Legal Framework Emission Trading“

¹⁴ Assessment of national allocation plans for the allocation of greenhouse gas emission allowances in the second period of the EU Emissions Trading Scheme, COM(2006) 725 final, 29 November 2006

¹⁵ See the protocols of the ECCP Working Group on the review of the EU emissions trading scheme on the DG Env website

¹⁶ Climate Change Committee, 22/09/2006, cited in the assessment of the German NAP, COM(2006)725, 29 November 2006

¹⁷ Fraunhofer ISI: An Early Assessment of National Allocation Plans [...], S1/2006, 9 November 2006

¹⁸ EU Commission - DG Environment: Review of Emissions Trading Scheme, Survey Highlights, November 2005

¹⁹ Proposal for a Directive of the European Parliament and of the council on the geological storage of carbon dioxide, Non-paper [October 2007]

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Annex I: EU-27 Caps

after Commission Decision on amendments to the Slovak NAP (07/12/2007)

Member States	NAP I Cap	2005 verified Emissions	Proposed NAP II Cap	Approved NAP II Cap	Difference to 2005 emissions**	Relative Difference to 2005 emissions**	Difference to proposed amount**	Relative Difference to proposed amount
Austria	33.00	33.40	32.80	30.70	-2.70	91.92	-2.10	93.60
Belgium	62.10	55.58	63.30	58.50	2.92	105.25	-4.80	92.42
Bulgaria	42.30	40.60	67.60	42.30	1.70	104.19	-25.30	62.57
Cyprus	5.70	5.10	7.12	5.48	0.38	107.45	-1.64	76.97
Czech Rep.	97.60	82.50	101.90	86.80	4.30	105.21	-15.10	85.18
Denmark	33.50	26.50	24.50	24.50	-2.00	92.45	0.00	100.00
Estonia	19.00	12.62	24.38	12.72	0.10	100.79	-11.66	52.17
Finland	45.50	33.10	39.60	37.60	4.50	113.60	-2.00	94.95
France	156.50	131.30	132.80	132.80	1.50	101.14	0.00	100.00
Germany	499.00	474.00	482.00	453.10	-20.90	95.59	-28.90	94.00
Greece	74.40	71.30	75.50	69.10	-2.20	96.91	-6.40	91.52
Hungary	31.30	26.00	30.70	26.90	0.90	103.46	-3.80	87.62
Ireland	22.30	22.40	22.60	22.30	-0.10	99.55	-0.30	98.67
Italy	223.10	225.50	209.00	195.80	-29.70	86.83	-13.20	93.68
Latvia	4.60	2.90	7.70	3.43	0.53	118.28	-4.27	44.55
Lithuania	12.30	6.60	16.60	8.80	2.20	133.33	-7.80	53.01
Luxembourg	3.40	2.60	3.95	2.50	-0.10	96.15	-1.45	63.29
Malta	2.90	1.98	2.96	2.10	0.12	106.06	-0.86	70.95
Netherlands	95.30	80.35	90.40	85.80	5.45	106.78	-4.60	94.91
Poland	239.10	203.10	284.60	208.50	5.40	102.66	-76.10	73.26
Portugal	38.90	36.40	35.90	34.80	-1.60	95.60	-1.10	96.94
Romania	74.80	70.80	95.70	75.90	5.10	107.20	-19.80	79.31
Slovakia	30.50	25.20	41.30	32.60	7.40	129.36	-8.70	78.90
Slovenia	8.80	8.70	8.30	8.30	-0.40	95.40	0.00	100.00
Spain	174.40	182.90	152.70	152.30	-30.60	83.27	-0.40	99.74
Sweden	22.90	19.30	25.20	22.80	3.50	118.13	-2.40	90.48
UK*	245.30	242.40	246.20	246.20	0.90	100.37	0.00	100.00
EU-27	2298.50	2122.16	2325.34	2082.68	-39.48	98.13*	-242.66	89.56

Source: EU COM IP/07/1869 of 7 December 2007 (Amendment decision on Slovak NAP), * Inagendo calculations. * Verified 2005 emissions for the UK do not contain approximately 30 million tonnes of CO₂, which were exempt only during phase 1. If they were applied, the difference to the target of the EU as a whole would amount to 3.23% rather than 1.87%.

Annex II: Glossary Emission Trading

The climate debate and the increasing sophistication of emission trading led to the rise of a wide array of terms and acronyms that come from the political (goal setting), scientific (research & prevention), and engineering (mitigation) realms. This glossary explains terms and underlying concepts in this important debate.

Additionality	Criterion for the evaluation (and issuance of emission credits) in ➤ CDM and ➤ JI projects, which mandates that emission reductions must be additional if compared to a ➤ business-as-usual scenario. See ➤ baselining																																												
Allocation	Assignment of emission allowances (certificates). The allocation principles are at the heart of the emission trading system. ➤ National allocation plans (NAPs) will lay down allocation rules. The NAPs must abide to guidelines set-up by the EU Commission (➤ NAP guidance), which will also approve the NAPs. The allocation rules are mandates on sharing overall emissions among single sectors (macro allocation) and distribution of emission allowances among companies participating in the emission trading system (micro allocation).																																												
allocation methods	Principles for the issuance of emission rights among the participants in the emission trading system. Methods are: ➤ Grandfathering: Allocation on the basis of historical emissions; ➤ Benchmarking: Allocation on grounds of a technical comparison among installations (➤ BAT) ➤ Auctioning: State "sale" or "auction" of available emission rights to the participants																																												
Annex B countries	The industrialised countries listed in this annex to the ➤ Kyoto Protocol committed to return their ➤ greenhouse gas emissions to 5 percent below 1990 levels by the year 2012. Among the Annex B countries, only the USA has not ratified the Kyoto Treaty. Australia's new Labour government ratified the protocol on 3 December 2007, effective March 2008. Annex B countries (reduction obligations in brackets as percentage of 1990 levels) <table border="0" style="width: 100%;"> <tr> <td>Australia (108)</td> <td>Belgium (92)</td> <td>Bulgaria* (92)</td> <td>Denmark (92)</td> </tr> <tr> <td>Germany (92)</td> <td>Estonia* (92)</td> <td>European Community (92)</td> <td></td> </tr> <tr> <td>Finland (92)</td> <td>France (92)</td> <td>Greece (92)</td> <td>Ireland (92)</td> </tr> <tr> <td>Iceland (110)</td> <td>Italy (92)</td> <td>Japan (94)</td> <td>Canada (94)</td> </tr> <tr> <td>Croatia* (95)</td> <td>Latvia* (92)</td> <td>Liechtenstein (92)</td> <td>Lithuania* (92)</td> </tr> <tr> <td>Luxembourg (92)</td> <td>Monaco (92)</td> <td>New Zealand (100)</td> <td>Netherlands (92)</td> </tr> <tr> <td>Norway (101)</td> <td>Austria (92)</td> <td>Poland* (94)</td> <td>Portugal (92)</td> </tr> <tr> <td>Romania* (92)</td> <td>Russian Federation* (100)</td> <td></td> <td>Sweden (92)</td> </tr> <tr> <td>Switzerland (92)</td> <td>Slovakia* (92)</td> <td>Slovenia* (92)</td> <td>Spain (92)</td> </tr> <tr> <td>Czech Republic * (92)</td> <td>Ukraine* (100)</td> <td>Hungary* (94)</td> <td>USA ** (93)</td> </tr> <tr> <td>Great Britain and Northern Ireland (92)</td> <td></td> <td></td> <td></td> </tr> </table> <p>* Transition countries, ** The US did not ratify the Kyoto Protocol</p>	Australia (108)	Belgium (92)	Bulgaria* (92)	Denmark (92)	Germany (92)	Estonia* (92)	European Community (92)		Finland (92)	France (92)	Greece (92)	Ireland (92)	Iceland (110)	Italy (92)	Japan (94)	Canada (94)	Croatia* (95)	Latvia* (92)	Liechtenstein (92)	Lithuania* (92)	Luxembourg (92)	Monaco (92)	New Zealand (100)	Netherlands (92)	Norway (101)	Austria (92)	Poland* (94)	Portugal (92)	Romania* (92)	Russian Federation* (100)		Sweden (92)	Switzerland (92)	Slovakia* (92)	Slovenia* (92)	Spain (92)	Czech Republic * (92)	Ukraine* (100)	Hungary* (94)	USA ** (93)	Great Britain and Northern Ireland (92)			
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Asia-Pacific Partnership on Clean Development and Climate (AP6)	Non-treaty agreement on climate emission reductions between the ASEAN countries USA, Australia, India, Japan, China, South Korea, and (since 2007) Canada, also known as AP6. The agreement was signed 2006, and the partners agreed to co-operate on development and transfer of technology that enables reduction of greenhouse gas emissions without hurting the economies. Unlike the Kyoto Protocol, the AP6 does not contain mandatory limits on ➤ greenhouse gases.																																												
assigned amount unit (AAU)	A ➤ Kyoto Protocol unit equal to 1 metric tonne of ➤ CO2 equivalent. Each ➤ Annex I party issues AAUs up to the level of its assigned amount, which makes up the emission budget of a country. The EU member states assign their national emission budgets to sectors and companies in ➤ national allocation plans (NAP). The EU emission trading system issues ➤ EU allowances (EUAs).																																												
auctioning	Allocation method where, unlike a (cost) free allocation, there is an auction of emission certificates. The EU Emission Trading Directive mandated that in the 1 st ➤ trading period (2005-2007) 95% , in the 2 nd trading period (1998-2012) 90% of all certificates must be allocated for free. Thus, the share of auctioning was limited to 5 to 10% . In the 1 st trading period, Denmark, Ireland, Hungary, and Lithuania opted for a (limited) auctioning. For the 2 nd trading period, these early adopters were joined by Germany (9%), the UK (7%), Poland, and the Benelux countries, which also designated a limited amount of certificates for auction. Following the debate on ➤ windfall profits, there is a tendency to increase the share of auctioning after 2012.																																												
banking	Saving or setting aside emission certificates for future return requirements. The Emission Trading Direct-																																												

ive does not allow transfer of unused or saved certificates from the 1st (2005-2007) to the 2nd → Trading period (2008-2012). This is one reason why the price of emission certificates (EUA) is moving towards zero at the end of 2007. See also → borrowing

baseline and credit	→ Cap and trade																														
baselining	Issuance of emission certificates from → joint implementation (JI) and → clean development mechanism (CDM) projects comes only when these projects result in additional emission reductions, compared to a → Business-as-usual scenario (additionality criterion). In a baselining process, project emissions are compared to a hypothetical emission situation with no measure taken. Emission credits (→ CER, → ERU) will be issued only for the surplus reduction between those two scenarios.																														
BAT	→ Best available technology																														
benchmarking	Allocation mechanism with assignment of → emission certificates based on specific (installation) emissions rather than historical data. Installations receive benchmarking (comparison) with a plant or facility that uses the → best available technology to date (and sets the standard).																														
best available technology (BAT)	Current state of the technology. An installation receives only so many emission certificates as the best plant would receive, no matter how high its actual or historical emission. The directive contains the definition " <i>Best available techniques' shall mean the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole</i> "																														
border tax adjustments	Border tax adjustments correct prices for goods produced outside of the emission trading system, for CO ₂ costs. This avoids the competitive disadvantage of European industries to companies in countries with no climate protection requirements (→ leakage effects). It is, however, questionable whether the current world trading system (WTO) allows for such a measure.																														
borrowing	Under EU emission trading, companies are required to return emissions certificates matching their actual emissions of a given year until 30 April of the following year. Since that year's certificates are already issued on 28 February, companies may "borrow" certificates from next year's allocation. See → banking.																														
burden sharing agreement	Under the → Kyoto Protocol, the European Union as a whole agreed to reduce its 2012 emissions 8% below 1990 levels, individually distributing the target among the 15 member states in a 1998 burden sharing agreement. While some member states shouldered stiffer compliance targets, others had higher-than-base emission allowances to provide for their economic development. Burden Sharing Agreement, 1998: <table border="0"> <tr> <td>Belgium</td> <td>- 7,5%</td> <td>Greece</td> <td>+25,0%</td> <td>Portugal</td> <td>+27,0%</td> </tr> <tr> <td>Denmark</td> <td>-21,0%</td> <td>Ireland</td> <td>+13,0%</td> <td>Spain</td> <td>+15,0%</td> </tr> <tr> <td>Germany</td> <td>-21,0%</td> <td>Italy</td> <td>- 6,5%</td> <td>Sweden</td> <td>+ 4,0%</td> </tr> <tr> <td>Finland</td> <td>0,0%</td> <td>Luxembourg</td> <td>-28,0%</td> <td>UK</td> <td>-12,5%</td> </tr> <tr> <td>France</td> <td>0,0%</td> <td>Netherlands</td> <td>- 6,0%</td> <td>EU (15)</td> <td>- 8,0%</td> </tr> </table> <p>The states that joined the European Union after 1998 share a 8% target, with exception of Hungary, Poland (both 6%), Cyprus, and Malta (both 0%).</p>	Belgium	- 7,5%	Greece	+25,0%	Portugal	+27,0%	Denmark	-21,0%	Ireland	+13,0%	Spain	+15,0%	Germany	-21,0%	Italy	- 6,5%	Sweden	+ 4,0%	Finland	0,0%	Luxembourg	-28,0%	UK	-12,5%	France	0,0%	Netherlands	- 6,0%	EU (15)	- 8,0%
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business-as-usual	Scenario calculating actual emission trends into the future, assuming no changes to current behaviour will happen, i.e. no actions are taken to mitigate emissions.																														
cap	Ceiling of allowed emissions (target level)																														
cap and trade	Underlying mechanism of emission trading: Capping of the total number of (allowed or desired) emissions: Emitters must comply with that cap. Companies saving more emissions than required may sell off surplus emissions to emitters that fail to comply with their emission goals (trade). → Joint implementation and → clean development mechanism are baseline and credit systems.																														
carbon capture and storage (CCS)	Technology to shed off (capture) CO ₂ emissions directly in the process of energy exploration (i.e. gas drilling) or generation (in power plants). The captured CO ₂ will then be stored away, mostly in underground reservoirs, so it may not disperse in the atmosphere. Also called "sequestration."																														
carbon sequestration	→ Carbon capture and storage (CCS)																														
CDM	→ Clean development mechanism																														
certified emission reduction (CER)	Emission certificates issued from a → clean development project (CDM). To comply with their obligation to return emissions certificates in the amount of their actual emission, companies may return CERs instead of "normal" emission certificates issued under the European trading regime (→ EUA). The EU Commission seeks to limit the share of CERs among the total certificates on both the national and company level.																														

CITL	<i>Community Independent Transaction Log</i> . Central emission trading register of the European Union, which links and balances all single national emission registers. The CITL itself cross-links to the global emission register (↔ UNFCCC Independent Transaction Log) of the United Nations.												
clean development mechanism (CDM)	One of three so-called flexible mechanisms of the ↔ Kyoto Protocol. CDM is a project-based mechanism that allows developed countries to contract or conduct projects in non-↔ Annex B countries, that is developing countries. Apart from ecological criteria, CDM projects serve a socio-economic purpose as well: The intention of CDM is contributing to the further development of developing countries. Underlying idea of CDM projects is that a given amount of investment might result in greater reduction effects if taken in developing countries than in the industrialised world, making the mitigation more cost-efficient. Investors from the developed world may contract or generate emission certificates (↔ CERs) from CDM projects and return them <i>in lieu</i> of "normal" certificates (↔ EUA) to comply with their emission obligation. The ↔ Linking Directive lays down the integration of CDM into the European emission trading system.												
climate hazards	Global warming will exert vastly different regional damages, according to the ↔ IPCC assessment reports. In Europe, the IPCC expects droughts, bush fires, dismal harvests, and an increase of heat related deaths in the south and south-east of the continent. Projections for western Europe include increased storms and flooding, erosion of coastlines, hotter summers, decreased work productivity, as well as warmer winters with more precipitation and less snow (harming winter travel destinations).												
CO₂ equivalents (CO₂e)	Carbon dioxide (CO ₂) is only one of six ↔ greenhouse gases held responsible for global warming in the ↔ Kyoto Protocol. These aerosols differ in their climate impact: CO ₂ equivalents are the best measure for relative climate impact of a greenhouse gas: One tonne of methane (CH ₄), i.e., which is a major compound in stock farming, is responsible for 25 times the damage of CO ₂ . One tonne of CH ₄ would thus represent 25 tonnes of CO ₂ e. Roughly, a quarter of all CDM credits (↔ CER) derive from hydro fluorocarbon reduction projects, since HFCs are 435 times as harmful as CO ₂ .												
	Greenhouse gases in CO ₂ equivalents (CO ₂ e)												
	<table border="0"> <tr> <td>Carbon Dioxide (CO₂)</td> <td>1</td> <td>Perfluorocarbons (PFCs)</td> <td>≈12/200</td> </tr> <tr> <td>Methane (CH₄)</td> <td>25</td> <td>Hydrofluorocarbons (HFCs)</td> <td>435</td> </tr> <tr> <td>Nitrous oxide (N₂O)</td> <td>298</td> <td>Sulphur hexafluoride (SF₆)</td> <td>32.600</td> </tr> </table>	Carbon Dioxide (CO ₂)	1	Perfluorocarbons (PFCs)	≈12/200	Methane (CH ₄)	25	Hydrofluorocarbons (HFCs)	435	Nitrous oxide (N ₂ O)	298	Sulphur hexafluoride (SF ₆)	32.600
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cogeneration	Joint generation of electricity and heat in a single plant. CHP plants make use of the heat generated in electricity production for heating. Heating plants respectively use the mechanical energy to produce electricity as a "by-product". While classic plants would waste some of these by-products, CHP plants have an energy efficiency of 70 to 90%, compared to classic plants that only transform a maximum 55% (gas) or 46% (hard coal) to end-user energy.												
combined heat and power (CHP)													
compliance period	Under the ↔ Kyoto Protocol, countries need to comply with the agreed targets until 2012. Thus, the Kyoto compliance period runs from 2008 until 2012. This is the first ↔ trading period under the Kyoto Protocol, but since the EU gained a headstart with its own emission trading system in 2005, it is also the second ↔ EU trading period.												
conference of the parties (COP)	Highest body of the United Nations ↔ Framework Convention on Climate Change (UNFCCC). The ↔ Kyoto Protocol is the result of the 3 rd Conference of the Parties 1997. A climate agreement succeeding the Kyoto agreement for the phase after 2012 (↔ Post-Kyoto) will be negotiated on COP13 in Bali (December 2007) and COP14 (2008 in Warsaw). These negotiations will hopefully result in a new climate agreement on COP15 in Copenhagen 2009. Though Kyoto does not expire until 2012, the succeeding regime is expected to be in place by 2009 to allow for a three-year phase to ratify the agreements and put all international legislation in place.												
early action	Emission reductions (voluntarily) achieved before the actual start of the emission trading system. Such early movers should not receive worse treatment in comparison to late adopters.												
ECCP	<i>European Climate Change Programme</i> . The EU issued its second ECCP in November 2005. One of the five ECCP working groups reviewed the emission trading system (↔ ETS-Review). Prior to June 2007, the working group issued four reports with topics and recommendations for a redraft of the EU Emission Trading Directive, due for release in January 2008.												
emission certificate	Vested right to emit 1 metric tonne of carbon dioxide (CO ₂) or carbon dioxide equivalent (CO ₂ e). There are different types of emission certificates, depending on the underlying regime. Under the Kyoto Protocol, Annex-B countries receive assigned amount units (AAU), which are more or less nationally based offset items. The European emission trading system issues and trades ↔ EU allowances (EUA). In order to comply with their emission obligations, companies may – up to a maximum share of 22% - return certificates from ↔ Clean Development projects (CERs) instead of EUAs. In the second ↔ trading phase, starting 2008, this admission is extended to certificates from ↔ Joint Implementation projects (↔ ERUs). In the meantime, a wide variety of climate certificates (verified emission reductions/VER) developed beyond the boundaries of the emission trading system. VERs are not officially acknowledged, but are offered on a voluntary basis, i.e. to offset emissions from business trips.												
emission reduction unit (ERU)	Emission rights from ↔ joint implementation projects. Unlike certificates from ↔ CDM projects, ERUs cannot exceed the maximum emission ceilings agreed on by the developed countries that committed to												

	<p>binding targets in ➔ Annex B to the protocol. The country hosting a project deducts the amount of ERUs from its emission budget (➔ AAU) and transfers this amount to the emission account of the country of origin of the investor. Russia, with its vast surplus of allowed emissions under the Kyoto Protocol's 1990 base-year criteria, is the major destination of JI investments. Russia also hosts the greatest JI project worldwide, with a possible avoidance of 82 million tonnes of ➔ CO₂ equivalents, projected through the elimination of leaks in the Russian gas pipeline system.</p>
emission right	<p>Allowance to emit 1 metric tonne of carbon dioxide, vested through an ➔ emission certificate</p>
emission trading register	<p>All issued emission allowances/certificates are registered in national emission registers or logs. The Community Independent Transaction Log (➔ CITL) coordinates these emission allowances on an EU-wide basis. The CITL in turn squares off with the ➔ UNFCCC Independent Transaction Log (ITL) that accounts for all emission units (➔ AAU) under the ➔ Kyoto Protocol.</p>
ETS	<p>Emission trading system, one of three flexible mechanisms targeting the CO₂ reductions laid down in the ➔ Kyoto Protocol. The first ➔ compliance period under the Kyoto Protocol runs from 2008 until 2012.</p>
ETS review	<p>Review of the emission trading system (and the Directive, for that matter). The EU Commission authorised a working group of the European Climate Change Programme (➔ ECCP) to evaluate the experiences gathered with the EU emissions trading and make suggestions for changes or amendments to the ETS Directive.</p>
EU allowance (EUA)	<p>Emission certificate under the European emission trading system. Vested right to emit 1 metric tonne of carbon dioxide (CO₂). Under the EU-ETS, EU Allowances (EUAs) are emission certificates that anybody may trade, usually through dedicated power exchanges, such as the European Climate Exchange (ECX), European Energy Exchange (EEX), Nord Pool, and Powernext. These exchanges may eventually merge into one (European) exchange, especially if the EU should decide on a uniform European approach to ➔ auctioning.</p>
EU ETS	<p>European Emission Trading System. The EU decided to start an early Emission Trading System on 1 January 2005, preceding the Kyoto ➔ compliance period for three years in the hope of building up experience with trading and allowing for a more gradual approach to its 8% Kyoto goal.</p>
ex post adjustments	<p>Upon draft of the NAPs for the first trading period, 13 member states sought to reserve the right to make subsequent (ex post) corrections of their initial emission allocation, i.e. upon plant closure or capacity underutilisation. The EU Commission prohibited such ex post corrections. It mandated that all allocation decisions had to be settled in advance (ex ante), in order to provide for unequivocal administration. Germany challenged this provision before the European High Court and won its claim at first instance in November 2007. Since the Commission had strictly ruled out any ex post mechanisms for the phase two ➔ NAPs, this court ruling is of no further relevance for the next ➔ trading periods.</p>
flexible project mechanisms	<p>The ➔ Kyoto Protocol contains additional project based mechanisms that provide for compensation of emission reductions by means other than emissions trading: ➔ Joint implementation (JI) and ➔ clean development mechanisms (CDM). Underlying principle of the mechanisms is that mitigation in third countries might be more cost-efficient than to seek the ultimate reduction measure in the developed countries.</p>
framework convention	<p>➔ United Nations Framework Convention on Climate Change (UNFCCC)</p>
fuel switch	<p>Desired switch from carbon intensive fuels, i.e. hard coal, to energy resources with lesser specific carbon content, such as natural gas.</p>
grandfathering	<p>Allocation method with assignment of emission certificates on the grounds of an installation's emissions in the past: Grandfathering takes a plant's emissions in a base year or base period (i.e. 2000-2004) and "bequeaths" this amount minus a reduction compound to the installation's allocation in the current year. The Commission seeks to reduce the use of this method since it both disadvantages early movers (➔ early action) and requires reserves for new entrants into the market (➔ new entrants reserve). For the redraft of the ETS directive, ➔ benchmarking or ➔ auctioning are the methods of choice.</p>
greenhouse gases	<p>Annex A of the ➔ Kyoto Protocol identifies six aerosols resulting from human activities held responsible for global warming: Carbon dioxide (CO₂), perfluorocarbons (PFCs), methane (CH₄), hydrofluorocarbons (HFCs), nitrous oxide (N₂O), and sulphur hexafluoride (SF₆). See also ➔ CO₂-equivalents.</p>
hot air	<p>Ironic expression for emission allowances from countries considered over equipped with emission rights (➔ AAUs). This is because the national emissions of all ➔ Annex B countries under the Kyoto Protocol were calculated based on 1990 levels. When the eastern European economies collapsed in the 1990s, their emission levels dropped sharply. As a result, many of these countries hold a considerable surplus of emission rights. Russia and Ukraine, in particular, hold hundreds of millions of unused emission allowances. Fears abound that if these countries put their rights on certificate markets, supply would vastly outnumber demand and result in a price crash for emission certificates. This could severely damage the emission trading system as it works only under the assumption of scarcity.</p>
Intergovernmental Panel on Climate Change	<p>A panel established in 1988 by two organizations - the World Meteorological Organization (WMO) and the ➔ United Nations Environment Programme (UNEP) - and bestowed with the task of giving independent scientific advice on climate change. The IPCC received the 2007 Nobel peace prize. So far, it issued four</p>

IPCC	assessment reports on the status, developments, and causes of climate change as well as recommendations on mitigation strategies. A synthesis of the fourth report (AR4), published in Valencia on 17 November 2007, serves as a discussion base for the Bali Climate Conference in December 2007.
ITL	⇒ UNFCCC Independent Transaction Log (ITL)
joint implementation (JI)	Project based mechanism of the ⇒ Kyoto Protocol, allowing for a compensation of emission reduction projects among ⇒ Annex B countries, that is the industrialised world. Instead of returning "normal" emissions certificates under the EU emission-trading directive (EUAs), companies may use emission reduction units (ERUs) from JI from 2008 on. Unlike credits from ⇒ CDM projects, the host country deducts ERUs from its overall emission budget and transfers it to the budget of the investor nation (⇒ AAU). Underlying principle of joint implementation is to identify cost-efficient mitigation strategies among the Annex B countries, instead of concentrating on (less efficient and costly) national measures only.
Kyoto Protocol	On 11 December 1997, the 3 rd ⇒ Conference of the Parties in Kyoto agreed to curb the global emissions of all ⇒ greenhouse gases 5% below 1990 levels by 2012 (Article 3). To do so, the Kyoto Protocol names three instruments: ⇒ Emission trading (Article 19), ⇒ joint implementation (Article 6) and ⇒ clean development mechanism (Article 12). In order to become effective, 55 member states of the convention had to ratify the protocol, and 55 percent of the greenhouse gases of the ⇒ Annex-B countries had to be represented. This second condition was met when Russia ratified the Kyoto Protocol on 18 November 2004. It became effective 90 days later, on 16 February 2005. As of December 2007, 176 countries and the European Union have ratified the agreement, Australia being the last country to join on 3 December 2007.
leakage effects	Exodus of industries to countries with no emissions trading or lower climate standards, mostly discussed in connection with the European steel industry. It is not so much the migration of industries that is detrimental, but that "exiled" companies may produce even higher emissions at sites with lower emission standards. As a result, the emission trading system would induce a counter-productive effect and yield more, not less overall emissions. See ⇒ border tax adjustments.
Linking Directive	Legal provision of the EU (2004/101/EU), mandating the particulars of the integration of the project based mechanisms ⇒ CDM and ⇒ JI of the ⇒ Kyoto Protocol within the EU Emission Trading System.
macro plan	⇒ National allocation plan
Marrakesh Accords	Agreements of the 7 th Conference of the Parties (⇒ COP) in Marrakesh (9 November 2001), containing further details of the Kyoto Protocol arrangements. The accords define the rules for ⇒ flexible mechanisms (JI / CDM). They also mandate that the developed world may not rely on emission reductions in developing countries alone, but must significantly contribute with domestic actions
micro plan	⇒ National allocation plan
monitoring	Evaluation process to monitor, verify, and report compliance to the emission reduction requirements.
monitoring guidelines	Rules published by the EU Commission, containing the principles for the monitoring, verification, and reporting relating to the EU emission trading system.
MW_{th}	Thermal Megawatts: Measure for the performance of a plant or engine. According to the Emission Trading Directive, only installations with a performance above 20 MW _{th} from the energy industry and other industries are obliged to participate in the emission trading system.
NAP	⇒ National allocation plan: Numbering of the NAPs is according to the applicable ⇒ trading period. NAP I concerns the first trading period (2005-2007), NAP II the second phase (2008-2012). NAP III development will follow the redraft of the EU Emissions Trading Directive and probably encompass an eight year trading period from 2013 until 2020 (Post-Kyoto period).
NAP Guidance	The EU Commission published a series of guidelines with mandatory and optional criteria on which EU member countries had to abide upon drafting their ⇒ national allocation plans (NAP). While the NAP guidance for first phase NAPs (covering 2005-2007) was more or less voiced in the tone of a "suggestion," the NAP II guidance for the second trading period was strictly formulated. Failure to comply with any of its criteria led to a rejection of the NAPII as a whole.
national allocation plan (NAP)	Each member country drafts a national allocation plan, which becomes effective when confirmed by the EU Commission. NAPs consist of a macro plan, assigning the total emissions budget on ETS sectors and non-ETS sectors, and a micro plan containing the rules for the assignment of emission certificates to the participants.
new entrant	Also <i>newcomer</i> : New company or installation that enters into the (carbon) market. Since the construction of new, energy-efficient installations is one of the goals of emission trading, member countries need to set up a ⇒ new entrant reserve
new entrant reserve (NER)	Some member states reserve a share of their total emissions budget for new installations that enter the (carbon) market in-between ⇒ trading periods. The size of this reserve tends to be critical, since certificates "parked" in the reserve are not available to the market and further decrease amount of emission cer-

	<p>tificates available to emission trading participants, thus providing for additional reduction burdens.</p>
opportunity costs	<p>Opportunity costs are a microeconomic concept to quantify forgone profits through the not-realization of alternatives. Well established in economic theory since the early 20th century, the concept gained the attention of the general public when it became clear that emission certificates are priced in the product calculation, no matter whether allocated for free or sold. The underlying rationale is that a company that does not price in the value of CO₂ certificates foregoes profits from a probable non-production (i.e. avoided fuel costs) and market value of the unused certificates. Opportunity costs, thus, do not constitute "classic" costs but rather foregone profits due to not-realization of viable alternatives. See ➔ windfall profits.</p>
post Kyoto (regime)	<p>The Kyoto Protocol expires on 31 December 2012, at the end of the Kyoto ➔ compliance period of 2008-2012. In order to provide for a follow-up regime, the United Nations started negotiations in December 2006 in Nairobi, succeeded by the December 2008 Climate Conference in Bali. See ➔ conference of the parties.</p>
ppmv	<p>Parts per million by volume. Measure of atmospheric carbon dioxide concentration. Carbon dioxide is a natural ➔ greenhouse gas, but its atmospheric concentration grew from 280 parts per million air molecules (≈ 280 ppmv) to 381 ppmv over the past 170 years. The focus of the Kyoto Protocol and all ensuing climate conventions is toward stabilising this concentration to 450 ppmv by 2050, a target deemed necessary to restrict global warming to 2° Celsius over 1990 levels.</p>
process emissions	<p>Emissions resulting from a chemical reaction, not from a combustion process.</p>
project based (Kyoto-) mechanisms	<p>➔ Flexible project mechanisms</p>
sequestration	<p>➔ Carbon capture and storage (CCS)</p>
Stern report	<p>The British government commissioned Nicholas Stern, former chief economist of the World Bank, to evaluate the consequences of global warming. Stern's report estimates the economic damage of the global warming at 5 to 20% of the global gross national product, while it puts the cost of decisive actions against climate change at only 1%. Although the report received criticism for methodological flaws, its basic premise is widely accepted: Environmental action will be economically cheaper than sustaining the damages from non-action.</p>
sustainable development	<p>Development that <i>"meets the needs of the present generation without compromising the ability of future generations to meet their own needs."</i> (Definition by Brundtland Commission 1987). Properly, human activity may only use as many natural resources as can be replenished within a generation (i.e. sustainable forest use). Following this definition, any fossil resources, such as oil or coal, would disqualify as sustainable - they are, after all, consumed in only a few centuries but take millions of years to build-up.</p>
trading period	<p>The Kyoto compliance period starts in 2008 and runs until 2012. The EU gained a head start with its emission trading system in 2005: The first EU emission-trading period lasted from 2005 until 2007 to gather practical experience with emission trading and ➔ flexible mechanisms. Kyoto compliance period and the second EU trading period are identical. Five-year trading periods have been widely criticized for being too short to work in harmony with the long investment cycles of industry. Since the initial horizon for the Post Kyoto process runs until 2020, the next trading period will probably run over eight years from 2013 to 2020.</p>
United Nations Environment Programme (UNEP)	<p>UNEP is the designated authority of the United Nations for environmental issues at the global and regional level. It is one of the founding bodies of the ➔ IPCC and – among others – responsible for the global registration and accreditation of ➔ CDM projects.</p>
United Nations Framework Convention on Climate Change (UNFCCC)	<p>International environmental treaty of the United Nations Conference on Environment and Development (UNCED) agreed on 9 May 1992 in New York and ratified by over 180 countries at the Earth Summit in Rio de Janeiro the same year. It went into effect on 21 March 1994. The treaty aims to reduce greenhouse gas emissions in order to combat global warming. It also laid the legal grounds for the ➔ conference of the parties (COP).</p>
UNFCCC Independent Transaction Log (ITL)	<p>Global emission register at the UNFCCC that balances assigned emissions (➔ AAU) under the ➔ Kyoto Protocol. The centralized European emission register (➔ EITL) cross-links with ITL.</p>
windfall profits	<p>Profits gained from unforeseen developments in a market, i.e. due to government regulation. Under the European emission trading system, charges of generating windfall profits especially fall on electricity generators. Though generators received zero cost certificates, they priced-in the free certificates at real market values, thus yielding additional profits (see ➔ opportunity costs). Though the pricing-in of CO₂ certificates is substantial to emission trading, the political upheaval over undue profits has spurred a discussion about shaving-off that profit (i.e. by a windfall profit tax). Currently, there is a strong tendency to do away with the principle of free allocation, at least for some sectors that may pass-through emission costs to their customers, and auction off the emission budgets (➔ auctioning).</p>

Annex III: Legal Framework

UNITED NATIONS

UN Framework Convention on Climate Change,

Agreed on: 09/05/1992;
Effective: 21/03/1994

Foundation for the international climate policy and legal basis for the Conference of the Parties (COP), the Kyoto Protocol and Marrakesh accords among them.

Kyoto Protocol

Agreed on: 10.12/1997
Effective: 16/02/2005

Treaty agreements of the 3rd Conference of the Parties (COP3) in Kyoto 1997. Emission trading is introduced in Article 17 of the treaty. Article 6 and 12 contain the flexible project mechanisms Joint Implementation (JI) and Clean Development Mechanism (CDM)

Marrakesh Accords

Effective: 09/11/2001

Agreements of the 7th Conference of the Parties (COP7) in Marrakesh 2001, further detailing the use of the flexible mechanisms of the Kyoto Protocol

Bali Roadmap

Agreed on: 14/12/2007

Agreements of the Bali Climate Conference (COP13), to install a two year round of negotiations to result in a post-Kyoto arrangement, envisioned for COP15 in Copenhagen 2009.

EUROPEAN UNION

Emission Trading Directive

2003/87/EU,
Agreed on: 13/10/2003, Effective: 25.10/2003

EU directive that installed the European emission trading system, started in 2005. The EU Commission has announced a redraft of the directive for the time after 2012 for January 2008.

Revision of the Emission Trading Directive circa 2009

NAP Guidance

COM(2003) 830, 07/01/2004

NAP II Guidance

COM(2005) 703, 22/12/2005

Guidelines of the EU Commission containing optional and mandatory criteria (and suggestions) for the first phase drafts of the national allocation plans (NAP). Following discussions about first phase allocations (2005-2007), the Commission stiffened these requirements in the NAP II Guidance.

Linking Directive

2004/101/EU, 13/10/2004

Directive mandating the integration of clean development mechanism and joint implementation into the European emission trading system

EU Monitoring Guidelines

2004/156/EU, 01/01/2005

Rules and suggestions for the monitoring of and reporting on greenhouse gases

Registry Regulation

R(EU) 2216/2004, 21/12/2004, supplemented by COM(2007) 916/2007, 13/07/2007

Regulation on the EU wide central emission register (CITL) and linkage to national registries. Supplemented by a measure for linking to the Kyoto Register of the United Nations (UNFCCC-ITL)