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# Working Paper

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## Emissions trading as a climate protection tool – aspiration, reality and outlook

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## Executive summary

If we do not want to run the risk of damaging our environment irreversibly through excessive consumption of the fossil energy carriers oil, gas and coal, the present structure of energy supply will have to be radically overhauled. Ultimately it is simply a matter of guiding the international community into a new, climate-conscious energy age. In this context one of the very few market-based climate protection tools – **emissions trading** – is of pivotal importance. If this market works as hoped, the price for the right to emit a tonne of carbon dioxide will be a kind of metric for the losses of economic value creation a stakeholder is prepared to tolerate in order to save an additional ton of carbon dioxide. The price of emission allowances will rise until companies decide that reducing their carbon footprint with improved technologies or the use of renewable energies is cheaper for them than buying additional expensive emission allowances.

The legal framework for implementing a system of international emissions trading consists of three stages. First, the regulations of the **Kyoto Protocol** – an agreement binding under international law to reduce greenhouse gas emissions that has since been ratified by 170 states. The European Union has committed to lower its emissions of greenhouse gases by 8 % in the period 1990 to 2012. The second stage is the **EU Emissions Trading Directive** dating from 2003. It stipulated the introduction at the beginning of 2005 of a European system for trade in emission allowances. Instead of emission allowances (also commonly referred to as 'permits'), under the amending 2004 Linking Directive installation operators may also use credits from project-based mechanisms of the Kyoto Protocol (Joint Implementation, Clean Development Mechanism). The third stage refers to the national implementation of emissions trading in the individual EU member states. For this purpose, prior to a trading period each country must develop a **National Allocation Plan** (NAP), which is subject to review by the European Commission.

The NAP turns climate protection into a **distribution problem**: Which sector is supposed to reduce how much of its emissions during a trading period and how many allowances are allocated to what type of installation? But the European Emissions Trading Directive set the scene itself for the basic functional shortcomings of the NAP I, which applies to the trading period 2005 to 2007, and the NAP II for the years 2008 to 2012. By stipulating that most of the emission permits were to be issued free of charge it made their allocation a bone of political contention. An alternative to free-of-charge issuance – permit auctioning – failed to obtain a political majority at the EU level.

All in all, NAP I has created a complex system entailing considerable administrative work for companies and the authorities. It places the operators of installations participating in emissions trading at advantages and disadvantages for which there is practically no justification. The many special rules and exceptions have restricted the tradability of emission allowances and made the system unmanageable. This is not consistent with the requirements of efficient emissions trading. NAP II,

however, does contain some important improvements and simplifications. Even so, **misusing the system in political pursuit of energy-policy and distributional aims** has a number of undesirable consequences. It unnecessarily pushes up the price of national climate protection and increases the burden of costs for operators of plants that do not benefit from special arrangements. Moreover, it results in economically questionable asset transfers and subsidization of the energy feedstock coal.

Many of the present shortcomings in emissions trading could be resolved by ceasing to allocate free-of-charge permits after 2012 and (increasingly) auctioning them instead. Full **auctioning** would avoid all the problems and distortions associated with state quota planning at the micro-level of emitter and plant by obviating such regimentation entirely. This would make the trading system as a whole far more simple and transparent and expedite the urgently needed refocus of energy supply towards carriers with a smaller carbon footprint. But most importantly, it would largely eliminate the influence that lobby groups bring to bear on emissions trading. And finally, a key upside to auctioning emission permits would be that the proceeds would flow into the public exchequer and make windfall profits a thing of the past.

Looking at the **development in the price of permits** so far, we see that volatility is very high. Given the many factors driving emission permit prices (emission quantities, costs of and potential for avoiding carbon dioxide, share of renewable energies in electricity generation, Linking Directive, relative price of coal and gas, weather dependence of renewables and the thermal sector, economic growth) any forecasts must come with caveats. However, the marginal control costs of $CO_2$ emissions do set an upper bound on prices.

If climate change is to be combated effectively, far **more stringent emission reduction targets must be set** globally farther down the line. The more countries that participate in the emissions trading system, the more liquid it will become and the more efficiently and economically it can be operated. For this, the major $CO_2$ emitters, chiefly in Asia, Latin America and the United States, will have to be integrated into a global climate protection strategy (Kyoto-plus agreement) by no later than 2013.

## 1. Introduction

Never before was the looming long-term threat of a climate change-induced global environmental disaster discussed more heatedly than in this very mild winter. The news published of late does indeed give cause for concern. Experts at the United Nations, for example, predict that temperatures will climb by an average of up to 6 ½ degrees by the end of this century, regularly bringing severe storms, long periods of drought and a rise in sea level of more than half a meter. The British economist Nicolas Stern expects economic damage running into the billions as a result. If nothing is done to prevent this, he estimates that it could cost between 5 and 20 % of global GDP by 2050.

If we are not to run the danger of irreversibly damaging the environment by over-consumption of the fossil energy carriers oil, gas and coal, the present structure of energy supply will have to be radically overhauled. The conundrum is how to satisfy the world's ever greater appetite for energy while sparing the energy feedstock and reducing emissions harmful to the climate. To do so, the energy industry must pay increasing attention to more sustainable energy procurement and use. Political leaders the world over have now also realized that their present energy policies will not secure the future long-term supply of energy. **Ultimately, it is all about leading the international community into a new, climate-sparing energy age.**

In this context one of the very few market-based instruments to protect the climate – trading in greenhouse gas emissions allowances (shortened to **emissions trading**) – is of pivotal importance. Essentially, this involves issuing a sector with certificates, or allowances, conferring the right to discharge a set amount of carbon dioxide into the atmosphere, such permits being freely tradable between the relevant emitters.

This Working Paper gives an overview of how emissions trading works, the prerequisites for such a scheme, its practical implementation and future prospects. After a brief outline of the idea behind the emissions trading system in **Section 2**, **Section 3** describes its institutional basis (Kyoto Protocol, EU Emissions Trading Directive, National Allocation Plan). **Section 4** examines how German emissions trading is designed and highlights the differences between the second and first National Allocation Plans. In **Section 5** we discuss some fundamental flaws in emissions trading in Germany, most of which could be remedied if emission allowances were auctioned rather than allocated free of charge, as at present (**Section 6**). The closing **Section 7** traces important determinants of carbon permit prices.

## 2. The idea of emissions trading: targeted and cost-efficient avoidance of pollutants

In an emissions trading system a politically specified quota of emission allowances is allocated to companies, industries or nations and traded among them. As far as companies are concerned, this turns the atmospheric pollutants they discharge into an **added factor of production**, the cost of which they must take into account in their product planning. The operator of a plant must decide whether it is better off avoiding emissions or purchasing emission permits. Ideally – assuming the market works perfectly – a permit price will be formed that is identical to the marginal **avoidance costs** aggregated across all participants in the scheme, i.e. to the (average) cost of an additional unit of emission reductions. The stakeholders will then avoid further emissions if their individual avoidance costs are lower than the permit price. Otherwise it would be cheaper for them to buy up permits on the market. Emissions trading thus has the advantage on legal regulation that, owing to its greater flexibility, the declared aim of cutting back emissions is achieved at the minimum macroeconomic cost. In comparison to a pollution levy scheme, the benefit lies in precise realization of the targeted reduction.

If the market works as hoped, the price for the right to emit a tonne of carbon dioxide will be a kind of metric for the losses of economic value creation a stakeholder is prepared to tolerate in order to save an additional ton of carbon dioxide. The price of emission allowances will rise until companies decide that reducing their carbon footprint with improved technologies or the use of renewable energies is cheaper for them than buying additional expensive emission allowances.

Critics of the system often maintain that utilities **pass the market price of emission permits on to the consumer in electricity prices** although the allowances are issued free of charge. At first sight this certainly does seem illogical. How can the power companies simply shift costs that they have not even incurred? Yet this criticism is unfounded, because emissions trading has turned carbon dioxide into a scarce factor of production. This leaves plant operators the choice of either using their emission allowances to produce further units of output or selling these permits on the market. If they use the permits for production they waive the proceeds of sales on the market. This gives rise to **opportunity costs** equivalent to the proceeds forgone. Since these must be taken into account in investment and operating decisions, the emission permits therefore have an impact on costs and hence prices.

It is precisely here that the logic of emissions trading lies – by making products more expensive in line with their carbon intensity. Passing on the opportunity costs of free-of-charge emission allowances communicates the scarcity signals to downstream areas of production and to consumers. This does, however, have undesirable distributional effects in the form of **windfall profits** for the power utilities. These could only be avoided if the state were to auction emission permits rather than handing them out free of charge (see Section 6).

## 3. Implementing emissions trading: the thorny path from theory to practice

The legal framework for implementing a system of international emissions trading comprises **three stages** (see Chart 1).

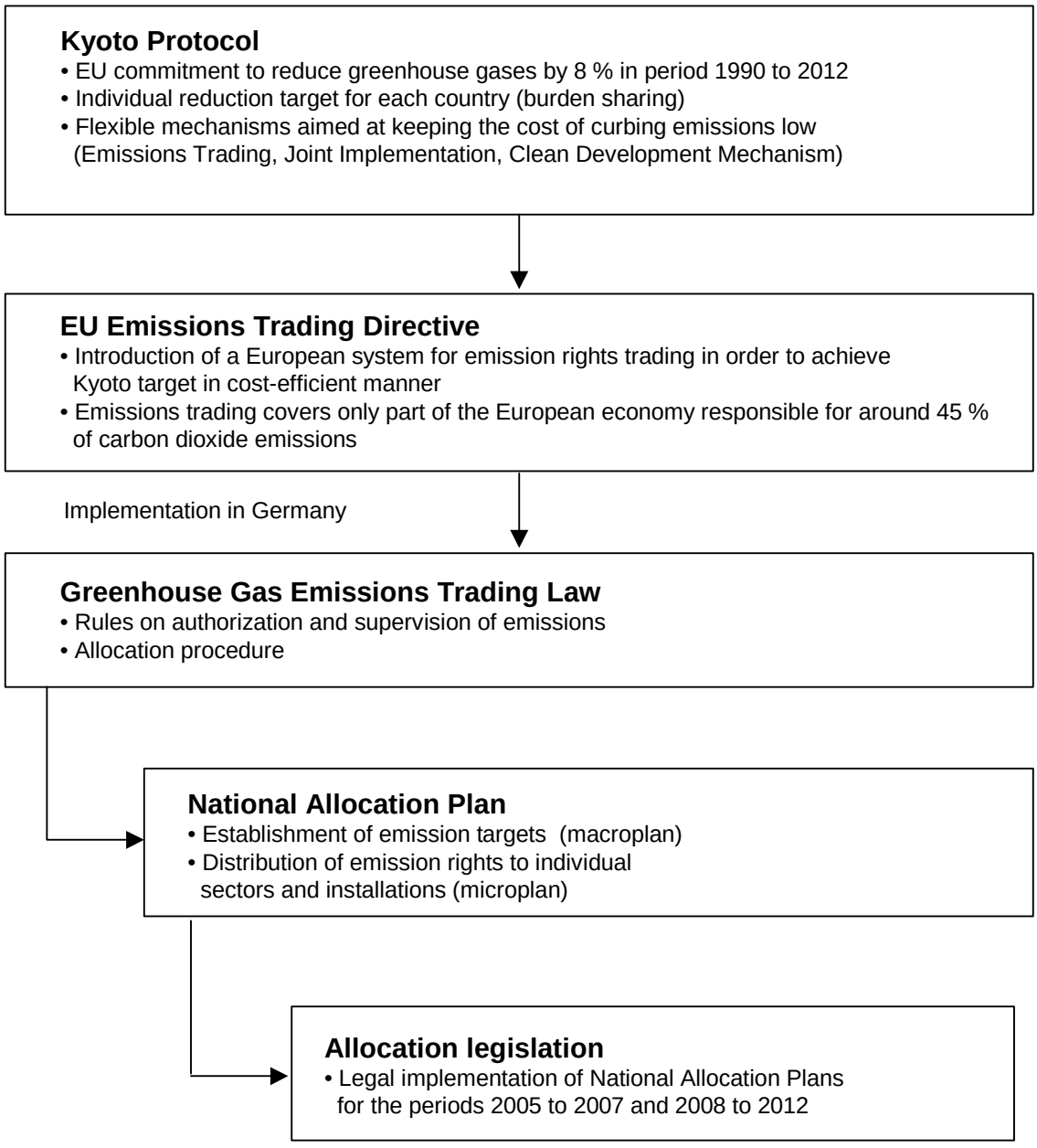
- The **first stage** consists of the regulations of the **Kyoto Protocol**, an agreement binding under international law to reduce greenhouse gas emissions that has since been ratified by 170 states. Only the industrialized countries listed in Annex B (known as **Annex B countries**) have actually committed to contain their carbon footprint; by 2012 they must comply with caps on emissions that vary by country and are calculated from the base year 1990. The other countries, like the non-ratifiers (such as the US, China, India and Australia), are not subject to any restrictions.[1] The cap on greenhouse gases (these are specifically carbon dioxide, methane, nitrous oxide, partially halogenized chlorofluorocarbons, perfluorocarbons and sulfur hexafluoride) covers the period from 2008 to 2012 (known as the commitment period), so that failure to meet targets in some years could be balanced out by over-fulfillment in others. Arrangements have not yet been finalized for the period post-2012.

  The Kyoto Protocol also contains three '**flexible mechanisms**', designed to direct the avoidance of pollutants to where it causes the least expense. These are **emissions trading** and the possibility of having emission reductions abroad counted towards national reduction commitments. If these measures take place in the Annex B countries, they come under the heading "**Joint Implementation**" (JI), otherwise they are known as "**Clean Development Mechanisms**" (CDM). The logic behind the three Kyoto instruments implies that the commitments by the individual Annex B countries are not intended to bind them to domestic emission reductions only. In effect, with JI, CDM and emissions trading emissions can also be lowered in Russian steelworks, Chinese coal-fired power plants or by swaps between the signatory states.

1 The Asia-Pacific Partnership on Clean Development and Climate signed in late July 2005 between the US, China, India, Japan, South Korea and Australia forms a kind of counterplan to the Kyoto Protocol. The six signatory countries, which together are responsible for generating around 50 % of global greenhouse gas emissions, focus on the promotion and use of state-of-the-art technologies to curb or even prevent environmentally injurious emissions rather than aiming for specific targeted reductions in these pollutants. The broad technological approach that this requires – going far beyond the promotion of renewables – calls chiefly for greater effort in the field of energy research, e.g. on the separation, capture and storage of carbon dioxide. Ultimately, the purpose is to create an awareness of climate protection – beyond the issue of strictly environmental protection – as a central economic policy objective.

Chart 1

## Institutional basis of emissions trading



The **European Union** has committed to lower its greenhouse gas emissions by 8 % in the period 1990 to 2012 – not exactly an ambitious target given the current pace of climate change. Under a burden sharing arrangement individual reductions are set for each member state, which can vary considerably from the overall EU target. Germany, for example, must scale down its emissions by 21 % between 1990 and 2012 whereas Portugal will have met its Kyoto target over the same period merely by restricting the increase in its emissions by 27 % (see Chart 2). France, the UK, Finland and Sweden have already complied with their emission targets and Germany is well on the way – in contrast to countries such as Spain, Portugal, Austria, Italy, Ireland, Denmark or Belgium. In 2005, the EU-15 as a whole had only decreased their emissions of greenhouse gases by slightly more than 1 % versus 1990. To achieve the 8 % reduction promised, many countries will therefore have to step up their efforts considerably in the coming years.

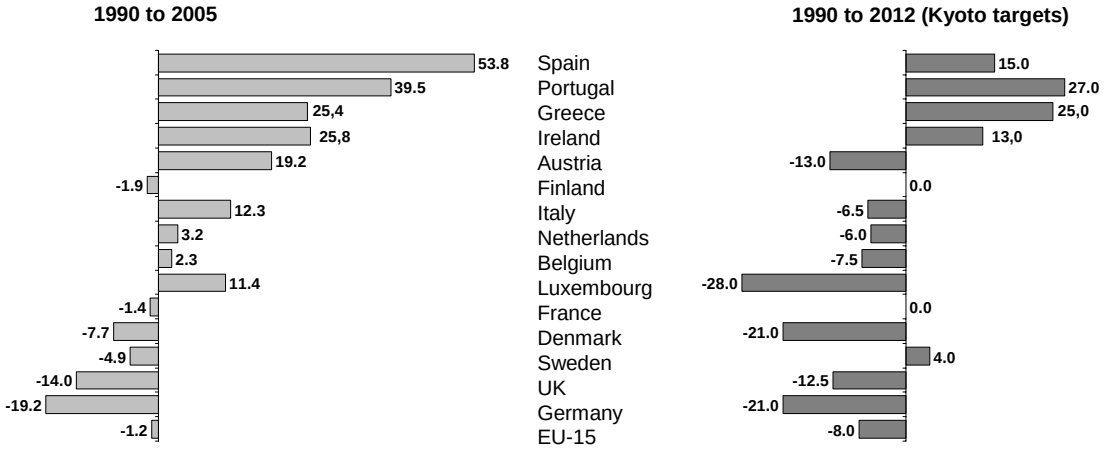
A grave **shortcoming of the Kyoto Protocol** from the outset is that not all countries could be persuaded to commit to limiting their greenhouse gas emissions. This opens up the possibility of evading climate protection measures that have too rigorous an impact in the Annex B countries, either by choosing a production facility in non-Annex B countries or by substituting lower-cost imports for domestic production. Both are detrimental to the global climate target owing to the poorer technology used elsewhere and the quantities of energy needed for additional transportation. Ultimately this "**leakage effect**" waters down the impact of environmental measures. Effective climate policy under the framework conditions of the Kyoto Protocol is therefore tasked with developing instruments in the Annex B countries that have the lowest possible leakage rates and are compatible with the Kyoto instruments.

The Kyoto commitments to generating less greenhouse gas emissions initially apply only until 2012. Already an agenda must therefore be set for a more stringent and comprehensive follow-up agreement. In December 2005 the eleventh meeting of the parties to the UN Framework Convention on Climate Change in Montreal agreed to begin negotiations on **extension of the Kyoto Protocol** – although without a specific roadmap. For this it is crucial to take the United States and big emerging markets such as China and India on board a global climate protection regime.

Chart 2

## Greenhouse gas emissions in the EU-15

- changes in % -




Source: EU Commission.

- The **EU Emissions Trading Directive** dating from 2003 forms the **second stage** of the legal framework for emissions trading. In it the European Union set the launch of an EU-wide system of trading in emission allowances for the beginning of 2005 – an institutional innovation unparalleled worldwide. The years 2005 to 2007 were scheduled as the pilot stage to gather experience with the scheme. Thereafter five-year trading periods apply, with the period 2008 through 2012 timed to coincide with the Kyoto period. **For the time being permit trading is confined to the climate gas carbon dioxide and restricted to certain sectors.** Trading covers electric power and heat generation, refining, glass and pottery, cement production, the paper and pulp sector, limestone and dolomite sintering, coking and steel production. All told, emissions trading throughout Europe thus encompasses more than 11,000 power stations and industrial plants, which are responsible for around 45 % of carbon dioxide emissions. Two-thirds of the roughly 1,850 installations affected in Germany belong to the energy and heat sector and one-third to the emission-intensive industries. As from 2008 emissions trading can be extended to further sectors and/or additional greenhouse gases.

  Operators of power stations and big industrial companies undertake to offer proof of authorization for every tonne of carbon dioxide emitted as the result of producing energy or goods. The companies have been issued with this authorization by the EU member states' governments in the form of permits, most of which are free of charge. These permits are valid for one trading period

only. If plant operators exceed the limit set on their emissions without being in possession of the necessary permits they are liable to **fines** of EUR 40 per tonne of $CO_2$ in the first trading period and EUR 100 in subsequent trading periods. Instead of emission permits, the **Linking Directive** also allows plant operators to use **credits from project-related mechanisms under the Kyoto Protocol** (Joint Implementation, Clean Development Mechanism). Counting these certified reductions in greenhouse gas emissions achieved outside the EU towards their overall emissions budgets gives companies greater flexibility.

- The **third stage** of the statutory framework of binding regulations refers to the national implementation of emissions trading in the various EU countries. Before each trading period every member state must prepare a **National Allocation Plan** (NAP), which is subject to review by the European Commission. The plan caps the amount of emissions by the sectors industry and energy, households, transport, trade and services (**macroplan**). The NAP also contains rules (**microplan**) governing the distribution of emission allowances for set periods to the installations involved in permit trading (e.g. power stations, steelworks).

## 4. Emissions trading in Germany: the National Allocation Plan

The NAP is thus the central tool by which emissions trading is organized in the individual EU member states. Ultimately it turns general climate protection into a distributional problem: Which sector is supposed to reduce how much of its emissions in a trading period, and how many allowances are allocated to what type of installation? With the first trading period 2005 to 2007 set to expire this year, the EU states were requested to submit a new National Allocation Plan (NAP II) to the European Commission by June 2006 for the period from 2008 to 2012.

However, the European Emissions Trading Directive set the scene itself for the basic functional shortcomings of both the NAP I and the NAP II. By stipulating that most of the emission permits were to be issued free of charge it made their allocation a bone of political contention. An alternative to free-of-charge **issuance** – **permit auctioning** (see Section 6) – failed to obtain a political majority at the EU level. Instead, it was decided that in the first trading period at least 95 % of the emission allowances were to be allocated free of charge and in the second at least 90 %.

Basically, a distinction must be made between **two forms of free-of-charge allocation of emission allowances**: distribution on the basis of historical emissions (**grandfathering**) and allocation based on output levels (**benchmarking**). In both cases each plant operator is allocated certain basic emissions, the total of which generally starts out by exceeding the emission target. With grandfathering, the basic emissions are equivalent to averaged historical emissions. With benchmarking, the basic emissions are calculated by multiplying the (historical) production quantity (e.g. kilowatt hours of electricity,

tonnes of steel, cement, paper) by an emission coefficient averaged (possibly weighted) across the relevant sector.

The projected emission target is then divided by a sector's basic emissions to calculate the **compliance factor**. This specifies the amount of allowances issued to installations relative to their expected emission levels. A compliance factor of 1 therefore means that no emission reductions have to be made. In contrast, a compliance factor of less than one, e.g. 0.975, determines that during one trading period emissions must be lowered by 2.5 % versus a baseline period.

Originally, Germany (like all other EU member states) rejected the allocation method based on benchmarking. Operators of coal power stations were particularly adamant opponents, as were the operators of facilities in the manufacturing sector, who insisted that it was all but impossible to define homogenous production quantities. Since neither auctioning nor benchmarking were viable implementation options in the first trading period, Germany therefore chose grandfathering as its allocation method. **But all in all, the NAP I has created a complex system of general and special allocation rules involving considerable administrative work for companies and federal agencies alike. It places the operators of installations participating in emissions trading at advantages and disadvantages for which there is practically no justification** (see Section 5).

A key objective pursued in the NAP I is the **renewal of Germany's power plant portfolio**, in which the **transfer rule** plays a pivotal part. This governs the transfer of carbon permits for existing installations to modernized replacement plant. Under the provision a new installation that goes online up to 2007 receives the old installation's emission allowances for four years and is subsequently exempted for 14 years from emission reductions (i.e. assigned a compliance factor of 1). This is intended as an investment guarantee for major commitments that are written off over the long term. An added incentive to shut down or replace inefficient lignite and hard coal power stations was put in place by issuing them with 15 % less emission permits (**"malus rule"**).

Neither the transfer rule nor the malus rule has a place in the NAP II. As the only one of its kind Europe-wide, the transfer rule was no longer accepted by the European Commission, and the introduction of benchmarks for energy installations (see below) obviates the need for application of the malus rule. Apart from these changes, the **NAP II differs from NAP I in the following further respects** (see Table 1).

- **Smaller carbon budgets**. NAP II allows the companies concerned far lower emissions than they are currently permitted. Whereas emission permits for 499 million tonnes of carbon dioxide were issued under NAP I (including a 4 million reserve for new plant), the Ministry of the Environment originally cut the NAP II emissions target to 482 million tonnes. As more installations were included than in the first trading period and 11 million allowances are penciled in for these, the

comparable allocations are in fact down from NAP I to 471 million tonnes. During the European Commission's review of NAP II the Ministry of the Environment already revised this figure down to 465 million tonnes. The Commission finally decided that Germany could not meet its Kyoto target on the basis of the NAP II submitted and therefore demanded a further **reduction in the emissions target to 453 million tonnes**. That is down more than 6 ½ % on 2005.

- **Different treatment of the energy sector and industry**. NAP I trimmed annual emission allowances versus the reference period 2000 to 2002 to the same extent for all the sectors affected – by just under 3 % (compliance factor 0.9709). NAP II, on the other hand, schedules different treatment for installations in the manufacturing and energy sectors, in terms of both the way in which permits are allocated and the compliance factor. For existing installations in **industry** NAP II requires a reduction in the annual carbon footprint of just 1 ¼ % versus the new baseline period 2000 to 2005. But allocation for existing plants in the **energy sector** no longer follows the grandfathering method; instead, a **benchmark system has been introduced**.

  Specifically, the amount of emission allowances allocated is determined by multiplying average annual output in the reference period 2000 to 2005 by a product-related benchmark based on the best available technology. Basically, the emissions budget available to energy installations is what remains after deduction of the allocations for industrial plant (a good 125 million emission permits a year), the allocation for small emitters (around 10 million) and the reserve (27 million) from the total allocation amount of 453 million for the years 2008 through 2012. In the event that the residual available permits thus calculated are not enough for allocation to energy installations in accordance with the benchmarking method, allocations will be cut pro rata across the board. **Consequently, the extent to which the energy sector will have to limit its emissions will not be known until completion of the allocation process for the second trading period.**

Table 1

# National Allocation Plans I and II in comparison

| | NAP I | NAP II |
|---|---|---|
| **Emission budget** | 499 million tonnes | 453 million tonnes |
| **Allowance existing installations** | Same compliance factor for industrial and energy sector installations (0.9709) | Compliance factor of 0.9875 for industrial installations;<br>Pro-rata reduction for energy installations possible |
| **Options for existing installations** | Choice of allocation rules for new installations | No options |
| **Allocation method for existing installations** | Grandfathering<br><br>Baseline period: 2000 - 2002 | Grandfathering for industrial plants;<br>Benchmarking for power stations;<br>Baseline period: 2000 - 2005 |
| **Allocation method for new installations** | Benchmarks and load forecasts with ex-post correction;<br>Compliance factor 1 for 14 years | Benchmarks and standard loads;<br><br>Compliance factor 1 for 5 years |
| **Small installations** | No special rule | Compliance factor of 1 |
| **Shutdown rule** | On falling below 60 % of baseline-period emissions (ex-post correction) | No allocation on falling below 20% of baseline-period emissions |
| **Transfer rule** | New installations receive the emission rights of the old installations for 4 years and subsequently for 14 years a compliance factor of 1 | No transfer rule |
| **Process-related emissions** | Compliance factor of 1 | Blanket allowance using compliance factor for industrial plant |
| **Cogeneration installations** | Bonus allocation of emission rights for existing installations;<br>Double benchmarks (heat, electricity) for new installations | Double benchmarks for existing and new installations |
| **Nuclear power rule** | 1.5 million emission certificates as compensation for closure of nuclear power stations | No special rule |
| **Flexible mechanisms of Kyoto Protocol** | Use permitted | Up to 20 % of operator’s emission rights useable via project mechanism vouchers |

- **New baseline period**. For existing industrial installations emission allowances will continue to be grandfathered on the basis of historical emissions in a baseline period. However, in NAP II the baseline period runs from 2000 through 2005 and no longer from 2000 through 2002 as in NAP I.

- **Exemption of small installations.** In NAP I operators of smaller plants did not enjoy any special treatment; but under NAP II rules, companies with annual carbon emissions of up to 25,000 tonnes on average over the reference period are assigned the compliance factor 1, exempting them from reductions.

- **Alteration in shutdown rule**. In NAP I the issue of emission permits was reduced if an installation's annual emissions fell below a threshold of 60 % of the average annual emissions in the baseline period. In this case so-called **ex-post corrections** in the allocation amount were scheduled. Since the European Commission did not authorize such adjustments, however, **NAP II dispenses entirely with ex-post corrections**. For the period 2008 to 2012 installations that emit less than 20 % of the average of the years 2000 through 2004 will not be issued with any permits.

- **Alteration in the allocation rules for new installations.** As in NAP I, new plants continue to receive allocations of emission allowances based on benchmarks geared to the best available technology. However, in NAP II these installations are no longer exempt from emission reductions for 14 years; instead they are only granted a compliance factor of 1 for the period 2008 through 2012. Previously, the allocation for new installations was based on data on expected output from their operators, with the possibility of ex-post corrections in the allocation amount. Now that these adjustments have been dropped entirely in NAP II, fixed **standard utilization rates of installation capacity** will replace production projections.

- **Different treatment of process-related emissions.** In NAP I a compliance factor of 1 applies to the share of process-related emissions generated by industrial plant. However, separating energy- and process-related emissions is extremely complicated, so in NAP II the special rule for process-related emissions has been dropped. Blanket allowance is now made for these with the high compliance factor of 0.9875 for industrial plant.

- **Altered special treatment of cogeneration installations**. Because of its gentler impact on the environment the production of electricity from cogeneration installations is given preference over conventional generation. In NAP I cogeneration plants received bonus allocation of emission permits (equaling 27 tonnes of $CO_2$ per GWh of net electricity generated from cogeneration installations).

  In NAP II a double benchmark method is used for allocation to existing and new cogeneration installations: allocation for the amount of electricity is based on the benchmark for emissions from

electricity generation and for the amount of heat on the benchmark for emissions from the generation of useful heat.

- **Expiry of the nuclear power rule**. In NAP I, on application nuclear power stations were allocated altogether 1.5 million emission permits for each year of the period 2005 to 2007 as compensation for their closure. This special rule has been dropped in NAP II.

- **Option rule eliminated.** In NAP I an option rule was introduced by which the allocation regulations for new installations could be applied to existing installations. Since advantage was taken of this rule for almost 30 % of all installations, correspondingly high cutbacks in emission allowances had to be made for other installation operators. To guarantee more reliability, the option rule has been eliminated in NAP II.

- **Improved use of the flexible Kyoto Protocol mechanisms**. Companies participating in emissions trading can already use credits earned from climate protection projects carried out abroad for the European trading scheme. NAP II considerably improves the conditions for use of the flexible Kyoto Protocol mechanisms. Companies can comply with up to 20 % a year of their emission commitments using vouchers from the JI and CDM project mechanisms. This is equivalent to a total of 91 million tonnes of carbon emissions per annum.

## 5. Climate protection walking a tightrope between emission reductions and distributional conflicts

Before we continue, here is a brief **summary so far**. National implementation of the EU Emissions Trading Directive in **NAP I** features many special rules and exceptions that have restricted tradability of the emission allowances and made the system extremely complex and unmanageable. This is not consistent with the demands of efficient emissions trading (see Section 2). **NAP II** on the other hand contains some important improvements and simplifications. By **doing away with special rules** (option rule, compensation for phasing out nuclear power), for example, future trading periods will be less encumbered and the allocation of emission allowances more calculable for each individual plant operator. What is more, replacing the allocation of emission allowances for new installations by fixed standard utilization rates for plant capacities instead of on the basis of individual production projections with ex-post corrections dispenses with the complicated procedure of claiming back excess allocations based on exaggerated emission forecasts.

That the **transfer rule has been dropped** is an extremely positive aspect indeed. Issuing new installations with relatively more generous emission rights than existing plants as a means of promoting investment in facilities with lower emissions is diametrically opposed to the long-range objective of cutting back emissions. Adhering to the present rule of setting the compliance factor for

new installations at 1 for 14 years would exempt power stations coming onstream in 2012 from emission reductions up to 2026. Given the expected scale of newbuild power plants, that would set the majority of emissions in stone for 14 years and mean that the other sectors not covered by emissions trading would have to shoulder even more of the burden of emission reductions envisaged on a large scale farther down the line.

But these not inconsiderable improvements in NAP II aside, the second National Allocation Plan still contains **three serious weak spots**.

- The first concerns the **use of fuel-specific benchmark factors**. The allocation of emission allowances for new installations has to be based on estimates of future production quantities. But for this NAP II uses different benchmark factors (emissions per unit of production) for the fuels coal and gas. Using a fuel-specific benchmark for, say, electricity generation, a specific efficiency target (amount of carbon dioxide relative to the amount of electricity) is defined for each energy feedstock (lignite, hard coal, gas). The result is that coal-fired power stations receive more emission allowances than climate-friendlier gas power stations although both generate the same amount of electricity.

  **Fuel-specific benchmarks are thus counterproductive climate change policy tools that also distort competition.** They reduce incentives to switch to fuels with a smaller carbon footprint and complicate urgently needed realignment of the energy mix. Ultimately this throws the basic principle of emissions trading – to let the market decide how best to cut down on carbon dioxide – into doubt. What we therefore need are fuel-independent benchmarks to make permit allocation consistent with the perpetrator principle, with equal amounts of permits allocated for equal amounts of electricity generated.

  The lack of incentive to switch fuels is evident in the **new power station schedule** (see Table 2). Power stations with aggregate output of 18,000 megawatts are planned up to 2012. Almost 12,000 megawatts of this will be generated by coal power stations hostile to the environment discharging up to 72 million tonnes of carbon dioxide a year. And what is more, these power plants will be in operation for around 40 years. But it is estimated that Germany will have to reduce around 80 % of its total emissions by 2050 to offset the imminent threat of climate change. That leaves the energy sector with about 90 million tonnes of carbon emissions. The newbuild power stations projected up to 2012 alone would account for almost 80 % of this.

Table 2

# Power station schedule in Germany

| Location | Investor | Planned start | Fuel | Output MW | $CO_2$ emissions million tonnes |
|---|---|---|---|---|---|
| **Weisweiler** | RWE | 2006/2007 | Gas | 380 | 1.05 |
| **Hamm-Uentrop** | Trianel | 2007 | Gas | 800 | 2.21 |
| **Herdecke** | Mark E | 2007 | Gas | 400 | 1.11 |
| **GuD-Hürth** | Stalkraft/Norway | 2007 | Gas | 800 | 2.21 |
| **GuD-Lubmin I** | Concord Power | 2007 | Gas | 1.200 | 3.32 |
| **Tiefstack** | Vattenfall | 2007 | Gas | 125 | 0.35 |
| **GuD-Braunschweig** | Braunschweiger Vers. AG | 2008 | Gas | 400 | 1.11 |
| **GuD-Irsching** | E.ON | 2008 | Gas | 800 | 2.21 |
| **Reuter West Topping** | Vattenfall | 2008 | Gas | 150 | 0.42 |
| **GuD-Lingen** | RWE | 2009 | Gas | 850 | 2.35 |
| **Duisburg-Walsum** | STEAG | 2010 | Hard coal | 750 | 4.29 |
| **Neurath (BaA)** | RWE | 2010 | Brown coal | 2,100 | 15.14 |
| **Niedersachsen** | Electrabel | 2010/2011 | Hard coal | 800 | 4.58 |
| **Boxberg** | Vattenfall | 2011 | Brown coal | 675 | 4.87 |
| **Bremen-Mittelbüren** | swb | 2011 | Hard coal | 800 | 4.58 |
| **Datteln** | E.ON | 2011 | Hard coal | 1,100 | 6.29 |
| **Heme** | STEAG | 2011 | Hard coal | 750 | 4.29 |
| **Irsching** | E.ON (with Siemens) | 2011 | Gas | 530 | 1.47 |
| **Ruhrgebiet** | EWMR | 2011 | Hard coal | 1,100 | 6.29 |
| **Hamm** | RWE | 2011/2012 | Hard coal | 1,410 | 8.07 |
| **Hamburg-Moorburg** | Vattenfall | 2012 | Hard coal | 1,640 | 9.38 |
| **Lünen** | Trianel | 2012 | Hard coal | 750 | 4.29 |
| **Total gas power stations** | | | | **6,435** | **17.81** |
| **Total coal power stations** | | | | **11,875** | **72.05** |
| **Grand total** | | | | **18,310** | **89.87** |

Source: VDEW, company figures.

**Some of the exceptions and special rules in NAP II evidently still serve energy-policy and distributional ends**. Energy policy remains geared to softening the impact of emissions trading on the structure of the energy feedstock and suspending incentives to switch over to other energy carriers. Although modernization within individual carriers is intended, not all cost-effective options to cut down on emissions are exploited to the full. This makes national climate protection unnecessarily expensive.

- Second, we take a critical view of the **alteration in the baseline period**. Should this create the impression that reference timelines could also be updated for future trading periods, it might weaken the incentive to reduce emissions. Regularly taking current emissions as the basis for future allocations gives operators an incentive to keep their carbon footprint high in the hope of receiving a higher allocation in the next trading period.

- Third, **so far emissions trading has not been used in Germany to achieve marked reductions in emissions**. Scenario analyses of the European energy system indicate that in all probability the EU will not meet the reductions of 8 % by 2012 to which it committed in the Kyoto Protocol. On the other hand, potential analyses conclude that reduction potential of as much as 30 % could indeed be unlocked up to 2020. Research by the Wuppertal Institut suggests that the sectors participating in emissions trading have a pivotal role to play here. They would need to cut about 2 to 3 % of their emissions a year up to 2010, with a substantial rise in reductions expected for the period 2010 to 2020.

**Acrimonious distributional disputes** raged over NAP II in the run-up to its adoption. This is understandable given that the emission permits up for allocation represent total assets worth somewhere in the region of EUR 10bn, depending on how they are priced. However, the debate was conducted mainly with reference to competition arguments that were off topic and disregarded the actual functional principle of emissions trading. Plant operators, for example, often insist on “needs-based allocation”. But this runs counter to the principle of emissions trading, whose raison d’être is surely to keep emission allowances in short supply. Were every plant operator issued with as many emission permits as they needed, there would be no scarcity of supply and the market price of emission permits would be zero.

## 6. Auctioning emission allowances would avoid functional deficits of the present system

There is no plausible justification, in terms of either energy policy or climate change policy, for the various special rules that apply to emissions trading in Germany. In fact, **misusing the system in political pursuit of energy-strategic and distributional aims** has a number of undesirable consequences. For one, it pushes up the price of national climate protection unnecessarily and

increases the burden of costs for operators of installations that do not benefit from special arrangements. Moreover, it results in economically questionable asset transfers and subsidization of the energy feedstock coal. And as already mentioned, the strategic and distributional overload has given rise to an extremely complex and unmanageable set of rules still far removed from a perfectly functioning permit trading system.

Many of the present shortcomings in emissions trading could be resolved by ceasing to allocate free-of-charge permits after 2012 and (increasingly) auctioning them instead. **Full auctioning is far more in keeping with the actual underlying principle of emissions trading**. It avoids all the problems and distortions associated with state quota planning at the micro-level of emitter and plant by obviating such regimentation entirely. Neither compliance factors nor benchmarks would be necessary. The trading system as a whole would be made much more simple and transparent and the urgently needed refocus of energy supply towards carriers with a smaller carbon footprint driven forward faster. But most importantly, auctioning would largely eliminate the influence that lobby groups bring to bear on emissions trading. All that would still be needed is a macroplan to cap national emission levels.

**An absolutely crucial advantage of auctioning carbon permits is that the proceeds would flow into the public exchequer – making windfall profits a thing of the past.** This of course raises the question of what to do with the funds coming in. Auction proceeds could conceivably be used

- for **development programs** to increase energy efficiency or encourage the use of renewables,

- by the government to **purchase emission allowances or credits** under the flexible Kyoto Protocol mechanisms as a means of subsidizing emission reductions in other countries,

- to **pay for the administrative costs of emissions trading**, which are estimated at around EUR 11m a year,

- in part or in full for general purposes in the **central government budget**,

- to **lower the tax on electricity** with the aim of specifically reducing the financial burdens caused indirectly by emissions trading through higher electricity prices.

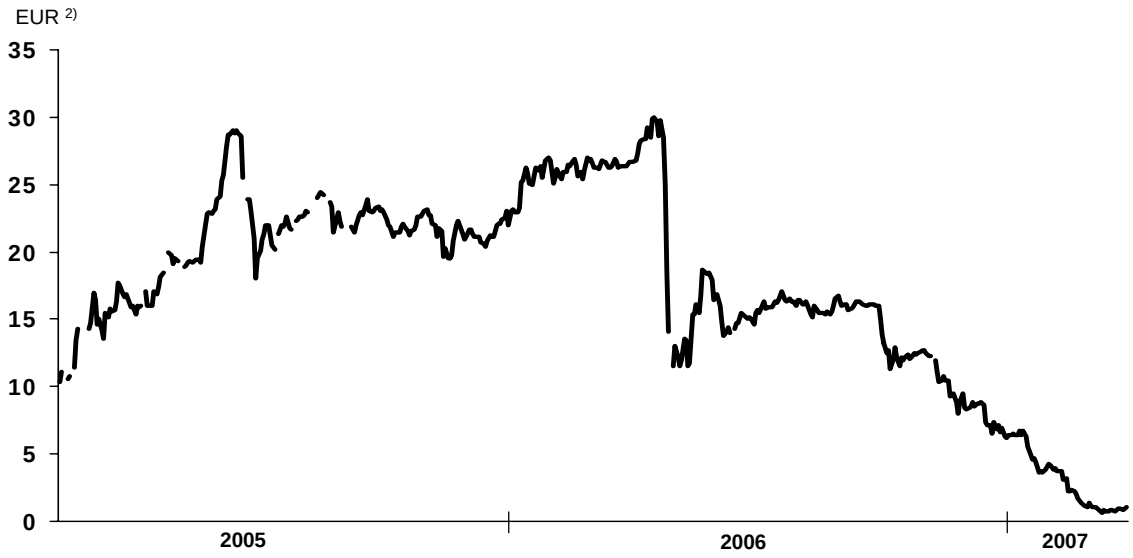
Another important advantage is that auctions can support the development of (secondary) markets by releasing reliable information at an early stage on participants' willingness to pay for permits and sending out price signals in the process. Particularly on newly emerging illiquid and volatile markets, auctions can help douse price swings and create a more reliable planning basis. There is a lot of empirical research to corroborate this.

## 7. The price of carbon permits – comparatively low for now

A glance at the development in the price of emission allowances so far reveals extremely high volatility (see Chart 3). This is partly a reflection of stakeholders' jittery expectations. From a base level of less than EUR 10 at the beginning of 2005, permit prices jumped to almost EUR 30 by mid-year, subsequently fluctuating between EUR 20 and 25 before brushing the EUR 30 mark again early in 2006. This came as a complete surprise to most market stakeholders as forecasts had put the upper price bound at no more than EUR 15. But when the news broke that actual emissions in Europe were almost 2 ½ % less in 2005 than the amount of permits allocated, it triggered a **crash on the permit market** that drove quotations below EUR 10. Since then they have been unable to stage a sustained recovery, chiefly because overall allocations of allowances are too high. Having see-sawed in the closing third of 2006, permit prices plummeted from around EUR 16 to less than EUR 1 as of writing. That surplus permits will become worthless at the end of 2007 because allowances cannot be carried over from one trading period to the next, has acted as a further damper. The exceptionally mild winter will presumably also have kept a tight lid on prices.

Chart 3

**Price of emission rights [1)]**




1) on the Leipzig exchange EEX, 2) per tonne of carbon dioxide emissions, spot prices.
Source: European Energy Exchange (EEX) Leipzig.

What basically drives the development in the price of carbon permits? The main **long-range determinants** are:

- the **amount of permits** set in the NAPs for the participants in emissions trading. By applying a stringent yardstick in its review of these allocation plans (as was recently the case with Germany) the European Commission restricts the supply of emission allowances and tends to push up prices.

- the **avoidance costs and reduction potential of carbon dioxide**. If the avoidance costs are lower than the permit price and a company has sufficient emission reduction potential, it will opt to control emissions proactively rather than purchase allowances on the market. So if the cost of avoiding $CO_2$ at most of the installations involved in emissions trading is low and they possess considerable reduction potential, the price of carbon permits will tend to fall, and vice versa. In market equilibrium conditions the marginal control costs will be identical to the permit price.

- **the proportion of renewable energies in power generation**. Given constant electricity consumption and an increasing share of renewables in power generation, the amount of conventionally generated electricity will decrease. As a result fewer emission allowances will be needed for fossil-fired power plants. The faster progress is made on the development of renewables, the lower the permit price will therefore tend to be, and vice versa.

- the **Linking Directive**. It provides for the recognition in European emissions trading of credits earned from CDM and JI projects. This has the effect of increasing the total amount of carbon permits available, which tends to lower their price.

The **short-range determinants** are:

- the **relative price of coal and gas**. Switching the feedstock fuel used to produce electricity is crucial to the reduction of $CO_2$ emissions. A coal-fired power station discharges roughly twice as much carbon dioxide per kilowatt hour of electricity generated as a modern gas power plant. By changing the feedstock, power generators could thus halve their $CO_2$ emissions and sell their surplus carbon permits. Falling permit prices would be the result. If, however, natural gas becomes more expensive than coal, switching feedstock may not be financially worthwhile. Indeed, more coal might be substituted for gas. That would increase the carbon footprint and reduce the supply of permits – the corollary being dearer emission allowances.

- the **weather dependence of renewables and the thermal sector**. The generation of electricity from renewable energies can fluctuate very severely, depending on the weather conditions. A cold, dry winter and a hot summer will seriously curtail hydroelectric power generation in

particular. Diminished output would have to be made up from conventional power plants, pushing up the price of emission allowances. On the other hand, prices would fall in the event of a mild, wet winter and a cool, rainy summer. Added to which, demand for heating rises in a severe winter and for air-conditioning in a sweltering summer. This fuels energy consumption and further restricts the supply of emission allowances.

- **economic growth**. As the production of goods and services is ratcheted up, so demand for energy increases, raising the level of carbon emissions. This correlation still holds valid, even if Europe's transition from an industrial to a services society now makes it less pronounced. Were an external shock to trigger stagnation, or even recession in the European economy, falling permit prices would be the result. A sustained period of burgeoning economic activity, on the other hand, would tend to drive up the price of emission allowances.

Given the many factors acting on the price of carbon permits (see Table 3), forecasts invariably come with caveats. However, the marginal control costs of $CO_2$ emissions do set an **upper bound** on prices. At present separation, capture and storage of the carbon dioxide occurring in the generation of electricity from coal costs in the region of EUR 25 to 30 per tonne of carbon. Whether this price limit is reached in the long term will crucially depend on the politically determined carbon reduction targets and on technological developments.

**For the time being, we expect carbon permit prices to remain relatively low, in the region of EUR 10 to 15 per tonne.** There are various reasons for this. First, the permit market is not yet sufficiently liquid. Second, the new EU member states are set to join the scheme in the second trading period from 2008 to 2012. Since they will probably be net permit sellers, prices will tend to be lower. Third, for the period after 2012 emissions trading is likely to be extended far beyond the EU – but only if the reduction commitments remain measured and permit prices therefore moderate.
At the beginning of 2007 the ZEW Centre for European Economic Research asked 200 specialists from the energy sector for their **assessment of the future price of emission allowances** in six months' time (mid-2007), in five years (2011) and in 2015. The consensus estimate for **mid-2007** ranged between EUR 10 and 15 EUR. Looking forward to **2011**, about 40 % of the respondents put the price between EUR 15 and 20, while 32% expected a price of EUR 20 to 25. This suggests that the experts are reckoning on more stringent permit allocations to companies in the second period of European emissions trading as from 2008. Estimates for **2015**, i.e. beyond the first stage of the Kyoto Protocol, ranged widely, with about 24 % each of the respondents forecasting a price between EUR 20 and 25, EUR 25 and 30 and above EUR 30.

Table 3

## Emission allowance price drivers

| | Change in certificate price if driver rises | Change in certificate price if driver falls |
|---|---|---|
| **Long-term drivers** | | |
| Authorized emission volume | ↓ | ↑ |
| Carbon dioxide avoidance costs | ↑ | ↓ |
| Share of renewable energies in electricity production | ↓ | ↑ |
| **Short-term drivers** | | |
| Gas price relative to coal price | ↑ | ↓ |
| Rainfall | ↓ | ↑ |
| Average temperature in winter | ↓ | ↑ |
| Average temperature in summer | ↑ | ↓ |
| Economic growth | ↑ | ↓ |

Source: Kreditanstalt für Wiederaufbau.

## 8. Conclusions and outlook

Introduction of the emissions trading scheme in Europe marks an important step on the road to an ecologically effective and economically sensible environmental policy. But it is by no means the end of that road. To counteract climate change successfully, in future far **more ambitious emission reduction targets** will have to be set worldwide. The total emissions budget for the installations taking part in the scheme needs to be tightened up appropriately if permit prices are to send out clear signals for investment in lower-emission or emission-free technologies.

What is more, as many countries and sectors as possible and all greenhouse gases should be included in the emissions trading system. The more nations that are involved, the more efficiently and economically the scheme can be operated – especially with the then higher liquidity. Only a **global market in emission allowances** will usher in the technological change making it possible to decouple energy consumption and greenhouse gas emissions from economic growth. As well as linking up EU emissions trading internationally to similar schemes outside Europe, it is also important to refine the methods and rules governing the allocation of emission allowances to make trading more efficient.

**Auctioning** plays a pivotal role here. Moving forward, emissions trading will only unleash sufficient innovative drive if permits are auctioned instead of allocated free of charge.

Last but not least, to achieve globally effective climate protection, the major carbon emitters – above all those in Asia, Latin America and the United States – will have to be integrated into a worldwide climate protection strategy (**Kyoto-plus agreement**) by 2013 at the very latest. At present the countries that have committed to cutting back their greenhouse gases within the framework of the Kyoto Protocol are responsible for barely 30 % of total world emissions. Only by doing its very utmost to encompass the emissions caused by countries not committed to the Protocol can the international community guarantee strategic protection for our climate that will unfold its impact the world over.

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