

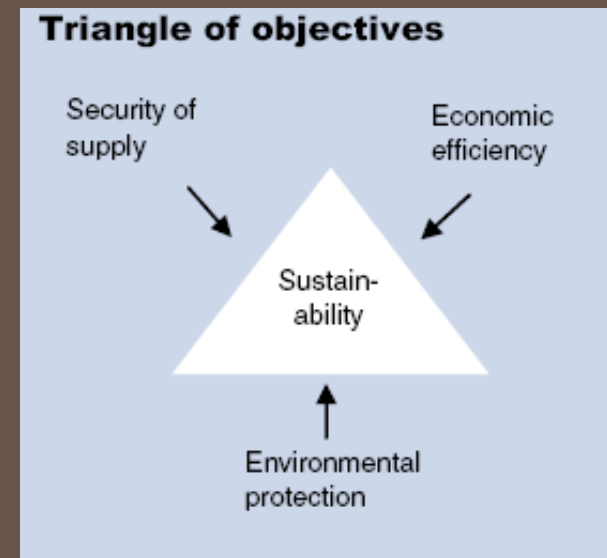
ENVIRONMENTAL DIMENSION OF THE EEP – CLIMATE CHANGE MITIGATION

Filip Černoch

cernoch@mail.muni.cz

Period between 1985 - 2000

- New incentives for energy on the EC level
 - ▣ **Weak competitiveness of European industry** – first proposals to create the internal energy market. Competition and transparency instead of national monopolies and closed markets.
 - ▣ **Climate change** – tools to prevent impact of usage of energy on local and global level. (to reduce the amount of emissions produced in the EU)
 - ▣ **Disintegration of Soviet block** – proposals to manage relations between producers and consumers (EU MS) of energy.



Environmental impacts of energy consumption

- Energy sector (extraction, transport, processing and combustion) harms the environment significantly.
- Local environment protection – covered mainly by Environmental policy
 - Air, land and water pollution, noise
 - Industrial (energy) waste
 - Protection of biodiversity
 - Extraction of non-conventional sources of energy
 - ...

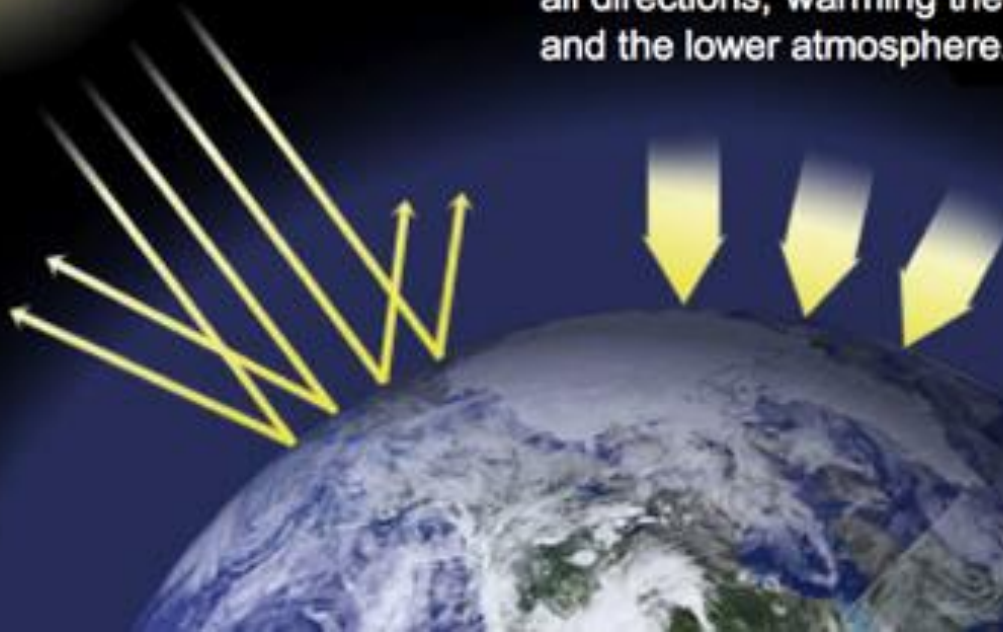
Environmental impacts of energy consumption

- Climate change (regional/global level) – measures to reduce GHG emissions
 - EU ETS
 - RES
 - Energy efficiency
 - Research and development, new technologies (CCS)

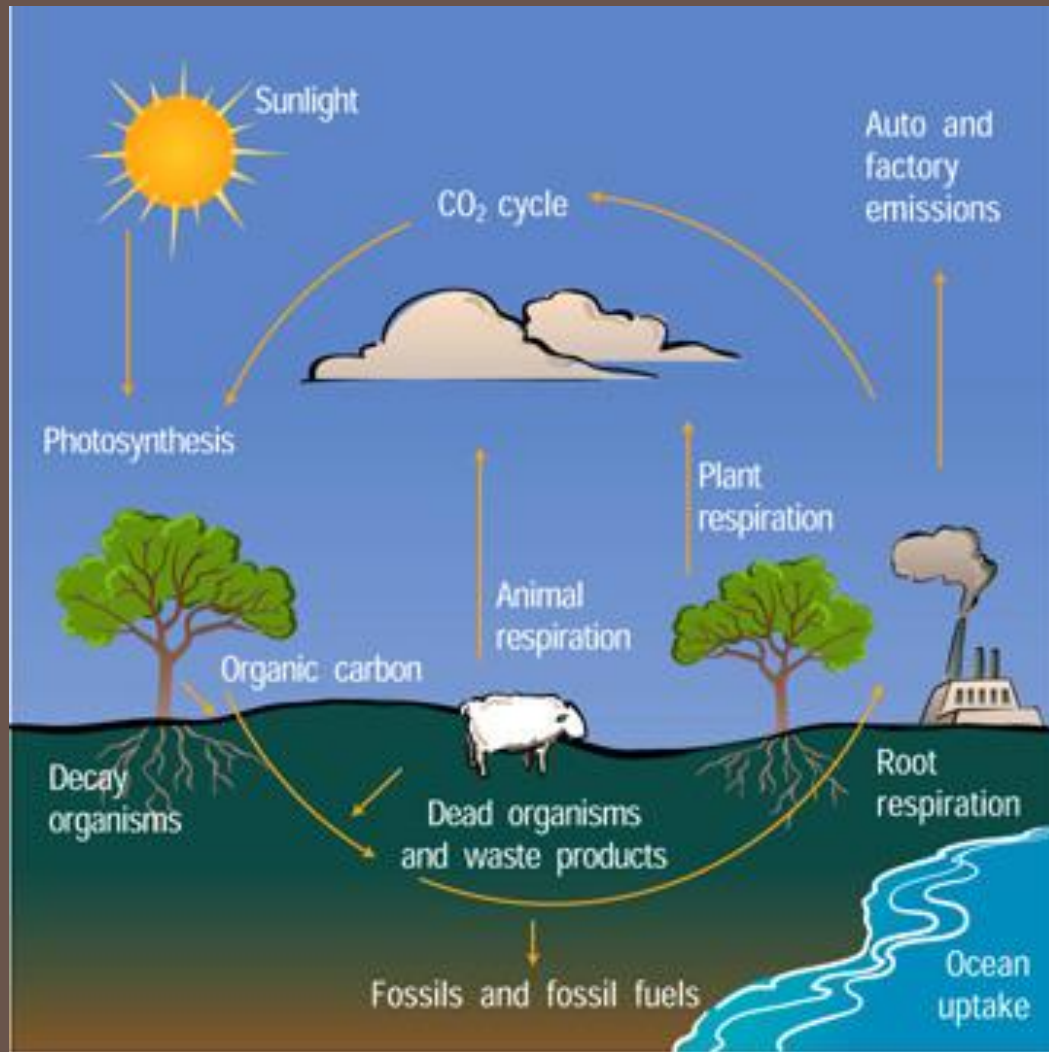
Greenhouse gas effect

Sunlight passes through the atmosphere and warms the Earth's surface. This heat is radiated back toward space.

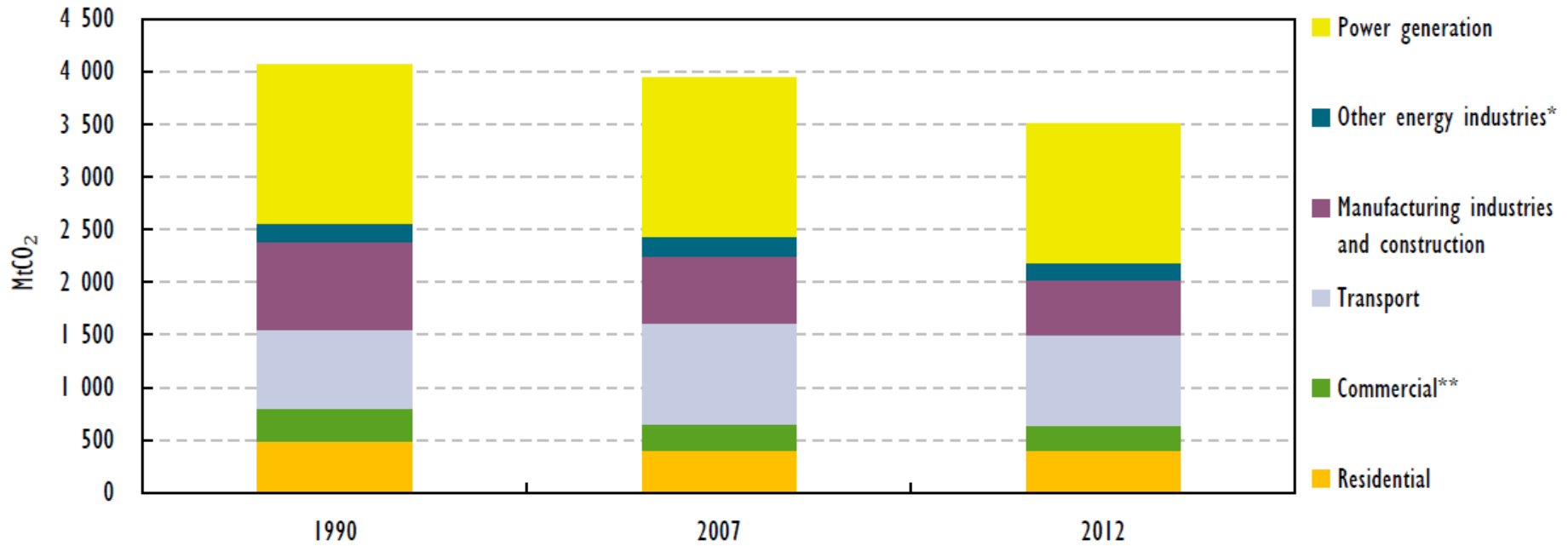
Most of the outgoing heat is absorbed by greenhouse gas molecules and re-emitted in all directions, warming the surface of the Earth and the lower atmosphere.



Carbon cycle



CO₂ emissions by sector, 1990-2012

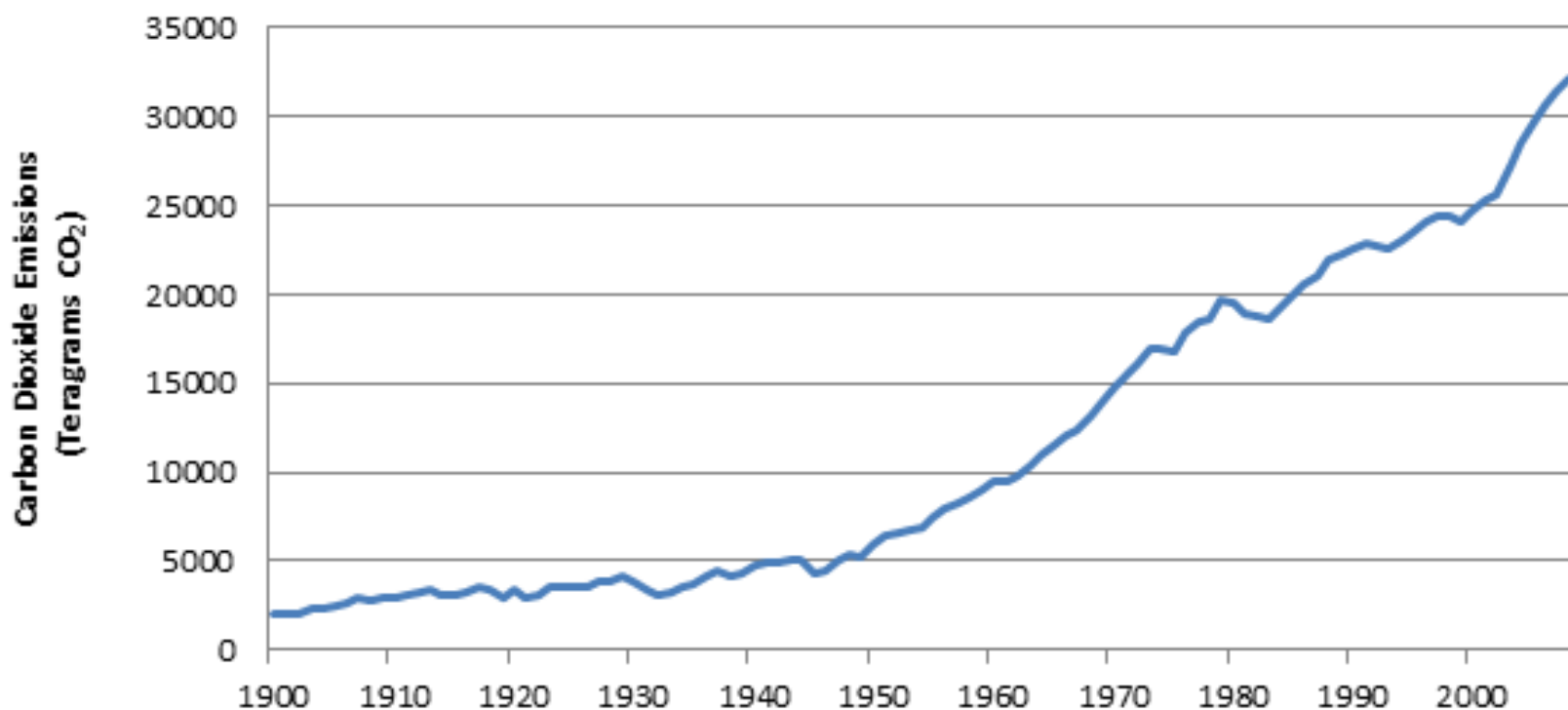


* *Other energy industries* includes refining/other transformations and energy own use.

** *Commercial* includes commercial and public service, agriculture/fishing and forestry.

Source: IEA (2014), *CO₂ Emissions from Fuel Combustion*, OECD/IEA, Paris.

Global Carbon Dioxide (CO₂) emissions from fossil-fuels 1990–2008



Source of data: Boden, T.A., G. Marland, and R.J. Andres (2010). Global, Regional, and National Fossil-Fuel CO₂ Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A. doi 10.3334/CDIAC/00001_V2010.

Impacts of climate change

- ❑ Confusion of the global ecosystem
 - ❑ change of temperature (+0,8°C in the last 100 years) results in changes of weather patterns
 - ❑ Redistribution of water and growing conditions
 - ❑ Places historically having great growing weather conditions are turned to wastelands. Famine, war, climate refugees.
- ❑ Sea level rise – displacement and extinction
 - ❑ The largest countries in the world like Bangladesh, Vietnam, India and China, all have very high amount of population living in the very low line level urban areas.
- ❑ Ocean acidification
 - ❑ Lowering the PH of oceans (CO₂ is water soluble) is not acceptable for many species.
- ❑ And the others.....

International regime to fight climate change

- Intergovernmental Panel on Climate Change – 1988.

= to provide comprehensive scientific assessments of current scientific, technical and socio-economic information about the risk of climate change, its potential environmental and socio-economic consequences and possible options for adaptin to these consequences or mitigating the effects.

- Rio Summit on Earth – 1992 (UN conference on environment and development) → UNFCCC

- **Kyoto protocol**

- – 1997, in force 2005

= Existence of a generally accepted consensus on the climate change as well as the contribution of human activities to this process.

Kyoto protocol

- 4 GHG (carbon dioxide, methane, nitrous oxide, sulphur hexafluoride) + hydrofluorocarbons and perfluorocarbons.
- Annex I. countries (37 industrialized countries + EU15), Non-annex I. parties.
- Reducing of GHG emissions by 5,2 % for the period of 2008-2012. (4,2 % after USA left). Base year 1990.
- Flexible mechanisms – Emission trading, CDM, JI.
- Art. 4 – burden sharing agreement

- Common but differentiated responsibility

Table of quantified emission limitation or reduction commitments for the purpose of determining the respective emission levels allocated to the European Community and its Member States in accordance with article 4 of the Kyoto Protocol

	Quantified emission reduction commitment as laid down in Annex B of the Kyoto Protocol (percentage of base year or period)
European Community	92 %
	Quantified emission limitation or reduction commitment as agreed in accordance with article 4(1) of the Kyoto Protocol (percentage of base year or period)
Belgium	92,5 %
Denmark	79 %
Germany	79 %
Greece	125 %
Spain	115 %
France	100 %
Ireland	113 %
Italy	93,5 %
Luxembourg	72 %
Netherlands	94 %
Austria	87 %
Portugal	127 %
Finland	100 %
Sweden	104 %
United Kingdom	87,5 %

EU and climate change

- Environmental awareness
- Preemptive environmental measures
- Common market
- Raison d'être

130r (TEU) „...Community policy on the environment...shall be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and that the polluter should pay“.

Tento projekt je spolufinancován Evropským sociálním fondem a státním rozpočtem České republiky.



INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

Key data (2012)

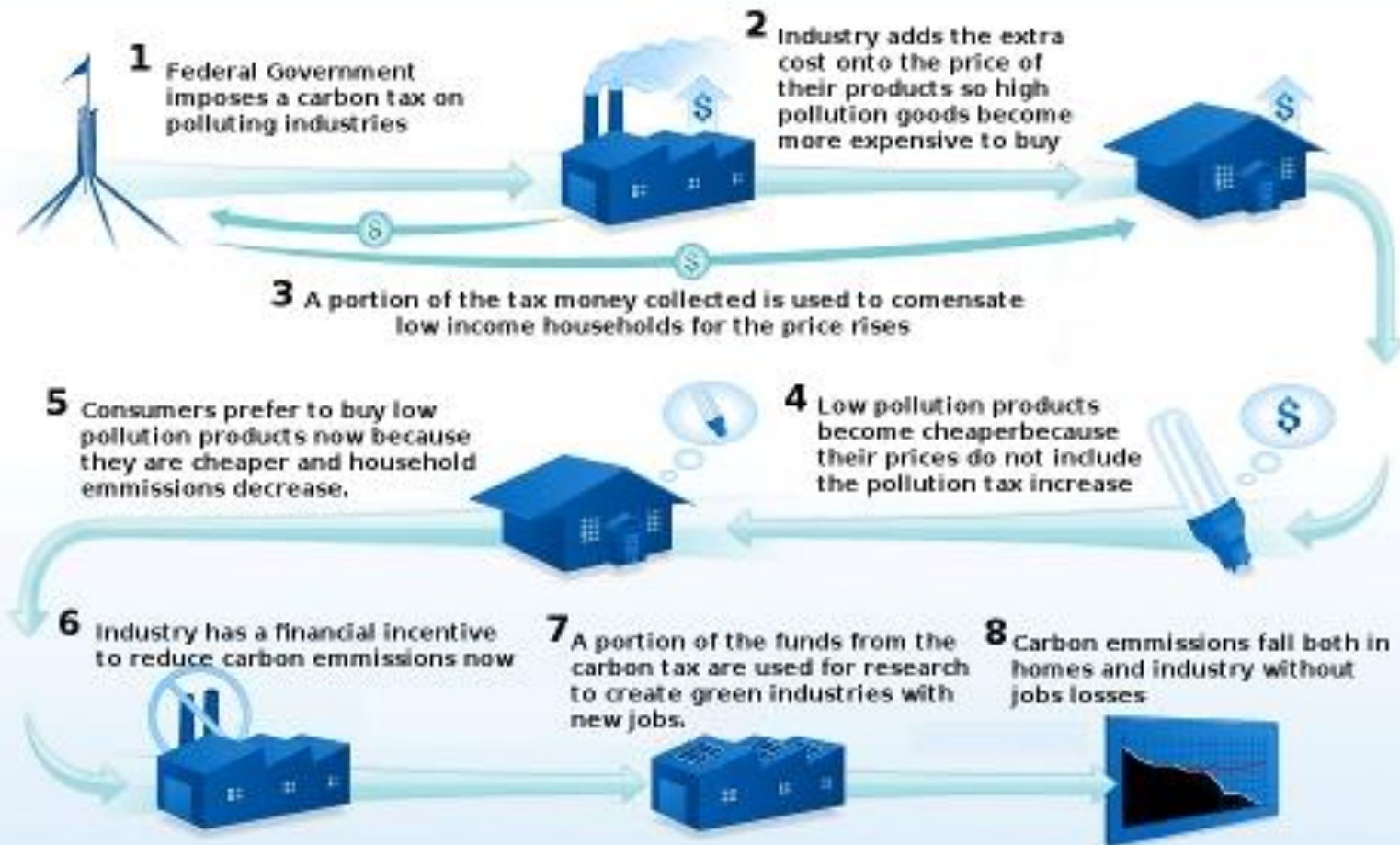
- CO2 emissions from fuel combustion: -13,8% since 1990.
- Emissions by source: oil 40,2%, coal 32,4%, natural gas 25,6%, other 1,8%.
- Emissions by sector: power generation 37,5%, transport 24,6%, industry 15%, residential 11,5%, commercial and other services 6,6%, other energy industries 4,8%.

Tento projekt je spolufinancován Evropským sociálním fondem a státním rozpočtem České republiky.



INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

EU and climate change: carbon tax



Adapted from ABC News - Carbon pricing explained
<http://www.abc.net.au/news/event/s/climate-change/carbon-pricing-explained.htm>

EU and climate change: emission trading

- **ET:** Central authority ... sets a limit ... on the amount of pollutant to be emitted ... the cap is sold/allocated as permits ... companies are required to hold those permits ... if they need to increase this volume ... have to buy those permits.
- = the buyer is paying a charge for pollution = he is motivated to invest in less-polluting technologies.

Tento projekt je spolufinancován Evropským sociálním fondem a státním rozpočtem České republiky.



INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

EU and climate change: emission trading

- How the system works?
 - ▣ It creates a dynamic monetary incentive so companies can sell their allowances to other producers and make profit
 - ▣ These incentives are based on real needs (scarcity) of allowances and on adequate monitoring and enforcement
 - ▣ This system (at least in theory) offers certainty of emission reduction corresponding to the stringency of the cap.
 - ▣ Unlike domestic schemes effective international systems are more difficult to establish
 - ▣ Even a well-designed system is not to work if it is not implemented correctly by the participants in the system (MS).

Run-up to the EU ETS

- 1988 EC's communication „The Greenhouse Effect and the Community“
- 1998 EC's communication „Climate Change - Towards an EU post-Kyoto strategy“
- 1999 EC's communication „Preparing for Implementation of the Kyoto Protocol“
- 2001 – EU ETS legal preparation launched, approved in 2003.
- Designated the first period from 1.1.2005 to 31.12.2007, covering about 11.500 facilities in 25 MS = 45% CO₂ emitted in the EU.

EU and climate change: emission trading

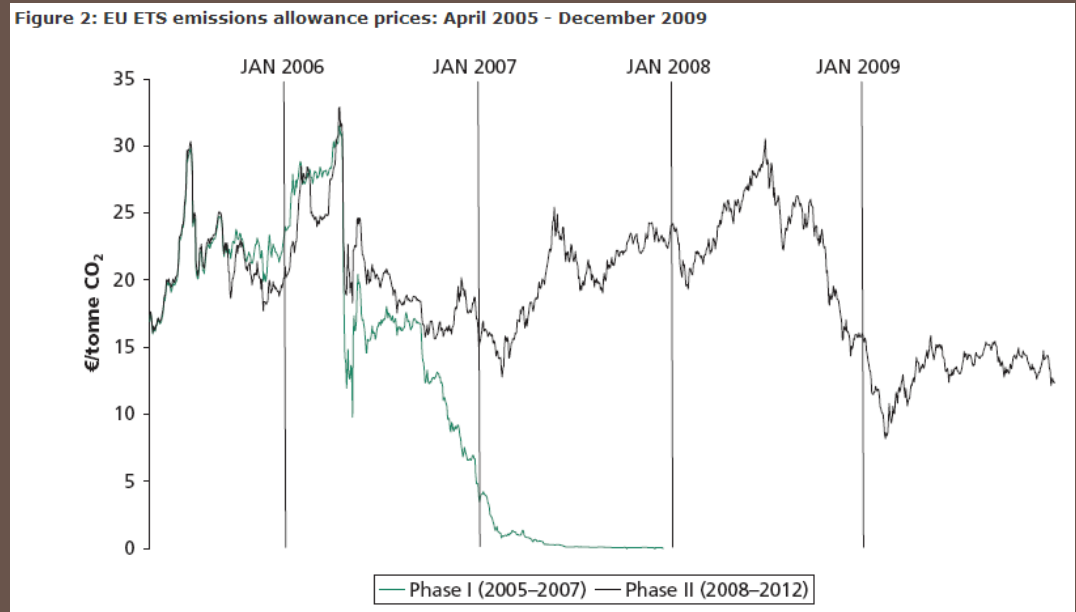
-
- EU firstly sceptical about international emission trading.
 - ▣ See the very concept morally wrong – trading authorizes pollution, turning it into commodity to be bought and sold
 - ▣ Questionable with regard to equity – that the richer industrialized countries can buy their way out of their obligations instead of lowering their disproportionate consumption of scarce sources
- But – change in the position of the U.S. placed the EU in the forefront of the climate change movement

Environmental dimension of EEP

- Climate change – EU aim to develop a low-carbon economy
- Measures primarily to reduce GHG emissions
 - EU ETS – covers 40% of EU emissions
 - individual targets of MS for the non-EU ETS sectors (housing, agriculture, transport, waste) – cover 60% of EU emissions
 - CCS
- Measures to transform the energy sectors
 - RES
 - Energy Efficiency
 - Research and development, new technologies

EU ETS: The first phase 2005 - 2007

- Problems with the decentralised system of distribution
- Drop in the prices of allowances
- Very limited impact on emissions of GHG
- NAP – only Austria, Denmark, Finland, Germany, Ireland and Slovenia in time
- Overestimation of emissions – with the exception of Germany and Slovenia (4 % surplus)



EU ETS: The first phase 2005 - 2007

Difficult calculations due to:

- Proneness to cheating
- Changing level of industrial production
- Changes in energy prices
- Increasing deployment of RES
- Permit stockpiling
- Weather
- The supply of permits associated with other EU targets

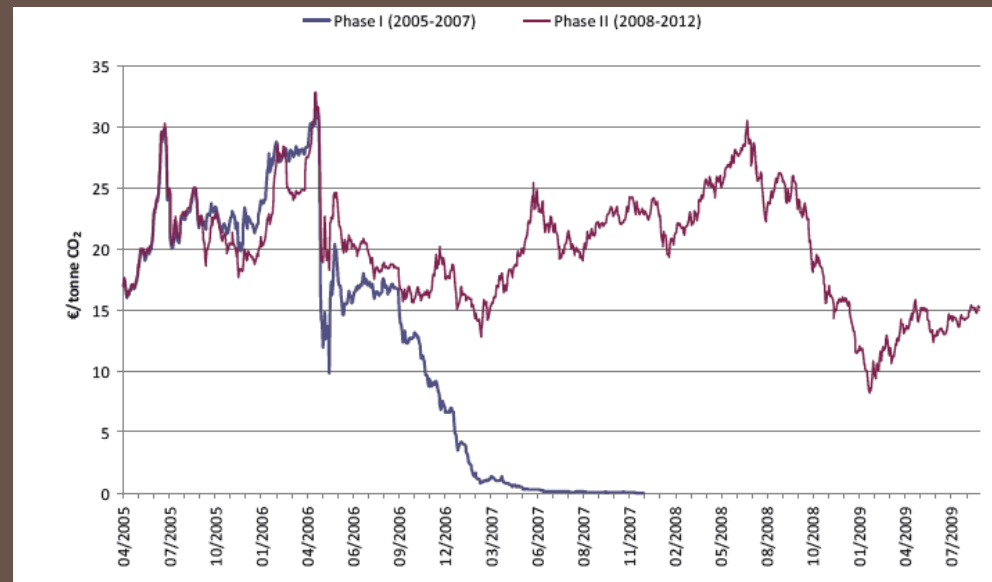
EU ETS: The first phase 2005 - 2007

Country	Mil. EUA	Share of the overall amount of EUA	Number of incl. facilities	The aim of Kyoto
Belgium	188,8	2,9	363	-7,5
Czech Republic	292,8	4,4	435	-8
Denemark	100,5	1,5	378	-21
Estonia	56,85	0,9	43	-8
Finland	136,5	2,1	535	0
France	469,5	7,1	1 172	0
Ireland	67	1	143	+13
Italy	697,5	10,6	1 240	-6,5
Cyprus	16,98	0,3	13	-
Luxembourg	10,07	0,2	19	-28
Lithuania	36,8	0,6	93	-8
Latvia	13,7	0,2	95	-8

EU ETS: The second phase 2008 - 2012

- Considerably more rigorous approach of EC – cuts of NAP (litigation at ECJ)
- Relatively stable price of allowances
- Pressure to change the whole system

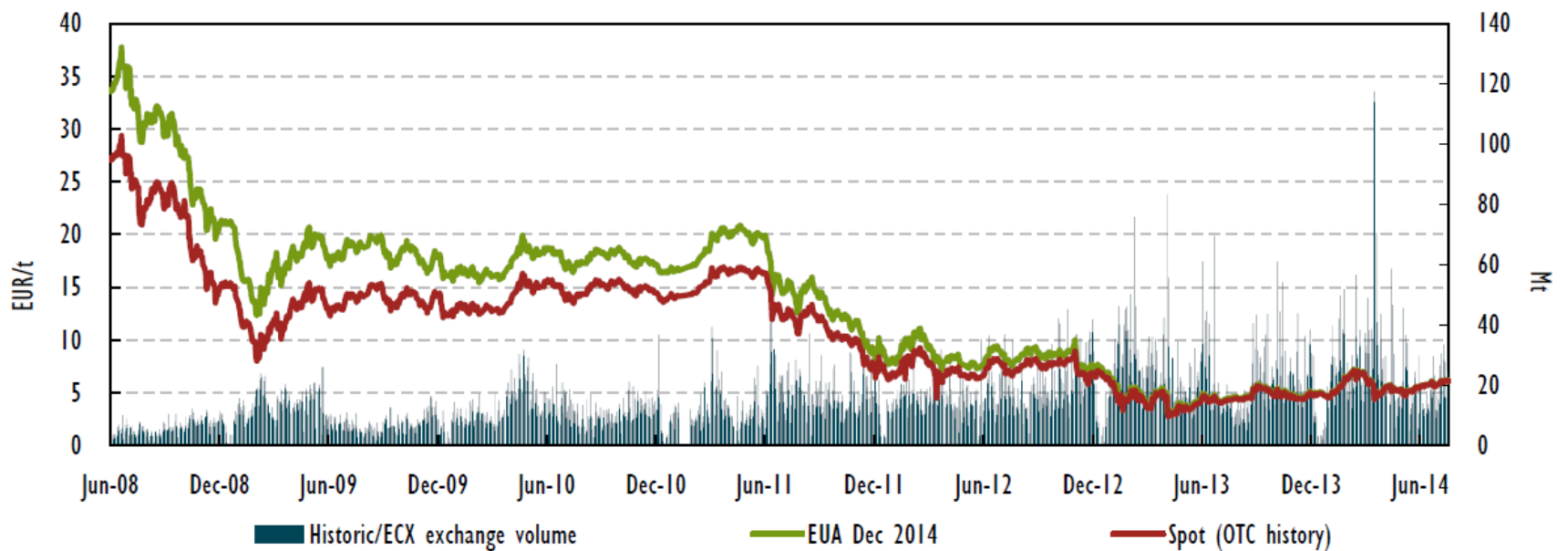
Nearly all 25 EU MS did not meet the 30 June 2006 deadline for the submission of the second phase NAPs (only Estonia was on time). Preinfringement letters were sent by the EC to 14 MS, namely Austria, Belgium, Cyprus, the Czech Republic, Denmark, Finland, Hungary, Latvia, Malta, the Netherlands, Portugal, Slovenia, Slovakia and Sweden.



EU ETS: The second phase 2008 - 2012

- Between 2008 – 2012 the CO₂ price decline from around €20 MtCO₂ to around €8 MtCO₂.
 - The reduction of energy demand due to the financial and economic crisis starting in 2008.
 - Inflow of international credits (Certified Emission Reduction CER of CDM and others)
 - Current cap and 1,74% annual linear reduction factor not sufficient
 - Impact of other EU policies such as RES and energy efficiency policy
 - Rising prices of fuels
 - The design of the EU ETS doesn't allow the adjustment of supply of EUA in reaction to the changes in demand
- Since the banking is allowed between the second and third trading period = a likely surplus of 2-2,5 bn EUA.

Historic evolution of volumes and spot prices for emission allowances under EU ETS



EU ETS: The third phase 2013 - 2020

- Changes introduced by Energy and climate package 2009
- Increased coverage of GHG (CO₂+nitrous oxide NO₂ and perfluorocarbons PFCs) and activities (airlines)
 - Power and heat generation
 - Energy intensive industry, such as oil refineries, steel works, production of iron, aluminium, metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids, bulk organic chemicals.

EU ETS: The third phase 2013 - 2020

- EU-wide emission cap to replace NAPs. A linear reduction factor of $-1,74\%/y$ applies.
- Auctioning of permits as a default method. More than 40% of EUA to be auctioned in the first year of 3rd period with progressively rising shares each year.
 - End of free permits to the power sector. In other sector the progressive transition to the auctioning.
 - In other sectors the transition to auctioning is taking place progressively. In aviation sector only 15% of aviation allowances will be auctioned over the whole 2013-2020 period.

EU ETS: The third phase 2013 - 2020

- Common auctioning platform for the sale of permits (except Germany, UK, Poland)
- 300 million EUA in the New Entrants Reserve to fund innovative RES technologies and CCS.
- An expanded list of restrictions on the use of credits from the CDM.

EU ETS: The third phase 2013 - 2020

- Distribution of auction revenues (88 % to MS, 10 to MS with low per capita income and 2 % to MS that had achieved a 20 % emission reduction in their Kyoto protocol base by 2005).
- At least half of revenues to combat climate change.

Exeptions and derogations

- Countries, producing more than 60% of their electricity from coal or poorly interconnected to European grid could provide up to half of the allowances in energy sector freely
 - ▣ Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Lithuania, Poland and Romania
- A risk of carbon leakage
 - ▣ Process industries may get part or, if subject to carbon leakage, all of their EUA for free at the level of harmonized industry best practice practice.
 - ▣ Carbon leakage list to be published every 5 years (2009, 2014).

EU ETS: Latest development

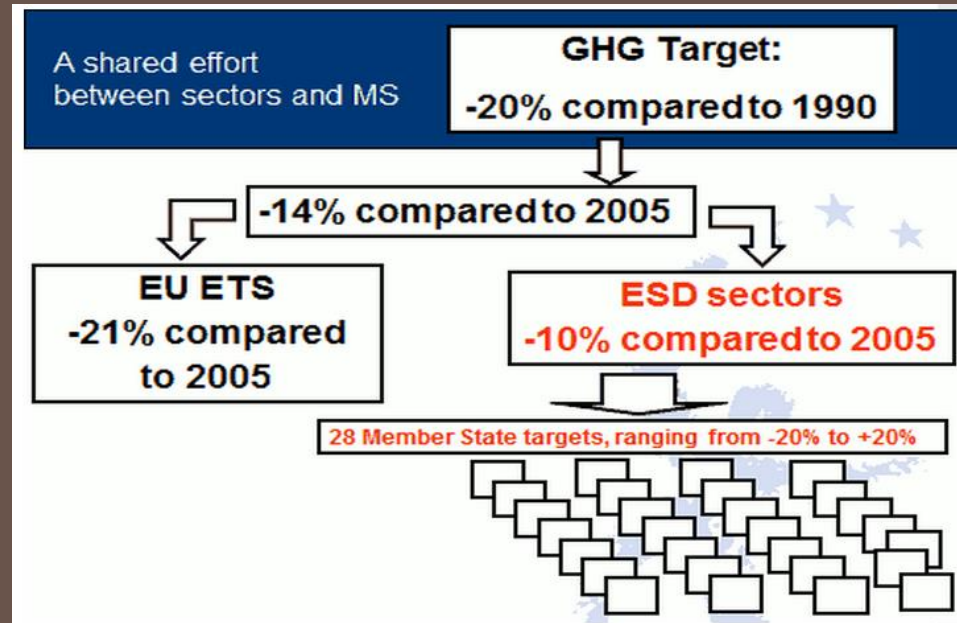
- At the end of 2nd period another 900 mil. EUA.
 - ▣ +the selling of left-over allowances in national phase 2 new entrant reserves
 - ▣ + early auctioning to meet sector hedging demand
 - ▣ + the forward selling of phase 3 allowances to generate funds for the NER300 program
- About 2 – 2,2bn of EUAs surplus
- Backloading: delaying the auctioning of emission allowances intended to be allocated in 2013-2015 until 2018-2020
- Market Stability Reserve (from 2021) – to address the surplus of EUAs by automatically adjusting the supply of EUAs to be auctioned.
- Change of the linear factor to -2,2% from 2021.

Environmental dimension of EEP

- Climate change – EU aim to develop a low-carbon economy
- Measures primarily to reduce GHG emissions
 - EU ETS – covers 40% of EU emissions
 - individual targets of MS for the non-EU ETS sectors (housing, agriculture, transport, waste) – cover 60% of EU emissions
 - CCS
- Measures to transform the energy sectors
 - RES
 - Energy Efficiency
 - Research and development, new technologies

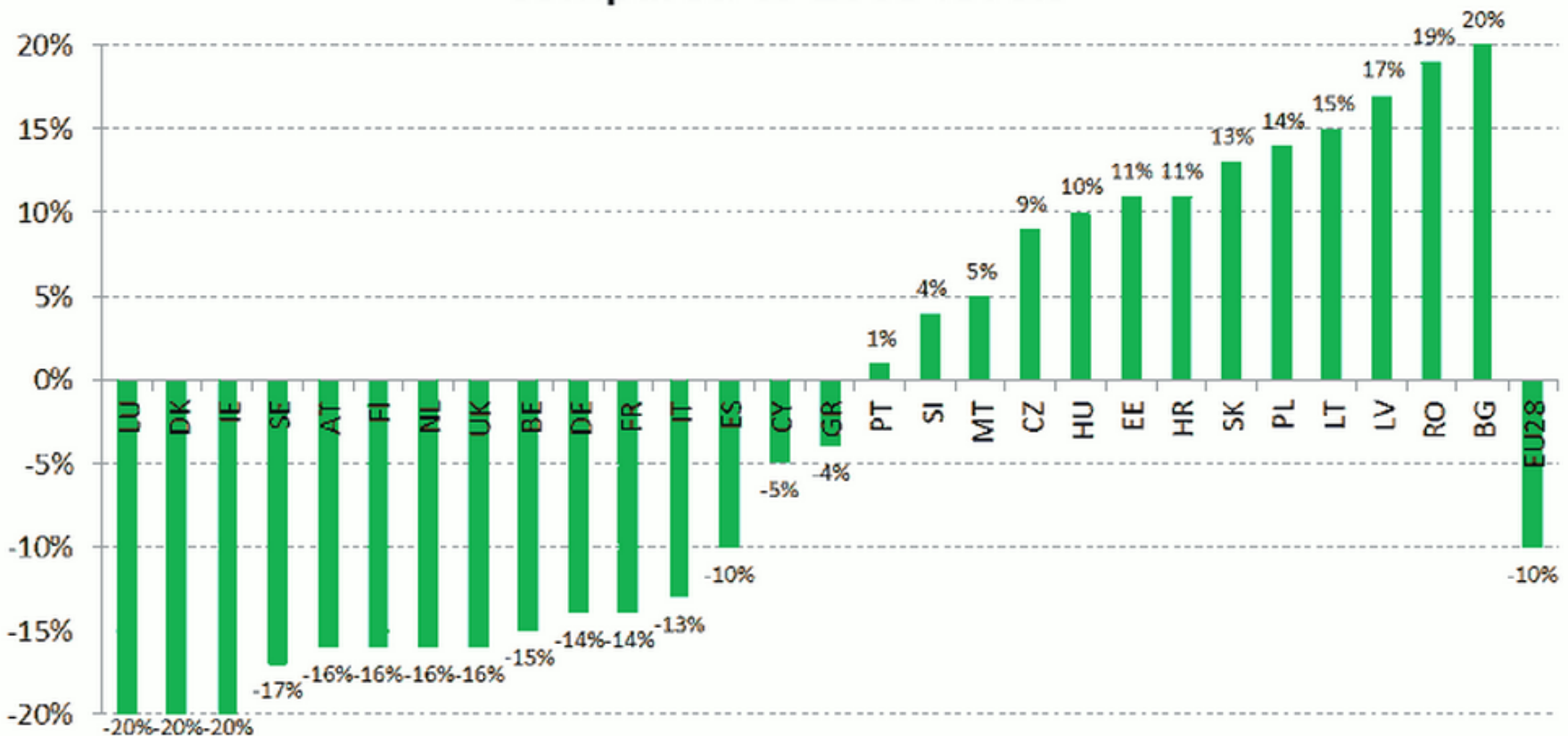
Non-EU ETS emissions

- National targets for non-EU ETS emissions
 - ▣ Traffic management, low-GHG transport, biofuels, urban planning, improved energy performance standards for public building, labeling system, eco design.....
- To support it some measures at the EU level – A regulation requiring a reduction in CO₂ emissions from new cars + a revision of the Fuel Quality Directive + Clean Power for Transport Package....



Individual targets of MS

Member State greenhouse gas emission limits in 2020 compared to 2005 levels



„The Commission's proposal for a 2030 climate and energy policy framework acknowledges the role of CCS in reaching the EU's long-term emissions reduction goal“.....

...“Significant emissions cuts are needed in the EU's energy and carbon-intensive industries. As theoretical limits of efficiency are being reached and process-related emissions are unavoidable in some sectors, CCS may be the only option available to reduce direct emissions from industrial processes on the scale needed in the longer term“.....

.....“In the power sector, CCS could be a key technology for fossil fuel-based generation. It could help balance an electricity system with increasing shares of variable renewable energy“..... (European Commission, 2015).

„The Commission's proposal for a 2030 climate and energy policy framework acknowledges the role of CCS in reaching the EU's long-term emissions reduction goal“.....

...“Significant emissions cuts are needed in the EU's energy and carbon-intensive industries. As theoretical limits of efficiency are being reached and process-related emissions are unavoidable in some sectors, CCS may be the only option available to reduce direct emissions from industrial processes on the scale needed in the longer term“.....

.....“In the power sector, CCS could be a key technology for fossil fuel-based generation. It could help balance an electricity system with increasing shares of variable renewable energy“..... (European Commission, 2015).

“No one in the country wants CCS – no party, and certainly not the citizens,” said Energy transition and Environment minister [for the German region of Schleswig-holstein] Robert Habeck.

“The underground injection of CO₂ would be a clean bill of health for the coal industry. CCS serves as a justification for the construction of new coal-fired power plants. But we do not want and need (CCS) for the energy revolution”(*ibid*).

- Supported from 90s, but the target of up to 12 demonstration plants by 2015 will be missed. (First one maybe after 2018).
- The main driver should be the price of carbon – it is not. No economics behind building CCS facility.

EU commitments

- Kyoto Protocol – EU15 to reduce its GHG emissions by 8 % compared to base year (1990, 1995) during the first commitment period 2008 – 2012. (2012 data shows up to 19,2%).
- Energy and climate package 2009
 - 1) A 20% reduction in EU greenhouse gas emissions from 1990 levels by 2020;
- Roadmap for competitive low carbon economy 2011 – up to 80% reduction to 2050 compared to 1990
- The EU supports the „Doha Amendment“ that extent KP from 2013-2020 (To be sign by 2015) – 20% target.
- 2030 climate and energy framework – 40% by 2030 compared to 1990

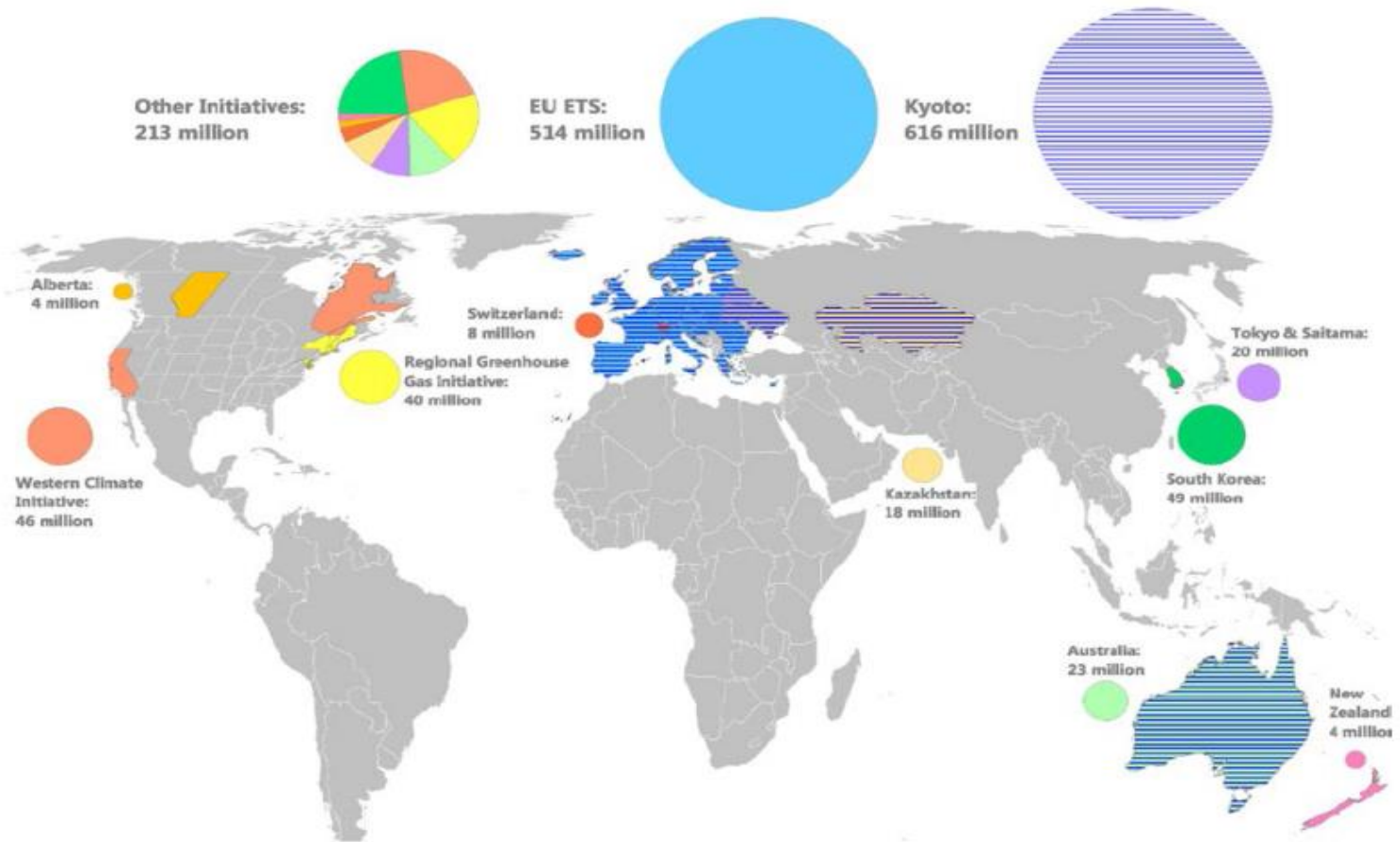
EU commitments

Summary of EU commitments to reducing its GHG emissions

Date	Commitment		Nature of commitment	Target date for achievement	Reduction in GHG below 1990 level: %	Progress to meeting target
1997(into force 2005)	Kyoto Protocol	EU-15	International treaty; binding	2008-2012	8	Probably over-achieved
2012	Doha Amendment to Kyoto Protocol	EU	International treaty; binding	2013-2020	20	-
2009	Climate and Energy Package	EU	Self-imposed; Binding	2020	20	On track to meet
2014	Climate and Energy Framework	EU	Self-imposed; binding	2030	40	-
2011	Roadmap for a competitive low carbon economy	EU	Aspiration	2050	80-95	-

Source: IEA, 2014

Map showing countries with an ETS and their populations



Source: Map generated by the Parliamentary Library; sources for population data: CIA World Factbook and census data for US, Canada and Japan.

Trade in emissions permits, 2010 to 2012

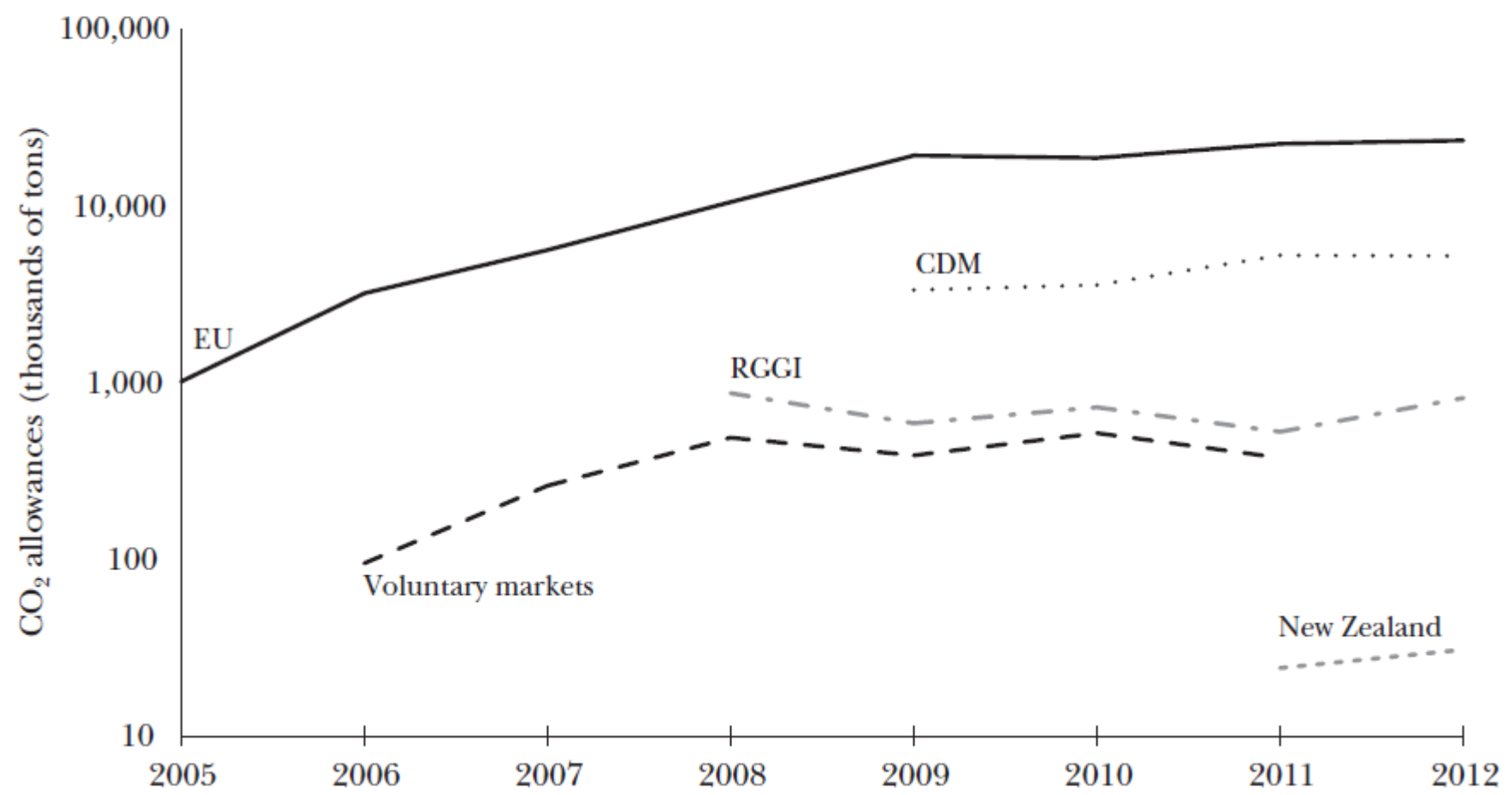
Permit type	Volume (Mt CO ₂ e)			Value (\$A million)		
	2010	2011	2012	2010	2011	2012
EUA	5,172	6,057	7,478	103,688	102,741	67,854
CER	1,508	2,012	2,408	25,934	23,926	7,604
ERU	59	101	574	731	962	1,126
AAU	63	69	119	663	545	187
North America	189	100	130	526	297	715
New Zealand	8	10	8	130	142	37
Australia	-	-	0.3	0	0	7
Other	35	25	-	297	157	0
Total	7,035	8,373	10,717	131,968	128,772	77,531

Note: EUA = EU Allowance, CER = Certified Emissions Reduction, AAU = Assigned Amount Unit, ERU = Emission Reduction Units.

Source: Point Carbon, 'Carbon market monitor: A review of 2012', 7 February 2013. Australian dollar value estimated by the Parliamentary Library based on average [exchange rate data](#) for each year as published by the Reserve Bank of Australia

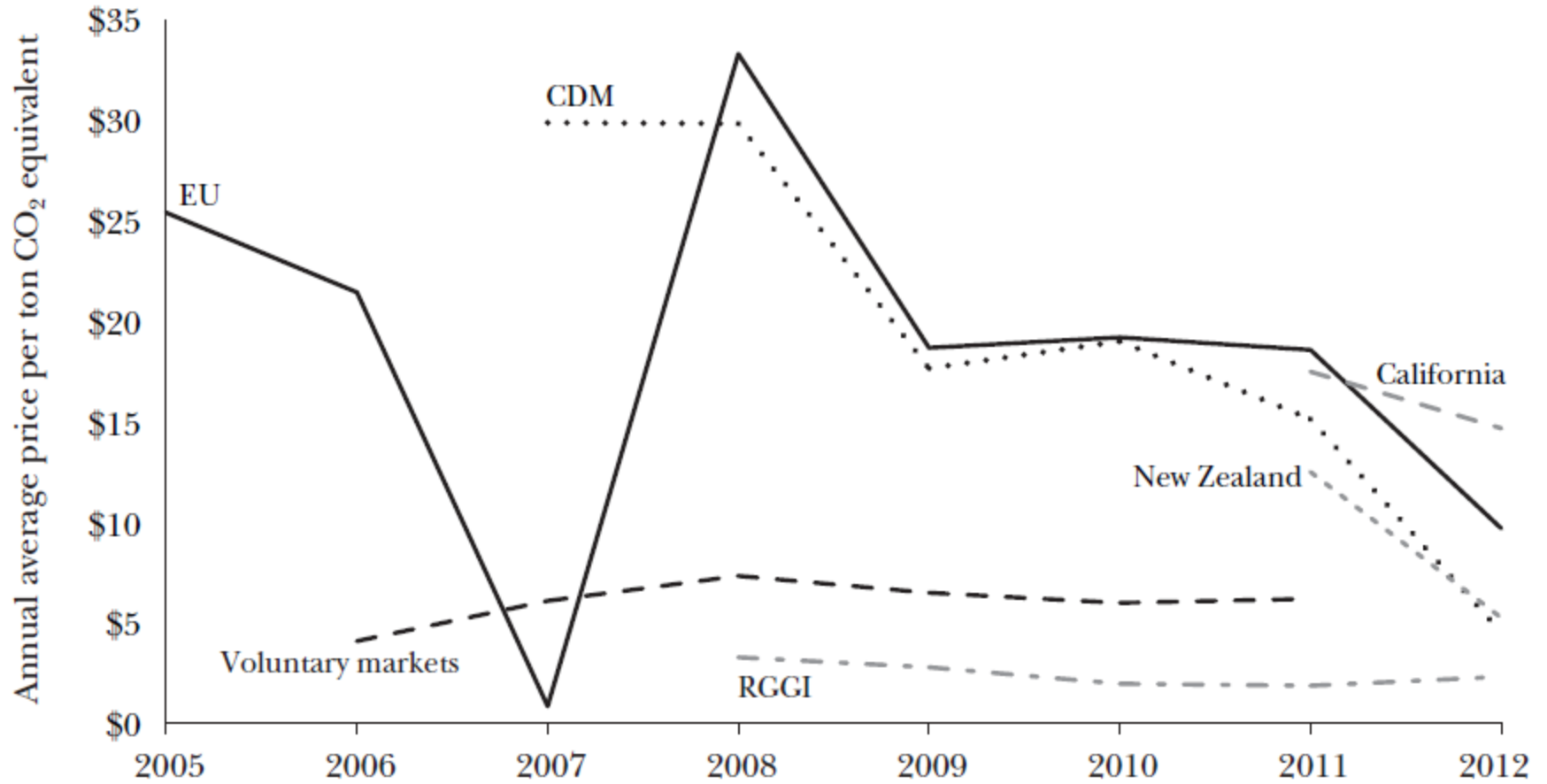
Volume of CO₂ Allowance Trades

(daily average)



CO₂ Allowance Prices

(nominal)



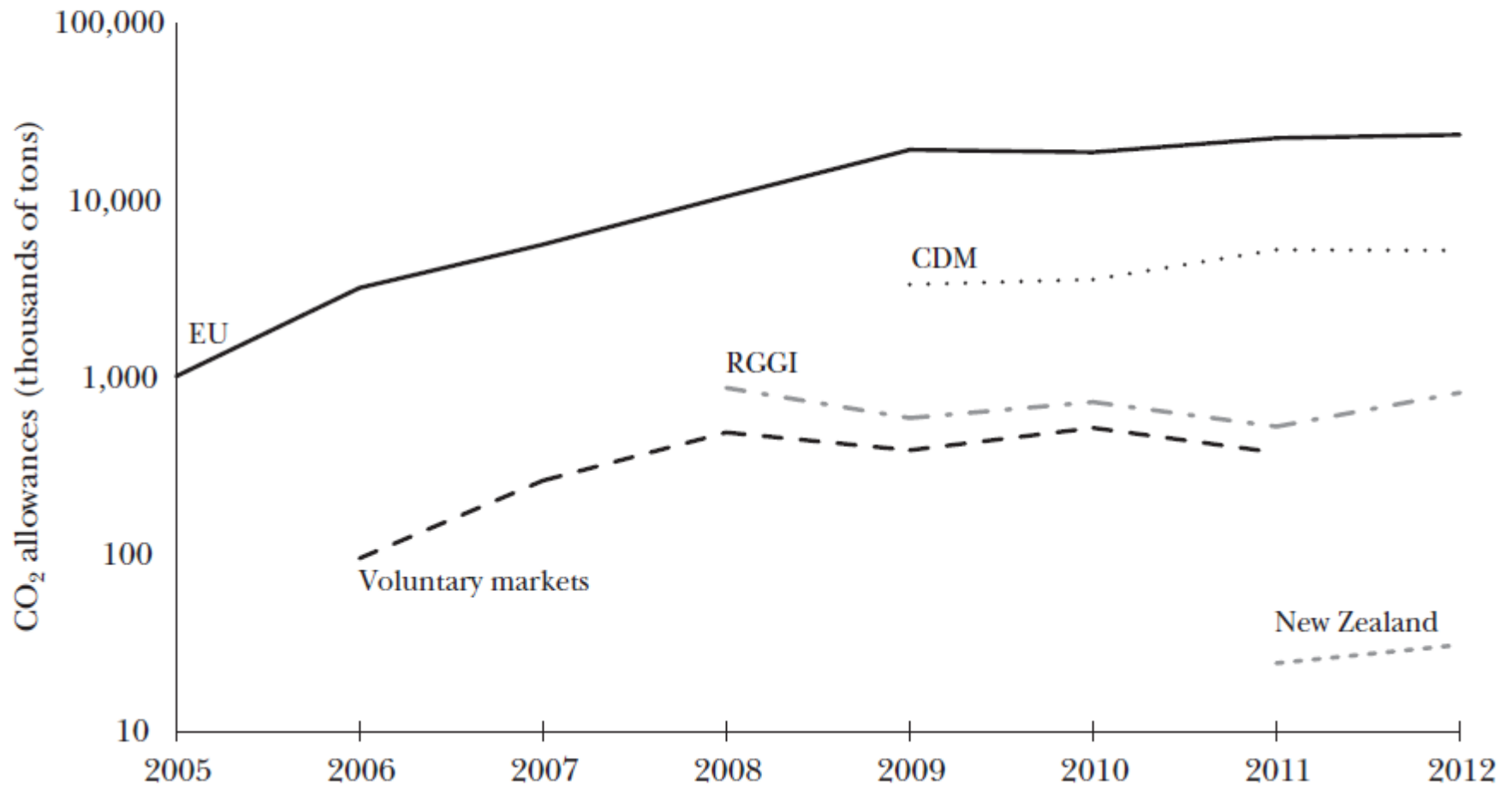
Tento projekt je spolufinancován Evropským sociálním fondem a státním rozpočtem České republiky.



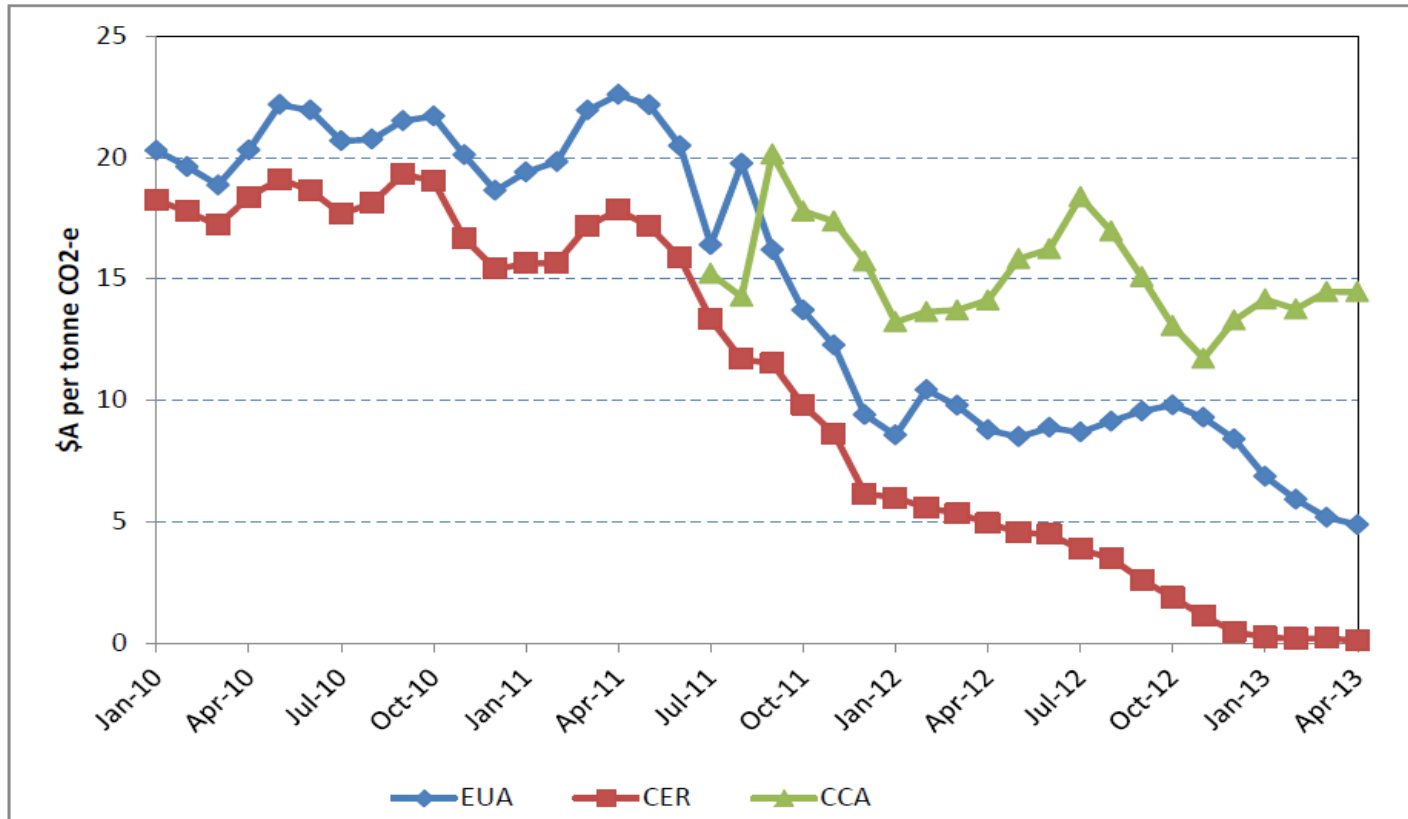
INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

Volume of CO₂ Allowance Trades

(daily average)



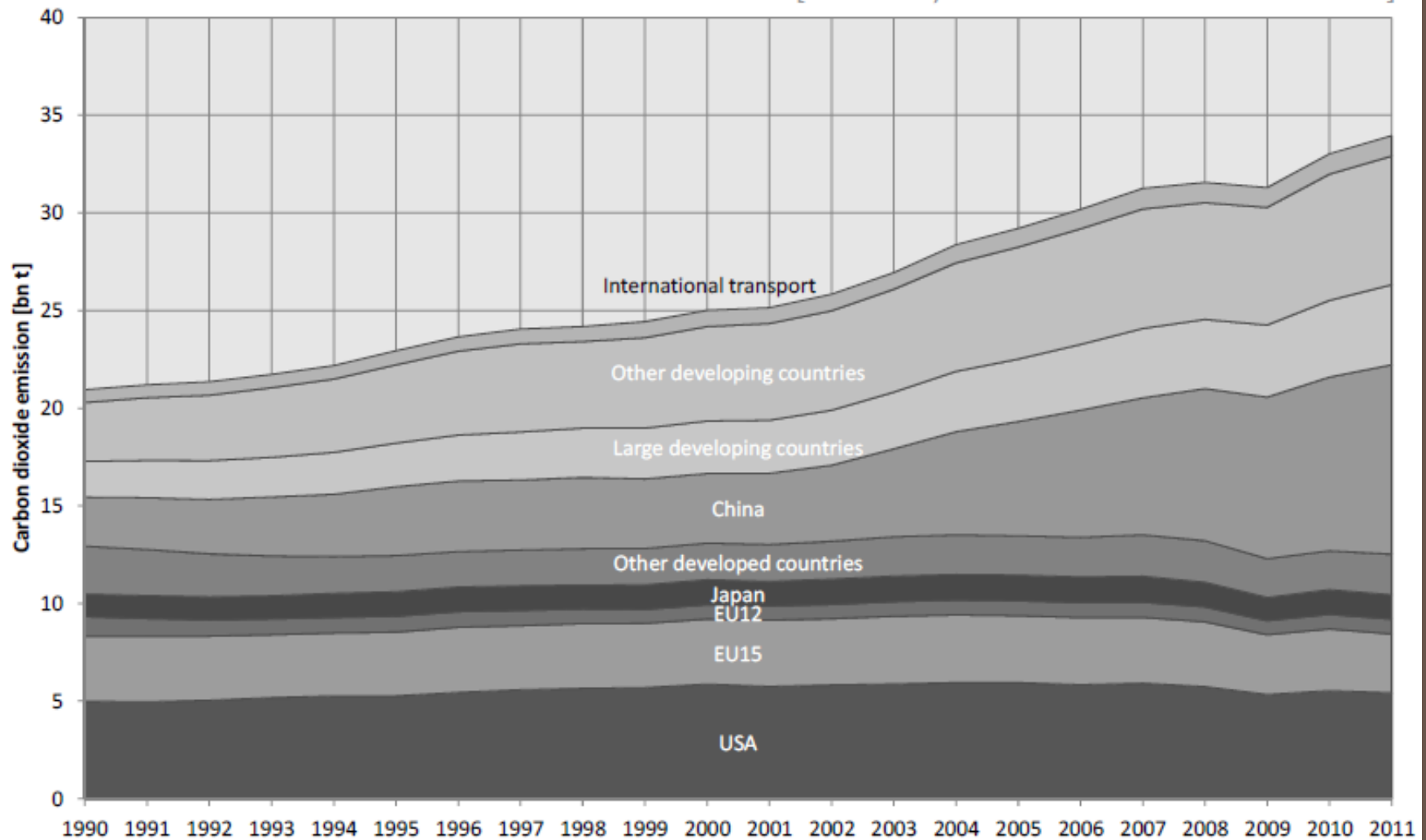
Carbon prices for EU ETS and California ETS, selected permit types, January 2010 to April 2013 (\$A)



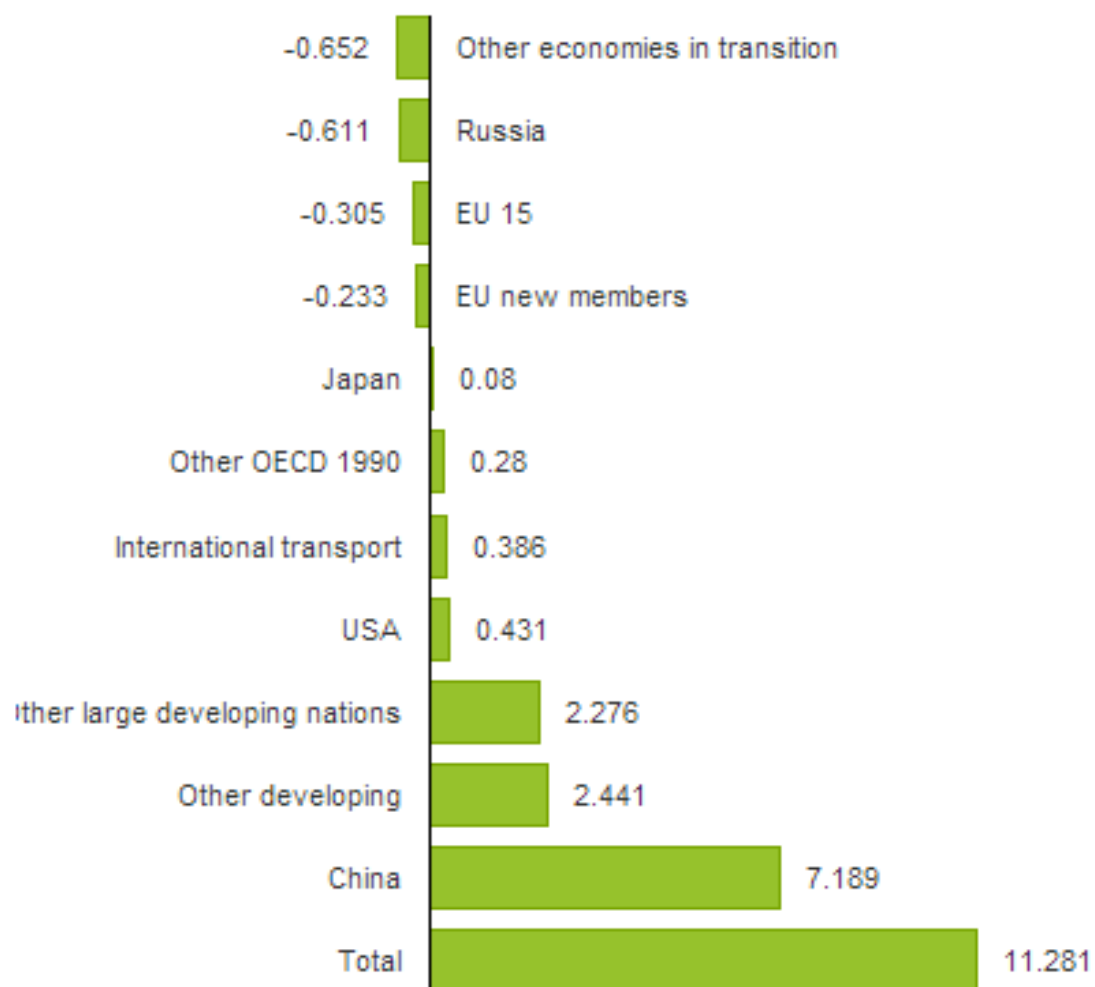
Note: Prices are spot prices as compiled by Point Carbon based on exchange-traded and OTC transactions. EUA = European Union Allowance, CER = Certified Emissions Reduction, AU = Australian Unit, CCA = California Carbon Allowance.

Sources: Point Carbon, sCER OTC price assessment, CCA OTC assessment, and EUA OTC assessment, accessed 30 April 2013. Australian dollar value estimated by the Parliamentary Library based on average [exchange rate data](#) for each year as published by the Reserve Bank of Australia.

Chart 1.2. GHG Emission 1990-2011 [Oliver JGJ, Janssens-Maenhout G and Peters]



Change in CO2 emissions (GT), 1990 to 2011



Summary

- ❑ Carbon intensity in the EU has declined by 40,9% since 1990.
- ❑ Kyoto target over-achieved.
- ❑ Economic growth and emissions have largely been decoupling (In 2012 the EU real GDP was 45% higher than in 1990 while its GHG emissions decreased by 19,2% in the same time).
- ❑ Transport emissions have risen, the same in case of increase usage of gas.
- ❑ The EU ETS does not act as signal for the decarbonisation of the power sector or the investment in low-carbon technologies, incl. CCS.
- ❑ = risk of not fulfilling the GHG reduction aims in the non-ETS sectors for 2030, 2050.

Summary

- Reduction of GHGs based on raising the share of RES to a great extent + efficiency.
- EU is a driving force in the UNFCCC negotiations (post-Kyoto agreement).