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Case Examples : Carbon and Renewables Markets

Session 2 : FSR Summer School Programme 2010

European University Institute, Florence

By

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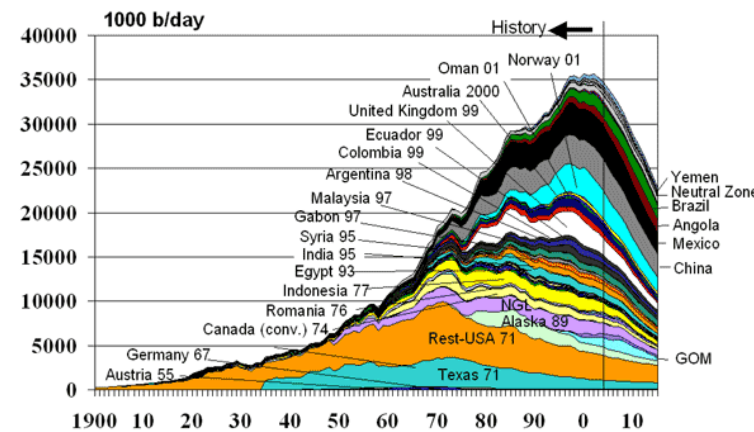
Agenda

2010 drivers for the transition to a low carbon economy …

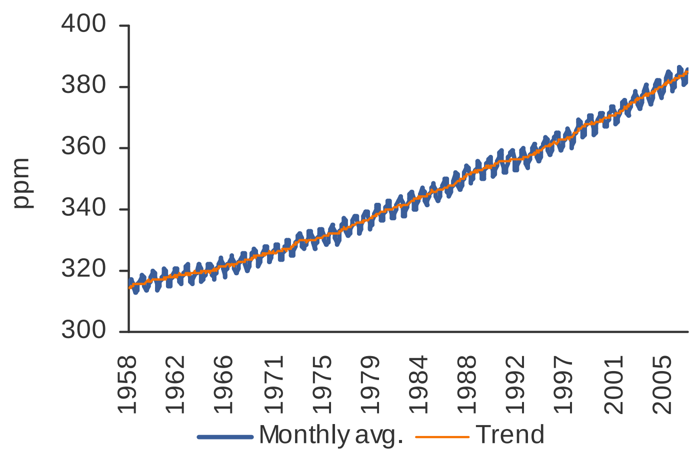
Industry drivers are diverse

- Clean energy and the migration to a low carbon economy is being driven in 2010 by three factors:
  - Climate Change
  - Energy Security
  - Green Infrastructure Build-out
- While no-one is ready to call “peak oil” few bank on continued “low” fossil fuel prices

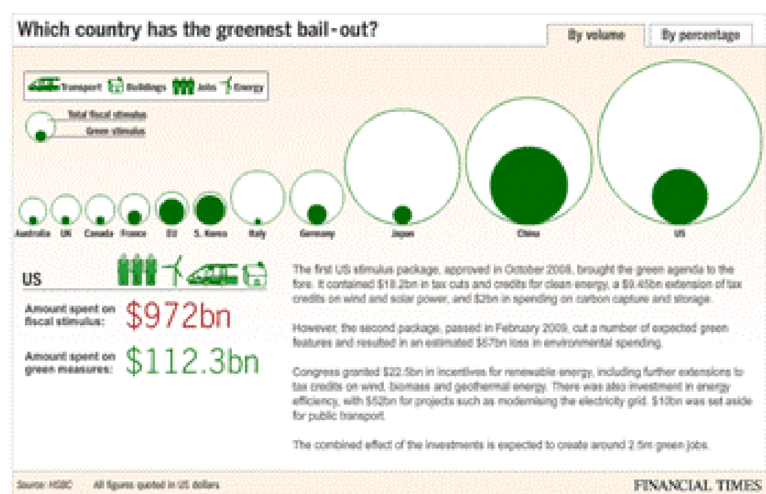
Energy Security/ Peak Oil



Atmospheric concentrations of CO_2



Policy Stimulus



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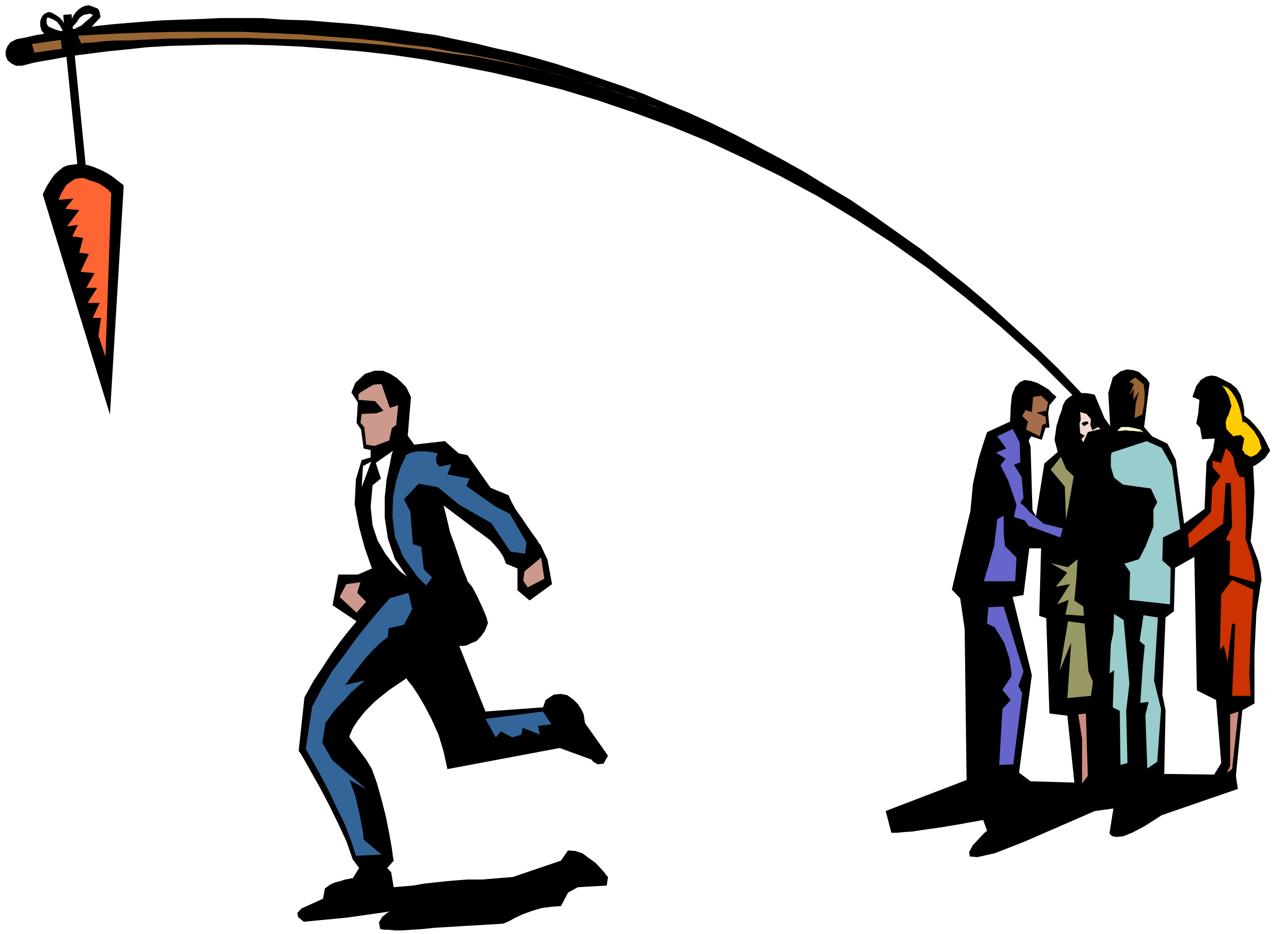
Source: CO2 concentration graph from data supplied by Maua Loa observatory, Financial Times article 2nd March 2009 and Hubbert’s Peak non-OPEC production graph from Zittel and Schindler, 2004, in Energy Bulletin, “The Countdown for Peak Oil Production has begun – but what are the views of the most important International Energy Agencies”

Climate Change drives Regulation drives Markets drives Investment… (helps to avert climate change)

“Carrot or Stick?” – Finding the right balance over time between Regulation and Incentives



Beyond command-and-control: “Economic incentives combined with effective and smart Regulation can incentivize and drive change.”

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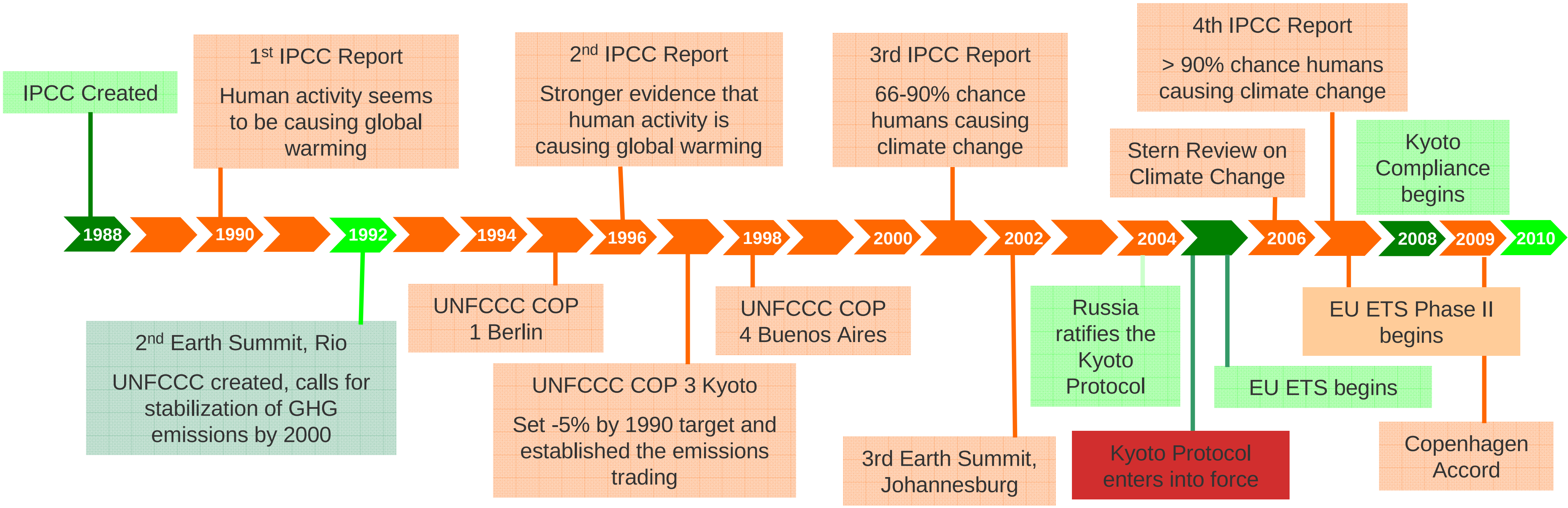
How the Global Climate Change "Policy Map" was drawn…



- **Build global "Scientific Consensus" to define the problem and solutions**
  - IPCC : 170 scientists from 25 countries producing reports written by 1,000 authors and reviewed by 2,500 independent experts from nearly every country in the world.
- **Form a high-level agreement among all Governments to set strategic direction**
  - United Nations Framework Convention on Climate Change (UNFCCC) ratified by 192 countries
- **Define responsibilities and deadlines – <u>and</u> governmental commitment to those**
  - Kyoto Protocol : Signed in 1997, the KP commits certain developed countries to undertaking quantitatively based reductions in their greenhouse gas emissions from 2008-12. The KP has been ratified by 175 parties.
- **Governments guide actions of local players in the "real economy" via local laws**
  - Examples include : European Emissions Trading Directive/ Scheme, EU Renewable Energy Directive, US Regional Green House Gas Initiative (RGGI = 10 States) and biofuels standards.

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The Kyoto Protocol : Three key concepts

Specific Targets

Country	Target (1990 – 2008/2012)
EU-15* (Spain	-8% +15%)
US**	-7%
Canada, Hungary, Japan, Poland	-6%
Croatia	-5%
New Zealand, Russian Federation, Ukraine	0
Norway	+1%
Australia	+8%
Iceland	+10%

* States have redistributed their targets among themselves using a "bubble" scheme".

** It has not ratified Kyoto.

"Flexible Mechanisms"

- **(1) Emissions Trading : Establishes concept of tradability to achieve "markets based efficiency"**
  - National Governments can sell some of their emissions allocation to other Governments that are party to the Protocol.
- **(2) Clean Development Mechanism and (3) Joint Implementation : To achieve lowest "global cost" and stimulate clean investment**
  - These mechanisms introduce the concept of "offsetting", that is, to comply with a target a country may 'offset' their emissions through reducing emissions in another country.

Clean Development Mechanism (CDM)

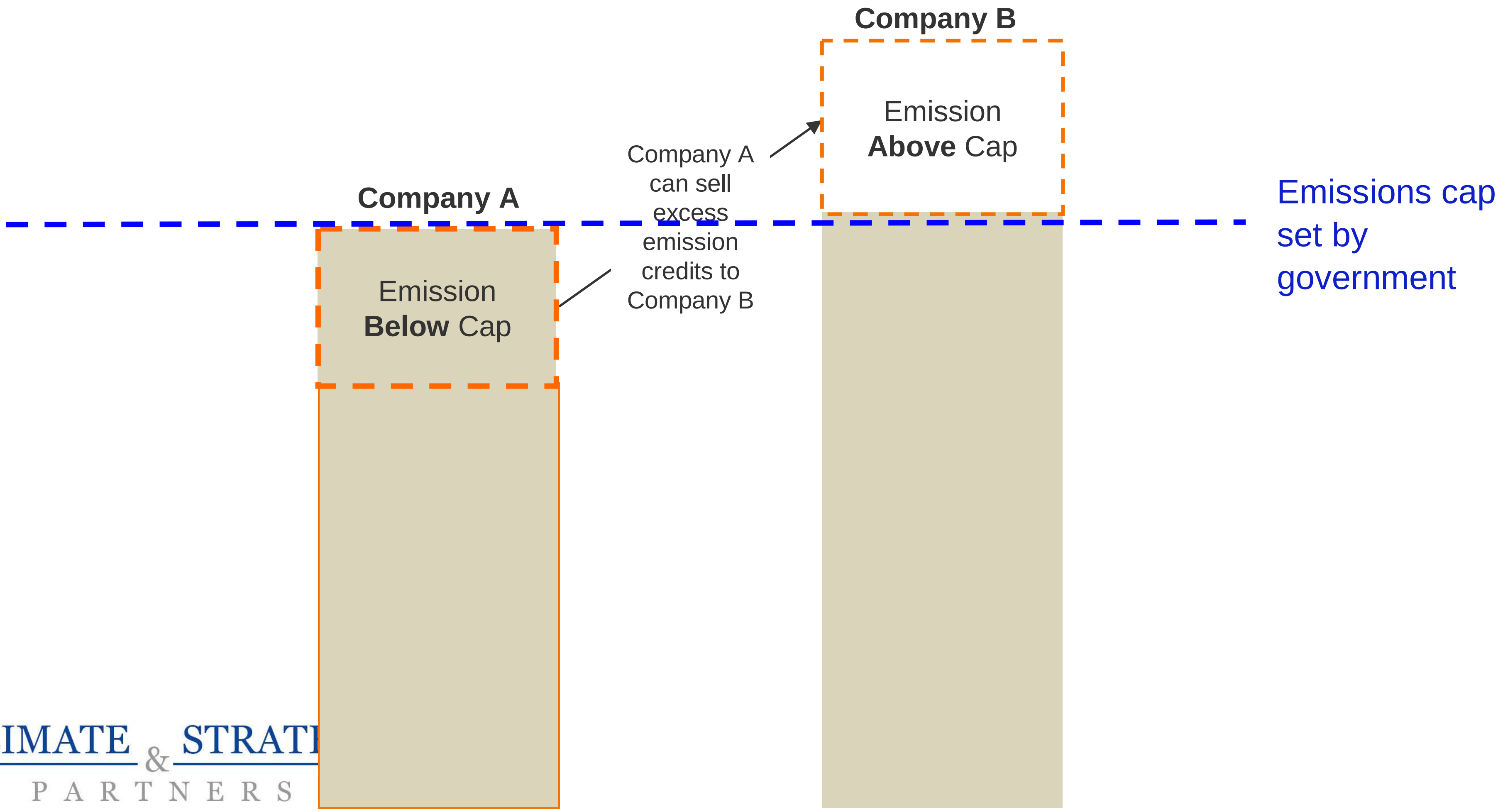
- **Who** = CDM allows Annex B Parties with binding commitments to assist non-Annex 1 Parties (i.e. developing nations listed) to implement project based activities to reduce GHG emissions.
- **What** = Credits associated with these emissions reductions are Certified Emissions Reductions (CERs), and Annex B Parties can use CERs to contribute to complying with Kyoto commitments.
- **How =** Projects must provide GHG emissions reductions that are additional (or reductions that would have not otherwise occurred),, projects must have their methodologies approved by a UN methodology panel and undergo independent verification and monitoring before credits are issued.
- **Regulator** = "Additionality" is regulated by the Executive Board of the UN

Joint Implementation (JI)

- **Who =** Joint Implementation allows Annex B parties to assist Annex 1 countries in the implementation of projects to reduce GHG emissions.
- **What =** The credits associated with JI projects are called Emissions Reductions Units (ERUs), and like CERs, must be additional to GHG emissions reductions that would have otherwise occurred.
- **How =** ERUs cannot be issued before 2008, and must go through a verification procedure similar to that of the CDM (JI Track 2) unless Member States chose to set up their own national procedures (JI Track 1).
- **Regulator =** JI Supervisory Committee (JISC) of the UN

“Cap and Trade” : Markets-based mechanism using carbon certificates to create “musical chairs” among emitters…

- The **EU Emissions Trading Scheme** is a cap and trade system that was created to promote compliance with Kyoto using a market-based approach.
- In cap and trade system, the government **sets a cap on the amount of emissions that a number of sectors, and each of facilities in it, can generate**. If an operator emits less than they are required, they can sell the emission credits to non complying companies. If they emit more than they are allowed, they have to buy extra credits.



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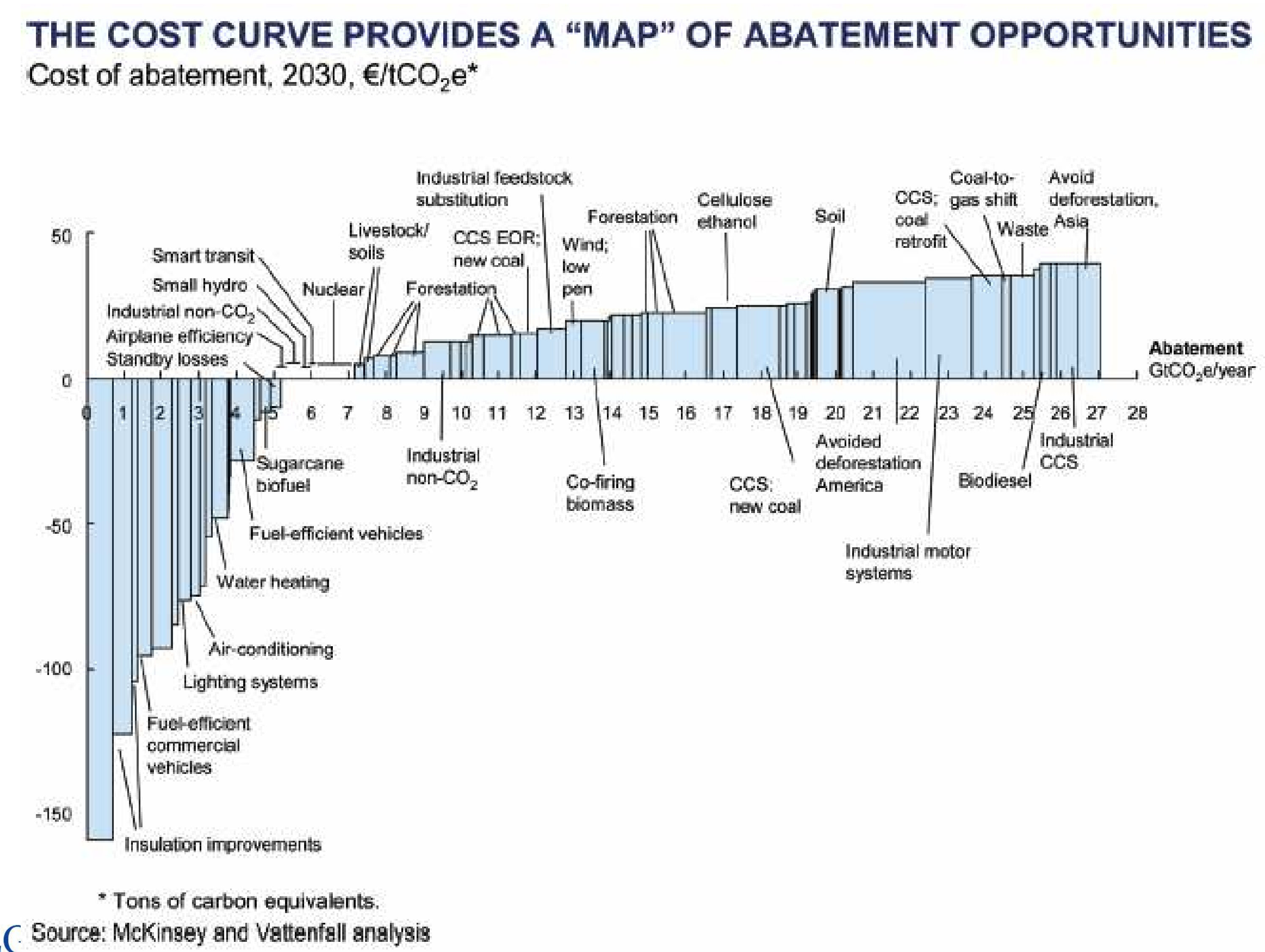
The “carbon price” provides the economic signal to stimulate many Giga-tons of CO2e abatement…

Marginal Abatement Cost of CO2e abatement shows what can be done given a price for carbon



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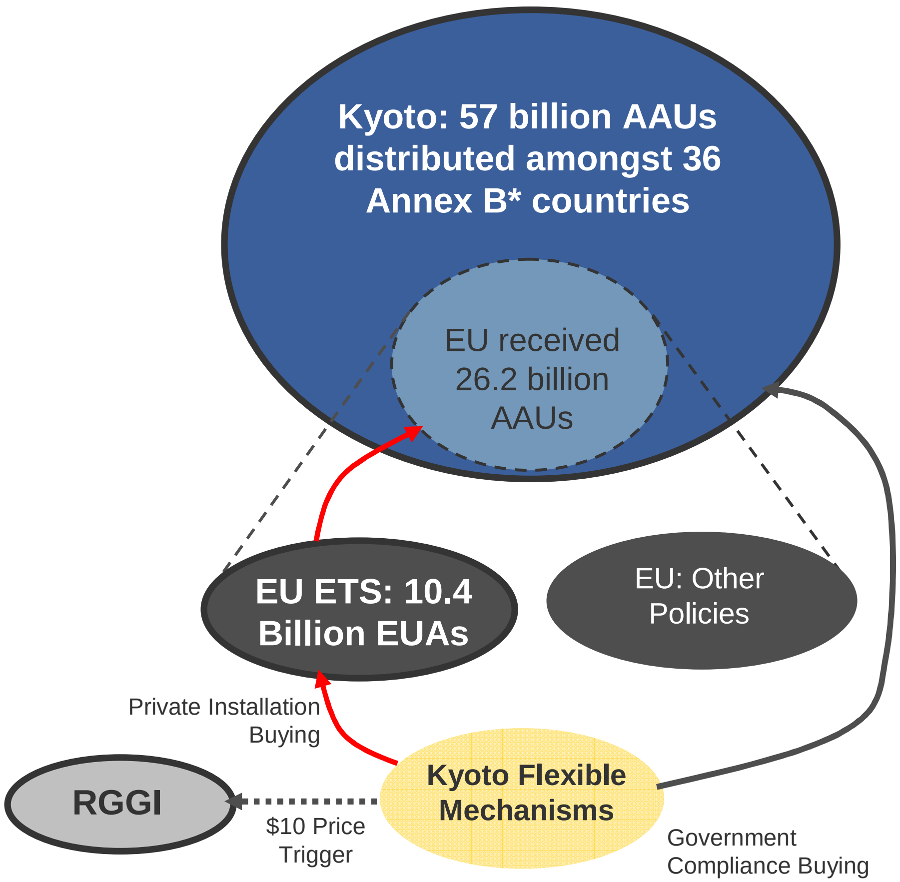
The 2008-2012 Kyoto compliance period drives the three key "carbon markets"…

Kyoto Emissions Trading (AAUs), EU Emissions Trading System (EUAs) and The US RGGI



*Annex B countries are Annex 1 countries from the UNFCCC that have binding commitments under the Kyoto Protocol

- **Kyoto created the first regulated market for GHG emissions reductions**.
  - Capped (Annex B) countries were allocated 57 Billion units/ credits (AAUs) to cover their emissions over the 5 year period from 2008 to 2012. This amount represents a 5.2 % reduction against 1990 levels.
- **There is an "excess of AAUs" in the Kyoto system**
  - resulting from the economic slowdown in Eastern European economies from the 1990 KP-baseline and the non-ratification of the US.
  - This surplus is referred to as 'hot air', and is unlikely to be purchased by Annex B parties, without substantial environmental benefits and conditions attached.
- **The EU ETS represents the transfer of a portion (c.45%) of the EU sovereign responsibility to comply with Kyoto to private companies**.
  - 12,000 European Installations were allocated 10.4 billion European Union Allowances (EUAs) for the 2008-12 period under their Government's second National Allocation Plan (NAP).
  - Each installation is permitted on average to buy 13 % more allowances through Kyoto's flexible mechanisms.
- **In the US, in 2009, the Regional Greenhouse Gas Initiative (RGGI) commenced trading**.
  - In nearly 10 US States it might be possible that Kyoto credits (CERs and ERUs) could be purchased by RGGI participants should the price signal inside RGGI remain consistently above $10 / tonne.
  - Relatively unlikely in 2010 given prices sub $5

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Emissions trading markets: key drivers of price

Commercial market factors

Prices in emissions trading markets are driven by the factors that drive prices in commercial energy markets, including:

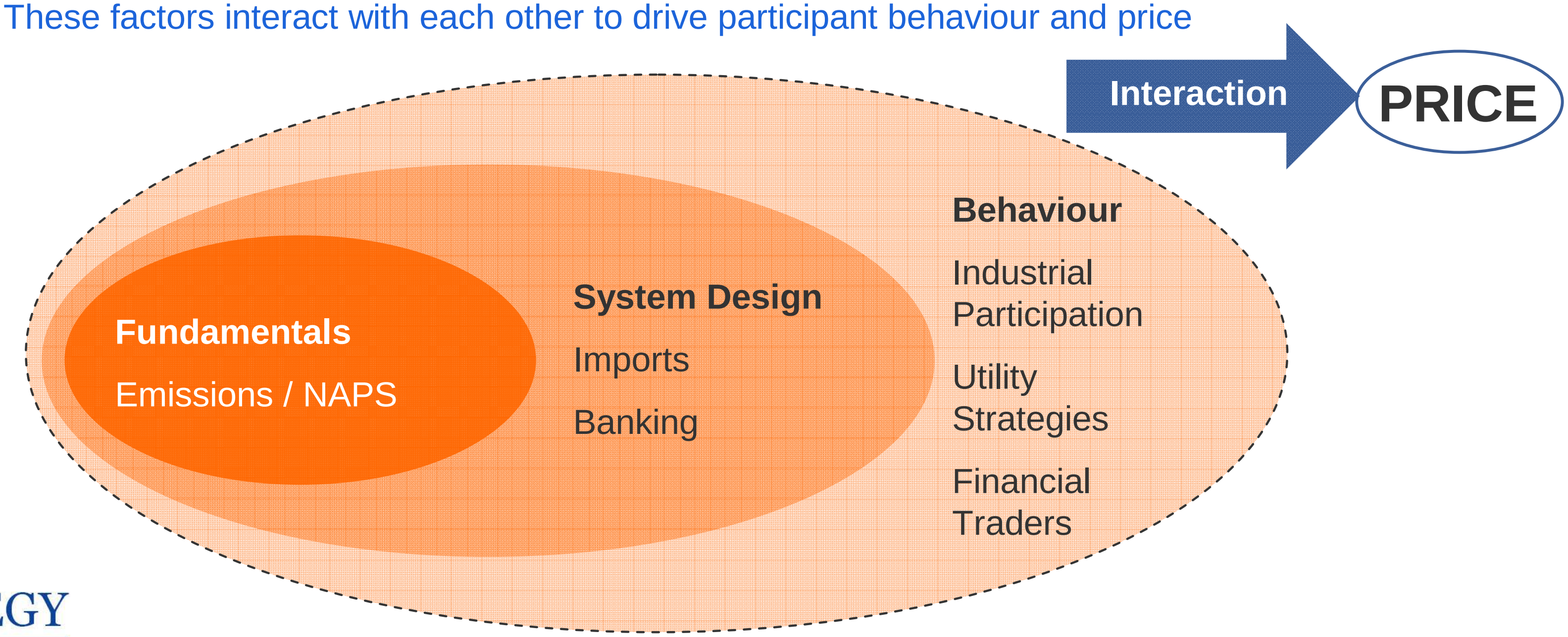
- fuel prices (gas, oil, coal, lignite)
- weather
- GDP
- Industrial output

Policy design factors

Prices in emissions trading markets are also driven by market design factors, determined by policy settings, including:

- Stringency of the cap
- Allocation method within the cap
- Leakage potential
- Availability to import offset allowances
- Availability of banking
- Treatment of new entrants
- Fungibility with other trading systems
- Penalty for non-compliance

These factors interact with each other to drive participant behaviour and price



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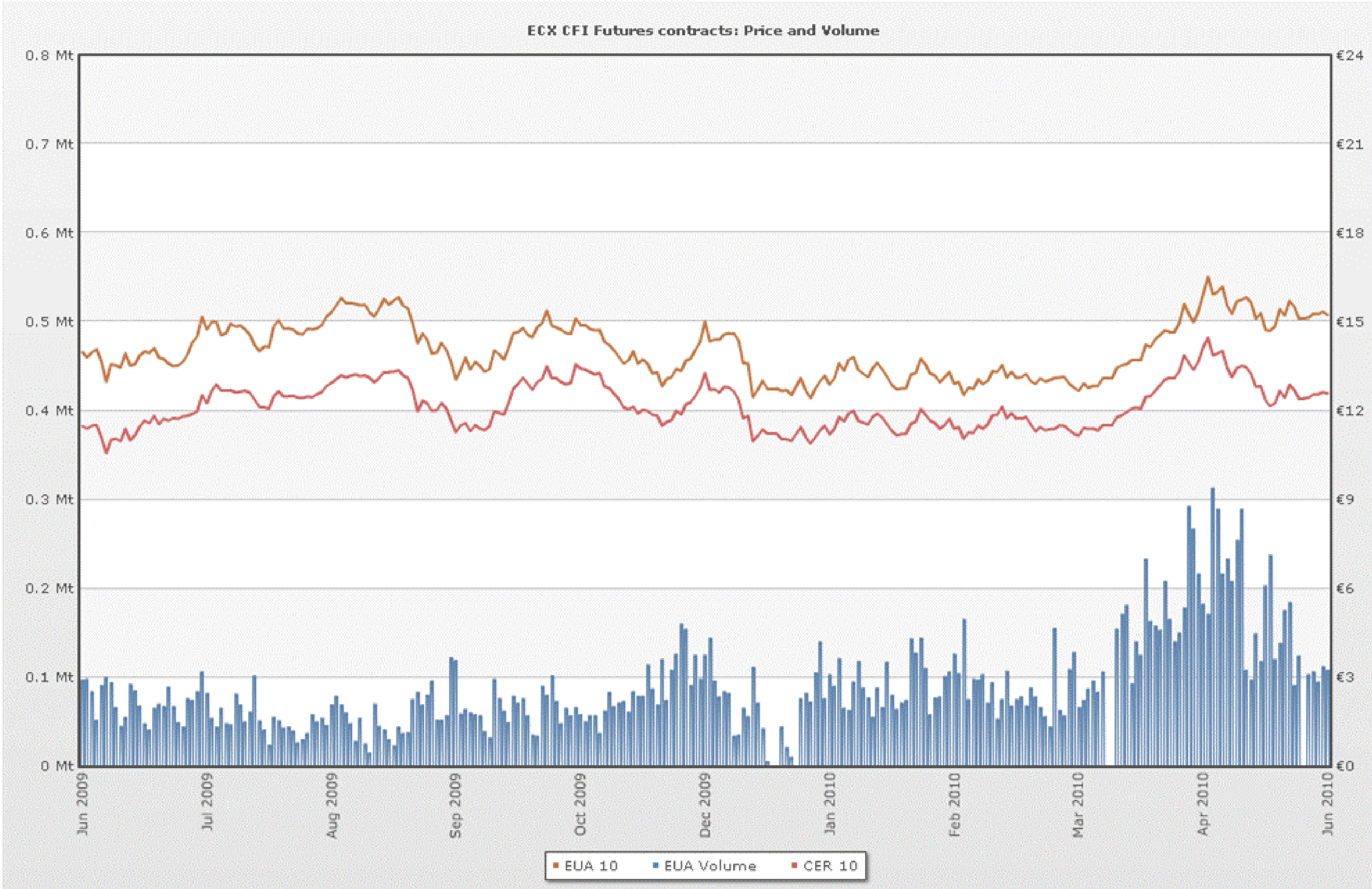
Today’s EU ETS Carbon “Price Action” plays out on a series of exchanges...

Intra-day Price and Volume data for ECX Carbon Futures



Source: Bloomberg New Energy Finance, ECX

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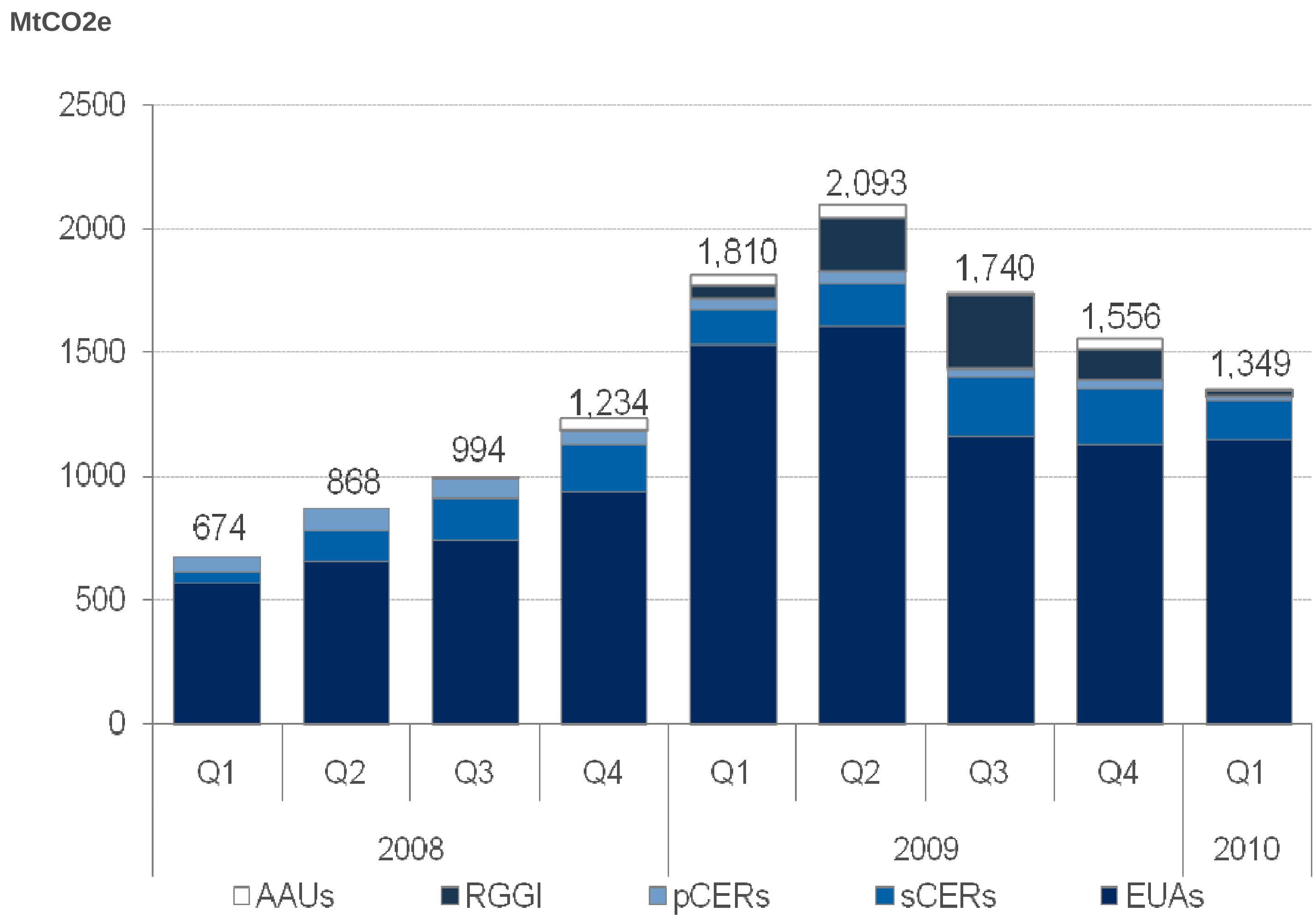
The different global carbon markets display very different levels of liquidity...



Source: New Energy Finance, ECX, Bluenext, EEX, Reuters, CCX, LEBA

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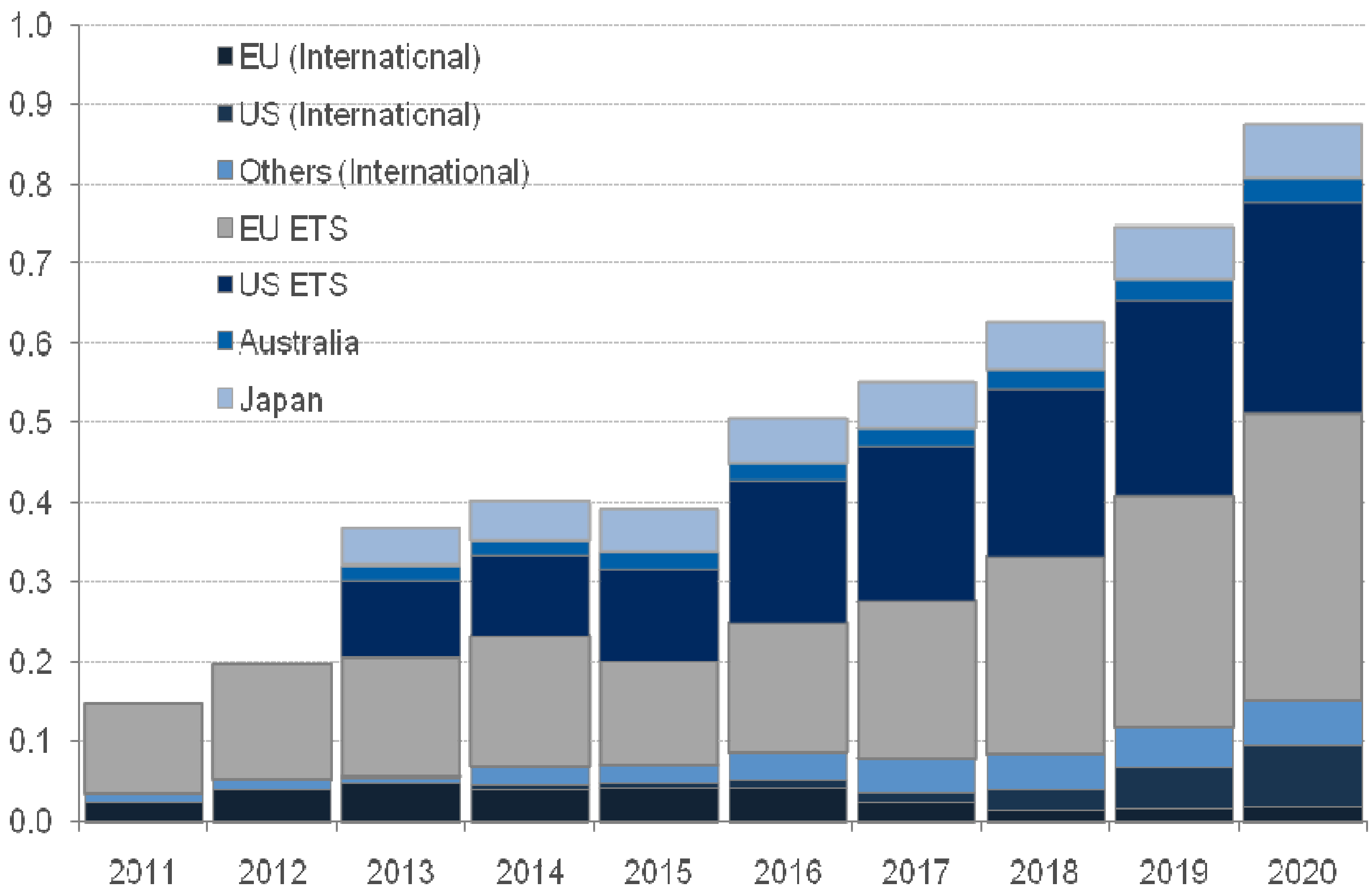
...but the expectation is that these markets will continue to grow x5 by 2020

$trillion



Source: New Energy Finance, ECX, Bluenext, EEX, Reuters, CCX, LEBA

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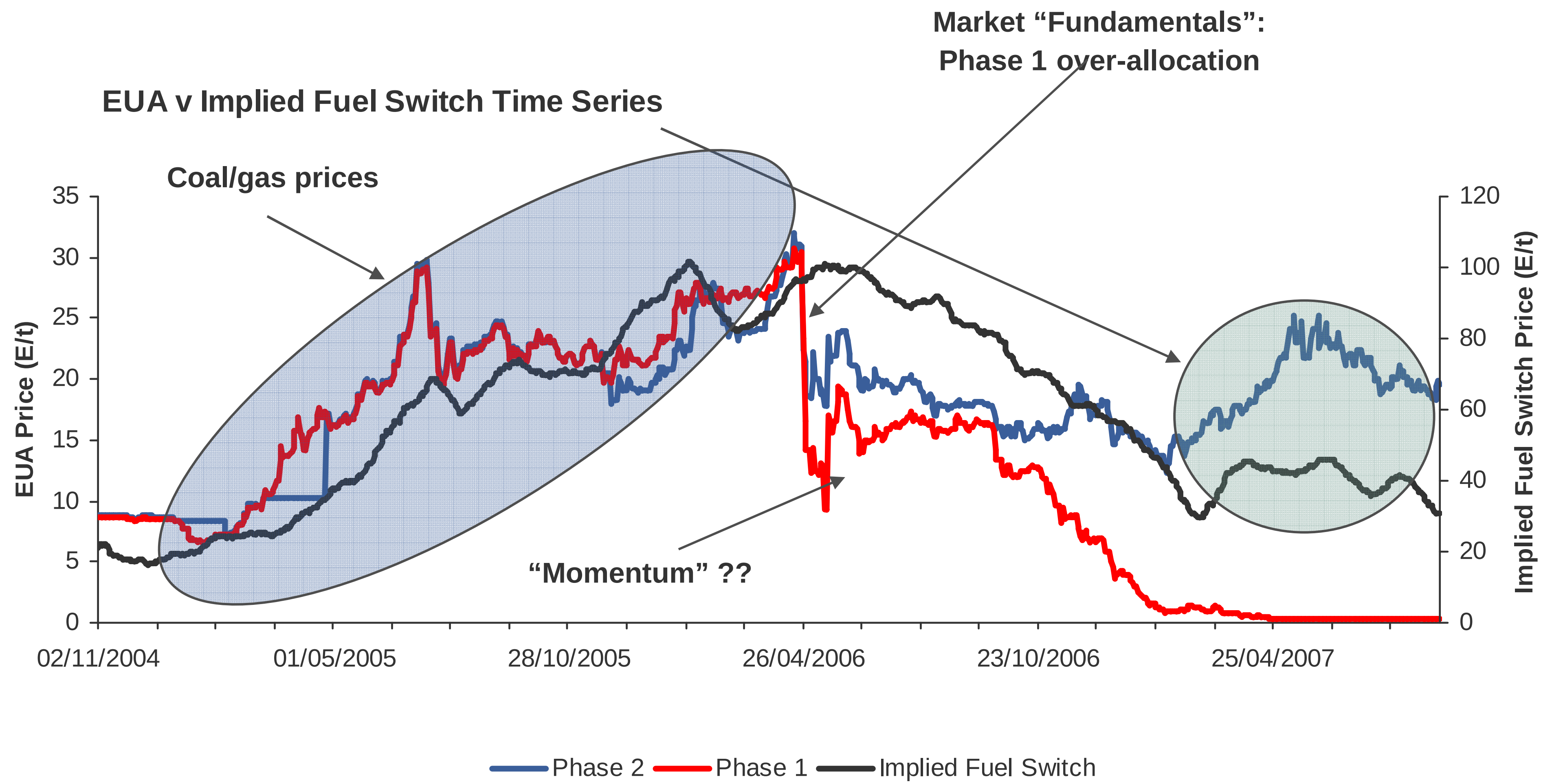
Case Study: How Policy Makers learned through the “failure” of EU ETS Phase 1…

Case Study: The Transition between phase 1 and phase 2 of the EU ETS



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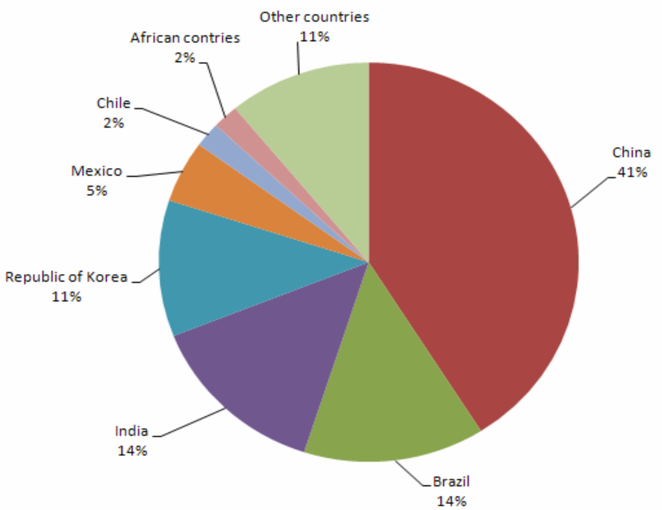
The CDM market the world's ONLY Globally linked Carbon Currency: 3 billion ton carbon market

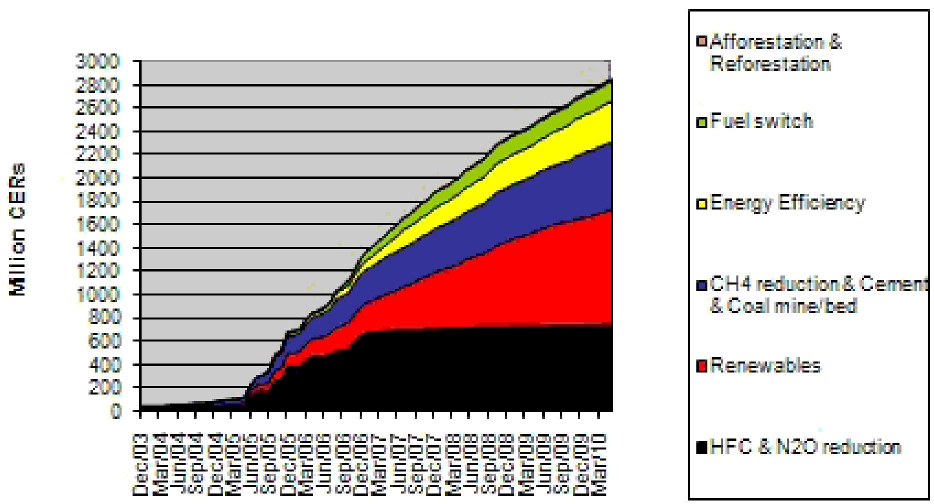
Where CDM projects are hosted



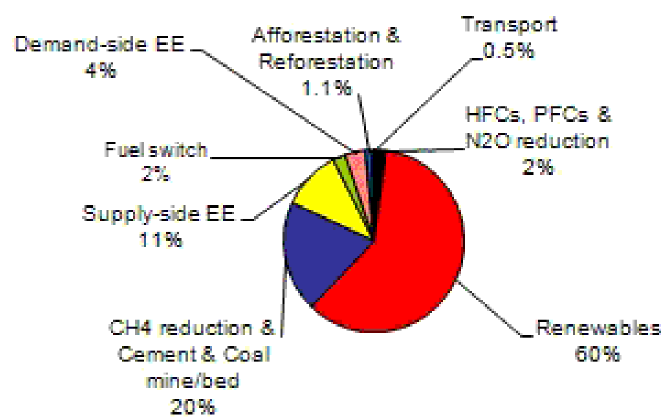
CDM is a clear success of the KP

- An estimated 2,9 billion CERs are expected to be created from a pipeline of c. 4,200 CDM projects prior to 2012 (UN)
  - 2,134 (or 50+ %) of these projects are registered
  - Concentration in China, India + Brazil
- US$12+ billion is already committed to these investments (World Bank)

CDM Emission Reduction Project Growth



Type of project undertaken



Source: UNEP RISOE 2010 (June)

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Case Study 1: Large Scale Landfill Gas CDM Project Shenzhen Lisai, one of China's largest LFG sites

Photo of Shenzhen Project Site

Expected to avoid over 5 million tons CO2e emissions

Case Study Information

Project Activity Overview

- Shenzhen is one of the largest and fastest growing cities in China
- The Shenzhen Xiaping landfill site handles approximately 25% of the city's municipal solid waste = 3,000 t per day
- LFG methane will be captured and destroyed through a mixture of flaring, on-site power generation and use of the CPLG as a fuel in the Shenzhen vehicle fleet

Sustainable Benefits

- Reduces health risks, bad odours and potential for localised LFG explosions;
- Demonstration of clean technology with economic benefits to promote better LF management practice in China
- Promotes capacity building, clean technology transfer, local employment and conserves natural resources
- Promotes use of upgraded LFG as automobile fuel

Entities Involved

- Shenzhen Lisai Development Company, People's Republic of China
- Climate Change Capital

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CDM Case Study 1: Shenzhen Xiaping

Through the purchase of CERs CCC is providing project financing for the collection and utilisation of LFG produced by the Xiaping landfill site in Shenzhen City, Guangdong Province. The collected LFG will be used to produce Compressed Purified Landfill Gas (CPLG) for power generation and avoid 5,741,878 metric tons of CO_2 from 2006 – 2015.

In addition to reducing CO_2e the project will also:

- Significantly reduce health risks, bad odour and potential for explosions
- Demonstrate the economic benefits of clean technology, promoting better management of landfill gases throughout China
- Increase capacity building and technology transfer, conserve natural resources and increase employment opportunities in the region
- Promote the use of upgraded LFG as automobile fuel reducing natural gas consumption and improve the mass transit vehicle system of Shenzhen City

Project developer had excellent track record in managing landfills, but limited expertise in landfill gas capture and combustion. CCC brought in world-renowned LFG experts to help the developer design a capture system, which would maximise capture efficiency and therefore increase the number of CERs

CDM Case Study 2: Shuanglio Wind Farm

CCC will provide vital project financing for the 49.3 MW grid connected Shuanglio Wind Farm project in Shuanglio City, Jilin Province, China. The project will reduce approximately 190, 800 metric tons of C02 on an annual basis.

In addition to reducing CO2 emissions the project will also:

- Assist China in stimulating and accelerating the commercialisation of grid connected renewable energy technologies and markets; providing a direct contribution China's target of generating 10% of electricity from renewables by 2012
- Yield substantial local and public health benefits by annually averting 581.5 tons S02, 11.9 tons of CO, 471.4 tons of NOx and 5.3 tons of mercury
- Generate 105, 120 MWh of electricity per year and avert the use of 37 thousand tons of coal per year
- Aid in technology transfer by the use of imported wind turbines from a European manufacturer
- Make use of land unfit for cultivation, located relatively far from residential areas

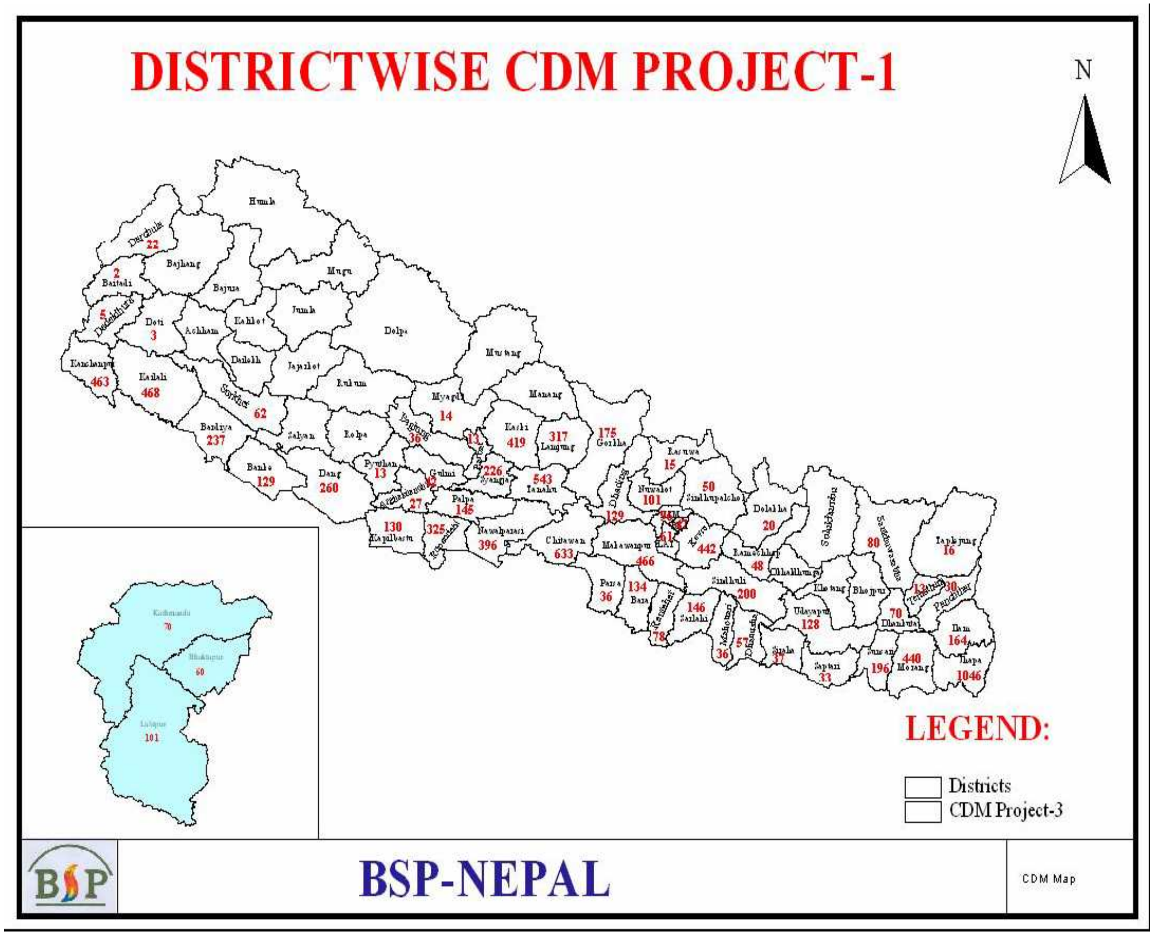
CDM Case Study 3: Zhejiang Juhua Project

The Zhejiang Juhua HFC 23 project deal is the largest ever private sector syndication of a Clean Development Mechanism (CDM) project in China. The project will achieve 29.5 million tonnes of carbon dioxide equivalent CERs over 6 years.

- Thanks to the syndication, the Chinese chemical company Zhejiang Juhua Co Ltd, have the necessary equipment to incinerate the refrigerant gas by-product, HFC 23.
- HFC23 is a green house gas which is 11,700 times more potent in global warming potential than carbon dioxide.
- CCC structured the syndicated deal with assistance from Deutsche Bank who financially guaranteed the underlying payment structure.
- The syndication members include various of the leading investment banks, utility and hedge fund investors in the Carbon area.

Case Study 4: Small Scale "Programmatic" CDM - Distributed Biogas Heating Systems in Nepal

Map of 57 Proposed Districts in Nepal



Expected to avoid 329,000 tons CO2e emissions

Key Project Information

Project Activity Overview

- Sale of 200,000 small household biogas digester plants providing for the thermal energy needs of households with at least 2 heads of cattle to displace fossil fuel and/or non-renewable firewood.

Sustainable/ Community Benefits

- Reduced time and energy spent by women and children in collecting firewood for cooking.
- Better sanitation to rural households, via attached latrines to biogas.
- Expected to add more than 15,000 people-years for skilled people in the process.
- The use of biogas means negligible smoke, hence better family health.
- Residual biological slurry from the biogas plants can be used as organic fertilizers.

Entities Involved

- Alternative Energy Promotion Centre (AEPC), Kingdom of Nepal
- KfW and DGIS from the Netherlands
- Community Development Carbon Fund of the World Bank

CDM “talking points” updated from Copenhagen and Bonn meetings (2009-2010)…

The following are “notes” from the recent (June 2010) Bonn meetings on the KP and LCA international negotiations and a collection of “points of interest” coming from the Copenhagen meetings and the Accord…

- **“Leakage”** : EU leading the analysis (together with certain key sectors like cement and steel) of carbon leakage, its impacts, effect area and rate of change with price
- **Sectoral Crediting** : Linked to leakage, the emergent political space proposing the establishment of “sectoral baselines” globally for specific industries and various forms of crediting and penalties for out or underperformance on a global sectoral level
- **Programmatic CDM** : Modifications to the existing CDM mechanism to try and improve speed and size of activity (based around large scale aggregation of regional upgrades like EE in cities and entire regional activities)
- **NAMAs** : Nationally Appropriate Mitigation Actions are plans submitted by non-Annex 1 parties describing the Climate Change Mitigation and Adaptation plans which each country is implementing. How this breaks into locally funded, baseline and fast-start finance and MRV under the Copenhagen Accord is still not clear.
- **Accounting Rules for LULUCF** : High tensions over the exact accounting for forest masses and actions relating to Land Use globally (and its change or aforestation).

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