

# An eCommerce Perspective on Carbon Trading

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... / EC/CT08-HK {html, ppt}

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[http://ec.europa.eu/environment/climat/emission/review\\_en.htm](http://ec.europa.eu/environment/climat/emission/review_en.htm)

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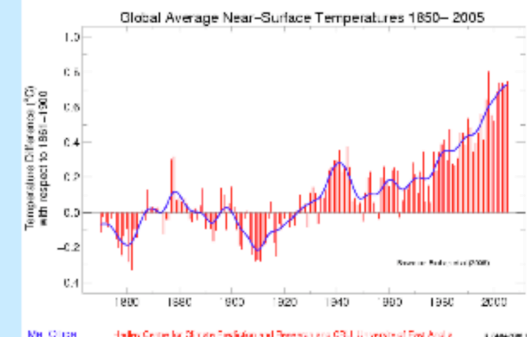
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**Figure 1.3 The Earth has warmed 0.7°C since around 1900.**

The figure below shows the change in global average near-surface temperature from 1850 to 2005. The individual annual averages are shown as red bars and the blue line is the smoothed trend. The temperatures are shown relative to the average over 1861 – 1900.



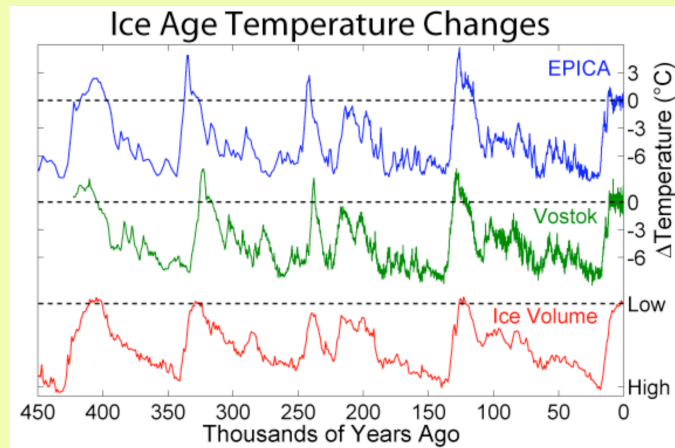
Source: Brohan et al. (2006)

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[http://www.hm-treasury.gov.uk/d/Chapter\\_1\\_The\\_Science\\_of\\_Climate\\_Change.pdf](http://www.hm-treasury.gov.uk/d/Chapter_1_The_Science_of_Climate_Change.pdf), p. 4

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[http://www.globalwarmingart.com/wiki/  
Image:Ice\\_Age\\_Temperature\\_Rev\\_png](http://www.globalwarmingart.com/wiki/Image:Ice_Age_Temperature_Rev_png)

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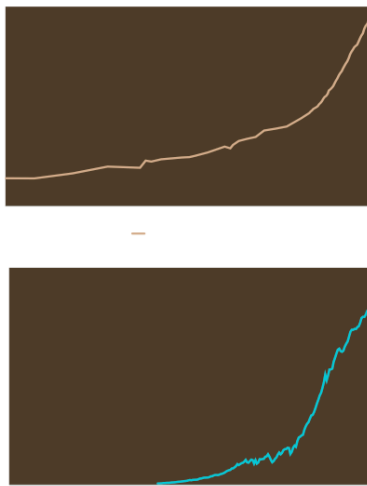


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Figure 1.1 Trends in atmospheric concentrations and anthropogenic emissions<sup>a</sup> of carbon dioxide, 1764–2002



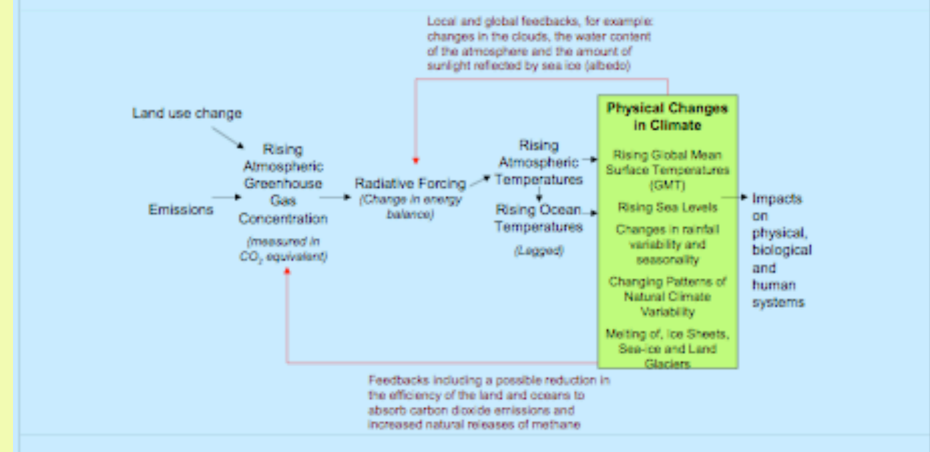
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[http://pandora.nla.gov.au/pan/79623/20080117-2207/...  
dpmc.gov.au/emissions/index.html](http://pandora.nla.gov.au/pan/79623/20080117-2207/...dpmc.gov.au/emissions/index.html), p. 19

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Figure 1.4 The link between greenhouse gases and climate change.



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[http://www.hm-treasury.gov.uk/d/  
Chapter\\_1\\_The\\_Science\\_of\\_Climate\\_Change.pdf](http://www.hm-treasury.gov.uk/d/Chapter_1_The_Science_of_Climate_Change.pdf), p. 7

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## Relative Importance of the Greenhouse Gasses

**Table 2.1 Kyoto Protocol gases—global warming potential**

| Kyoto gases                             | Global warming potentials |
|---|---------------------------|
| Carbon dioxide (CO <sub>2</sub> )       | 1                         |
| Methane (CH <sub>4</sub> )              | 21                        |
| Nitrous oxide (N <sub>2</sub> O)        | 310                       |
| Sulphur hexafluoride (SF <sub>6</sub> ) | 23,900                    |
| Hydrofluorocarbons (HFCs)               | 140–11,700                |
| Perfluorocarbons (PFCs)                 | 6,500–9,200               |

Source: Intergovernmental Panel on Climate Change Second Assessment Report: The Science of Climate Change

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## Relative Importance of the Greenhouse Gasses

| Gas            | Preindustrial Level | Current Level | Increase since 1750 | Radiative forcing (W/m <sup>2</sup> ) |
|----------------|---------------------|---------------|---------------------|---------------------------------------|
| Carbon dioxide | 280 ppm             | 384ppm        | 104 ppm             | 1.46                                  |
| Methane        | 700 ppb             | 1,745 ppb     | 1,045 ppb           | 0.48                                  |
| Nitrous oxide  | 270 ppb             | 314 ppb       | 44 ppb              | 0.15                                  |
| CFC-12         | 0                   | 533 ppt       | 533 ppt             | 0.17                                  |

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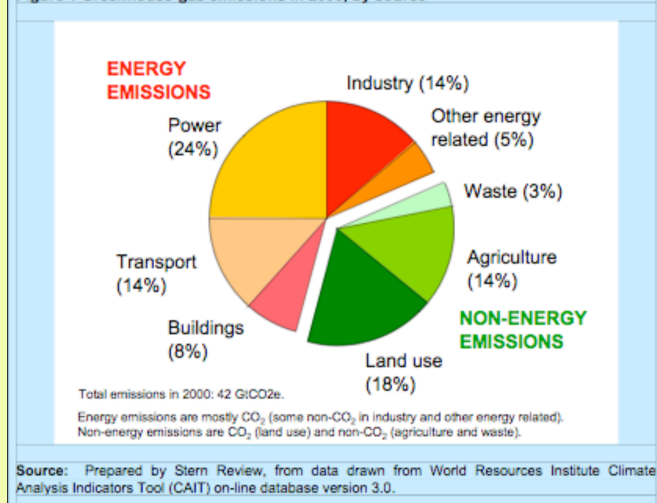


Intergovernmental Panel on Climate Change (IPCC)  
[http://en.wikipedia.org/wiki/Greenhouse\\_gases](http://en.wikipedia.org/wiki/Greenhouse_gases)

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## The Activities That Generate GHG Emissions

**Figure 1 Greenhouse-gas emissions in 2000, by source**



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[http://www.hm-treasury.gov.uk/d/Executive\\_Summary.pdf](http://www.hm-treasury.gov.uk/d/Executive_Summary.pdf), p. 4

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## National GHG Emissions Estimates 2000 and 2050

| Country           | Per cent of global emissions in 2000 | Per cent of global emissions in 2050 |
|-------------------|--------------------------------------|--------------------------------------|
| US                | 20.6%                                | 15.1%                                |
| China             | 14.7%                                | 22.9%                                |
| EU25              | 14.0%                                | 7.8%                                 |
| Russia            | 5.7%                                 | 2.8%                                 |
| India             | 5.6%                                 | 9.2%                                 |
| Japan             | 3.9%                                 | 1.8%                                 |
| Brazil            | 2.5%                                 | 2.2%                                 |
| Canada            | 2.0%                                 | 1.3%                                 |
| Republic of Korea | 1.5%                                 | 1.0%                                 |
| Mexico            | 1.5%                                 | 1.7%                                 |
| Indonesia         | 1.5%                                 | 2.2%                                 |
| Australia         | 1.5%                                 | 1.0%                                 |
| South Africa      | 1.2%                                 | 1.1%                                 |
| Rest of the world | 23.8%                                | 29.9%                                |

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Sources: World Resources Institute, 2005; Matysek et al., 2006  
<http://pandora.nla.gov.au/pan/79623/20080117-2207/...dpmc.gov.au/emissions/index.html>, p. 19

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## Alarm Bells

- The Kyoto Protocol – 1992, 1997, 2005, 2009
- Al Gore's 'An Inconvenient Truth' – 2006
- The Stern Report – 2007

## Why Not Regulation?

- Conventional Regulation is difficult:
  - Transnationality
  - Jurisdictional Arbitrage
  - Polluters are big, and have considerable lobbying power

## Why a Market?

- The Capitalist's Solution – Markets Are Good  
Because 'greed is good'  
Because it greases the wheels of the economy  
[but uncontrolled greed has, yet again,  
been discovered to be bad for our health]
- The Economist's Rationale – Efficient Intervention:

A market in tradable instruments enables polluters to:

- reduce their pollution (if they can do it cheaply enough); OR
- buy tradable instruments from other sources (if other polluters can reduce their own pollution more cheaply)

## The Kyoto Protocol

- An International Agreement
- Establishes Commitments  
by (almost) all Industrialised Nations  
to reduce greenhouse gas (GHG) emissions
- Involves Developing Nations
- Provides a Framework for 'Carbon Trading'



## How Kyoto Facilitates Carbon Trading

### Each industrialised country:

- sets a 'cap' on emissions
- creates 'permits' equal to its 'cap'
- requires organisations to meet their target within the 'cap'
- reducing their emissions, and selling excess permits
- buying permits from someone else
- buying credits

### Polluting organisations comply by:

- using 'allowances' (gratis permits) and/or
- buying permits from the government

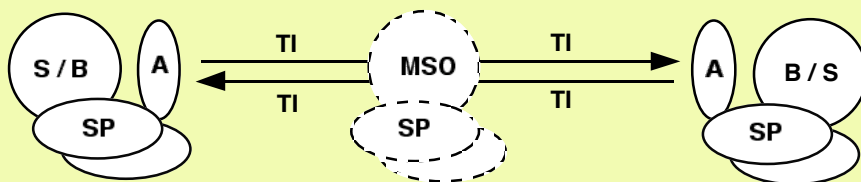
### Credits arise from emission reduction projects:

- in industrialised countries (often expensive)
- in developing countries (often inexpensive)

## Relevant Elements of eCommerce Theory

- Marketspaces and Marketplace Actors
- Characteristics of Viable Markets
- Tradable Items
- How to Achieve Market Depth
- Price-Setting / Trading Mechanisms

## Marketspace and Marketplace Actors



**Sellers/Buyers**      **Tradable Items**      **Buyers/Sellers**  
 Agents      **Marketspace Operator(s)**      Agents  
 Service Providers

Business Processes      Infrastructure

## Characteristics of Viable Markets

- **Credible Tradable Items**
  - Obligations
  - Obligation Enforcement
  - Transferability
- **Sufficient Scale:**
  - Quantity of Tradable Items
  - Sellers, Buyers, Turnover
- **A Suitable Market Mechanism**
  - Coherence and Comprehensibility
  - Robustness

## Credible Tradable Items for Carbon Markets

- **The Commodities**
  - Permits (disincentive to pollution)
  - Credits (incentive to solutions)

## How to Achieve 'Market Depth' i.e. enough Items, Buyers and Sellers

- **Tradeability**
  - A Common Denominator (tonnes of CO<sub>2</sub>-e)
  - Transferability
  - Guarantee of Substance
- **'Bankability'**
  - Flexibility as to the time of surrender
- **Derivatives**
  - Freedom to construct deals

## Credible Tradable Items for Carbon Markets

- **The Underlying Commodities**
  - Permits (disincentive to pollution)
  - Credits (incentive to solutions)
- **Derivatives**
  - **Futures** (the right and obligation to deliver a specified amount, at a specified price, on a specified date)
  - **Options** (the right, but not obligation, to buy ('call') or sell ('put') a specified amount, at a specified ('strike') price, during a specified period of time)
  - **Complex or 'Structured' Derivatives**

## Trading / Price-Setting Mechanisms

- **Sellers' Markets:**
  - Catalogue-Sale / List-Price Sale
  - Auction (of many kinds)
- **Buyers' Markets:**
  - RFQ (Sealed First-Price Auction)
  - RFT (Tender) / EOI-RFP (Proposal)
  - 'Reverse Auction'
- **Balanced Markets:**
  - Negotiation Processes
  - Two-Sided Offers with Matching  
aka Clearinghouse Auction or Exchange

## Common Categories of Auction

- **Sellers' Markets:**
  - **English Auction / Open Ascending Price Auction**  
price runs up, bids may be open or sealed, excitement built in, possible 'reserve price', last bidder wins, various price-determination models
  - **Dutch Auction / Open Descending Price Auction**  
price runs down, first bid wins, forces a motivated buyer to bid early and high
- **Balanced Markets:**
  - **Clearinghouse Auction / Exchange**  
both sellers and buyers submit offers, offers are 'matched', may be continuous or periodic

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<http://en.wikipedia.org/wiki/Auction>  
[http://en.wikipedia.org/wiki/Exchange\\_\(organized\\_market\)](http://en.wikipedia.org/wiki/Exchange_(organized_market))

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## eCommerce Practice The Tradable Items

- Initial Sale of Permits
- Trading of:
  - Permits (Kyoto)
  - Credits (Kyoto)
  - Offsets (Voluntary)
  - Derivatives

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## Kyoto-Compliant Tradable Items

- **Permits**, which may be:
  - granted as 'allowances' – especially initially (Assigned Allocation Units – AAUs)
  - or sold by the government on the open market
  - and may be for a specific year, for any one year after a specific year, or for any one year at all
- **Credits**, from emission reduction projects:
  - Unit Emission Reduction Units (**ERUs**)  
Joint Implementation (JI), in industrialised countries
  - Certified Emission Reductions (**CERs**)  
Clean Development Mechanism (CDM), in developing countries

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## Current Carbon Markets

- **Precursors to Carbon Markets**
  - US sulphur dioxide permits
  - US and European electricity and gas markets
- **Carbon Markets**
  - EU Emissions Trading Scheme (ETS)
  - Smaller ETS in other countries  
esp. NZ (now), Australia (2010), Canada
  - the 'Voluntary' approach, esp. US, also Japan, and in regions of USA, States of Australia

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## How To Sell Permits – Alternative Approaches

- Single-round bidding ('sealed-bid'), or multi-round bidding (auction)
- If an auction, then alternative approaches include:
  - price starts low (ascending), or high (descending)
  - one bidder at a time (open outcry), or all bidders at once (timed-round)
  - bids are the price, or the quantity at a declared price
  - if the bid is a price, the winners pay the last or highest bid, their own bid, or the second-last bid
  - if the bid is a price, the winner may take the lot, or as much as they want, leaving the remainder

## Case Study of a Permit Sales Mechanism An 'Ascending Clock Auction'

- As used for the sale of Australian Treasury Bonds
- The auctioneer announces a (low) starting price
- Bidders make (open) bids for a quantity at that price
- If the total amount bid for is less than the total available
  - Bidders have bought that quantity, at that price
- Otherwise, iteratively until the total amount bid for is equal to or less than the total available:
  - The auctioneer raises the price
  - Bidders make (open) bids for a quantity at that price
- Bidders have bought, at the price set applicable in the previous round, the quantity that they bid for in this round

## 'Ascending Clock Auction' Positive Features

- May provide some information about demand, and hence may enable informed bidding, and may result in a price that reflects the current supply-demand balance
- Can prevent market manipulation, by including reserve prices, and minimum and maximum parcel-sizes
- Can be sealed-bid with disclosure at the end of each round of either all bids, or only the aggregate quantity of all bids
- Can be used for multiple simultaneous auctions of related tradable items (e.g. Permits for earliest use in 2009, 2010)
- Tends to maximise the price (i.e. a Sellers' Market)

## 'Ascending Clock Auction' Negative Features

- It's designed for 'big players', and hence deters small ones (although a, say 10%, price preference could change that)
- It assumes deep demand and strong competition which is unlikely to be the case, especially initially
- During the foundation period at least, price maximisation is not the main aim, but rather:
  - placement of a sufficient quantity, to enable the emergence of a market for permits, and sufficient volume to support derivatives
  - visibility of a price at the outset and at all times (i.e. avoid holding the items back until later)

## Current Carbon Markets Some Reality Checks

- EU ETS Phase 1 2005-07 was:
  - a success (trading occurred)
  - a failure (price collapse due to gratis permits, and over-issuance of them)
- US schemes are:
  - a failure (small volumes)
  - a success (standards for tradable items)
- 95% of trading has been in derivatives
- Free-marketeers say government-driven schemes will be and/or should be supplanted by an industry-driven scheme based on 'carbon offsets'

## eCommerce Opportunities for Hong Kong

- Initial Sale of Permits
- Trading of:
  - Permits (Kyoto)
  - Credits (Kyoto)  
esp. Chinese CERs
  - Offsets (Voluntary)
  - Derivatives
- East Asian Partner to  
US and Euro Exchanges

## An eCommerce Perspective on Carbon Trading Recapitulation



- Global Warming
- Why Carbon Trading?
- Tradable Items
- eCommerce Theory
- eCommerce Practice

