

Pricing greenhouse gas emissions

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Background

- What are GHGs?
 - Gases that help keep the planet from freezing
 - Water vapour, carbon dioxide, methane
- Sources of anthropogenic GHGs:
 - Transportation: oil
 - Industrial processes: cement production
 - Electrical generation: coal, oil, natural gas
- How to stop the build-up of GHGs that are changing the planet (with minimal economic impact)?

Cap-and-trade: Basics

- A ceiling on emissions is determined by some national (?) body
- Emission limits are allocated to (major) emitters (the **cap**)
- At the end of the year, emitters are either under or over their cap (**trade**):
 - Under: Sell (or bank) remaining emissions
 - Over: Purchase necessary emissions to meet cap

Cap-and-trade: Examples

- EU (2004)
 - Caps too high in most countries
- Western Climate Initiative (2008)
 - US and Canadian jurisdictions (initially west coast)
 - Focus on transportation
 - Stationary emitters of CO₂ given a break
- Federal NDP (Bill C-377)
 - Large final emitters only
 - Allocation auctioned at start of year
 - 25% below 1990 by 2020 and 80% below by 2050

Cap-and-trade: Comments

- Large emitters are easiest to identify and “cap”
- Costs must eventually be passed on to consumers
- Small emitters are harder to cap and trade
- Caps and penalties must be sufficient to make real change

Carbon taxes: Basics

- Most energy sources are carbon based
- Put a price on carbon (or CO₂) and price this into sales of all energy products
- Example:
 - \$10/tonne CO₂ (or 1,000¢ per tonne or 1¢/kg)
 - 1 litre of gasoline emits 2.36kg CO₂/litre
 - Tax is: 2.36¢/litre
- What are the tax revenues used for?

Carbon tax: Examples

- Norway
 - Minor benefits
- BC:
 - All consumption (eroding due to public pressure)
- Federal Liberals (Green Shift)
 - All end-use *plus* 700 largest emitters
 - Cost is to increase over time
 - 20% below 1990 levels by 2020 (estimate)
 - Revenue neutral (consumption tax)

Carbon tax: Comments

- No actual emission target
- Assumes rising prices will encourage switching to lower- or non-carbon fuel sources
- Rebound effect and overly optimistic targets mean reductions usually don't meet expectations

Intensity targets: Basics (1)

- Many economic activities produce CO₂
- Carbon (CO₂) intensity:
$$\frac{\text{CO}_2 \text{ emitted}}{\text{Production}}$$
- Intensity targets attempt to reduce emissions by reducing the allowable intensity
- Ideal: Intensity declines as CO₂ emitted declines and production increases...

Intensity targets: Basics (2)

| Production | CO ₂ emissions | | |
|------------|---|---------------------|---|
| | Decrease | Unchanged | Increase |
| Decreases | <p>Intensity: <i>Decreases</i> if emissions fall faster than production. <i>Increases</i> if production falls faster than emissions.</p> | Intensity increases | Intensity increases |
| Unchanged | Intensity decreases | No change | Intensity increases |
| Increases | Intensity decreases | Intensity decreases | <p>Intensity: <i>Decreases</i> if production increases faster than emissions. <i>Increases</i> if emissions increase faster than production.</p> |

Intensity targets: Example

- Federal Conservative government “Regulatory Framework for Air Emissions” (2007)
- LFEs must reduce (target year is 2006):
 - 18% by 2010 (over 2007, 2008, 2009)
 - 2% per year to 28% by 2015
- Penalties: \$1 million/day or 3 years imprisonment
- Target: 20% below 2006 emissions by 2020

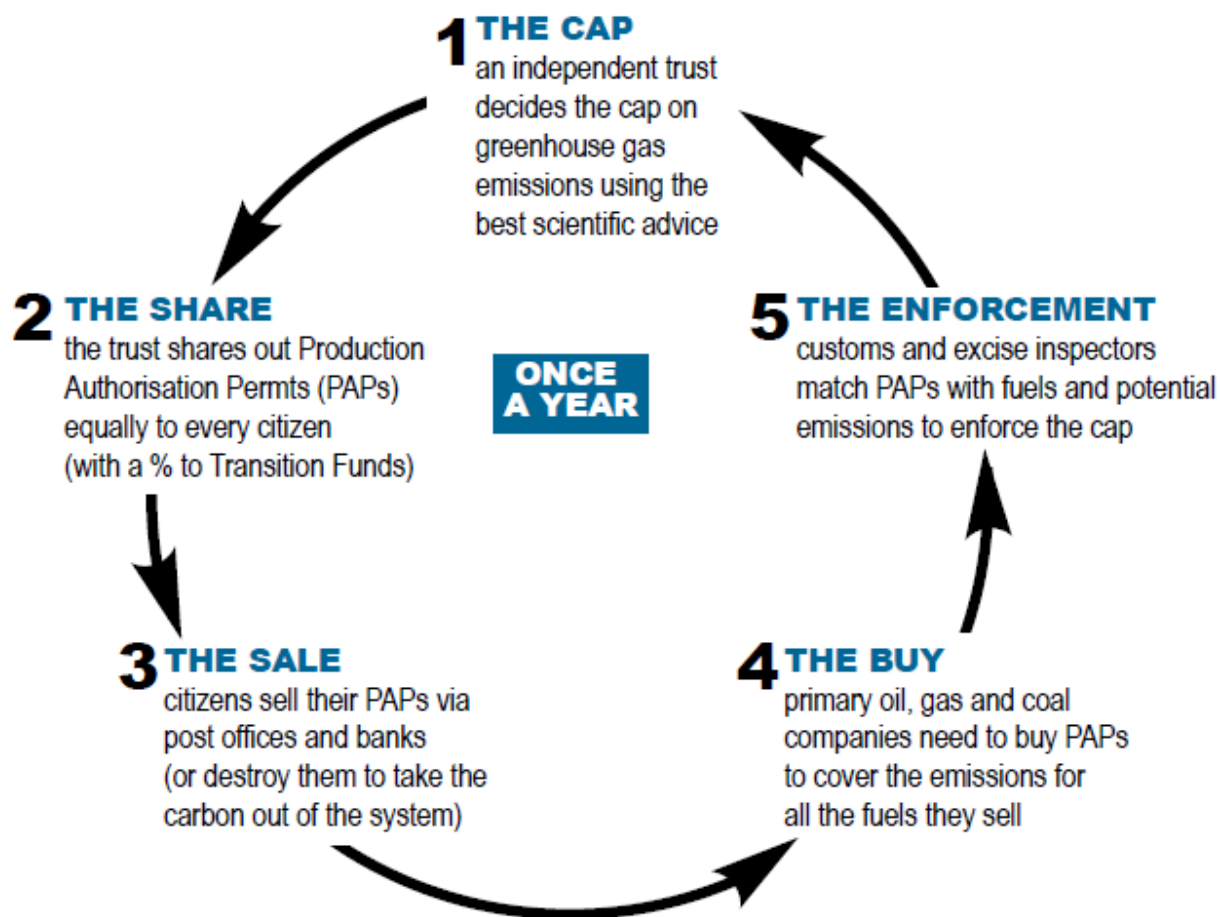
Intensity targets: Comments

- Emissions will eventually start to decrease
- Emissions trading (i.e., cap-and-trade) will be allowed
- Higher costs are inevitable:
 - Fines
 - New technology

Contraction and convergence

- Bring down emissions with annual limits (contraction)
- Equalize world per capita emissions (convergence)
- Each adult receives a CO₂ emissions permit:
$$\frac{\text{Total world emissions}}{\text{Total world adult population}}$$
- Permits can be sold or discarded
- Fails to acknowledge that some regions require more energy than others

Ireland's cap-and-share



Summary

| | Cap and trade | Carbon taxes | Intensity targets |
|-------------------|-----------------------|--------------------------|--------------------------|
| Settable targets? | Yes | No | No |
| Higher prices? | Yes | Yes | Yes |
| Prices hidden? | Yes | No | Yes |
| Targets | Production | Consumption | Production |
| All sectors? | No | Yes | No |
| Canada | NDP | Liberals | Conservatives |
| 2020 target | 25% below 1990 levels | 20-25% below 1990 levels | 20% below 2006 levels |

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