Managing the Environmental Impact of Energy Use

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Overview

- **Energy Related Environmental Issues**
  - ⇨ Focus of climate change
- **Policy Solutions**
  - ⇨ Technology
  - ⇨ Demand side
  - ⇨ The role of prices
- **The McKibbin-Wilcoxen Blueprint as a regional and national approach**
  - ⇨ Concept
  - ⇨ An Example
- **Conclusion**

Energy Related Environmental Issues

- **Energy use has local, regional and global impacts on the environment**
- **This is particularly true in China**

Energy Related Environmental Issues

- **Coal is a primary energy source**
  - ⇨ Particulate emissions
    Local Impacts on air quality
  - ⇨ Black Carbon
    - Health
    - Agriculture productivity
    - Climate change – droughts/ floods
  - ⇨ Sulphur Dioxide emissions
    Local/ regional impacts
    - Health
    - Acid rain
  - ⇨ Carbon Dioxide Emissions
    Local/regional/global
- **Oil use**
  - ⇨ affects local air quality through NOX and CO emissions

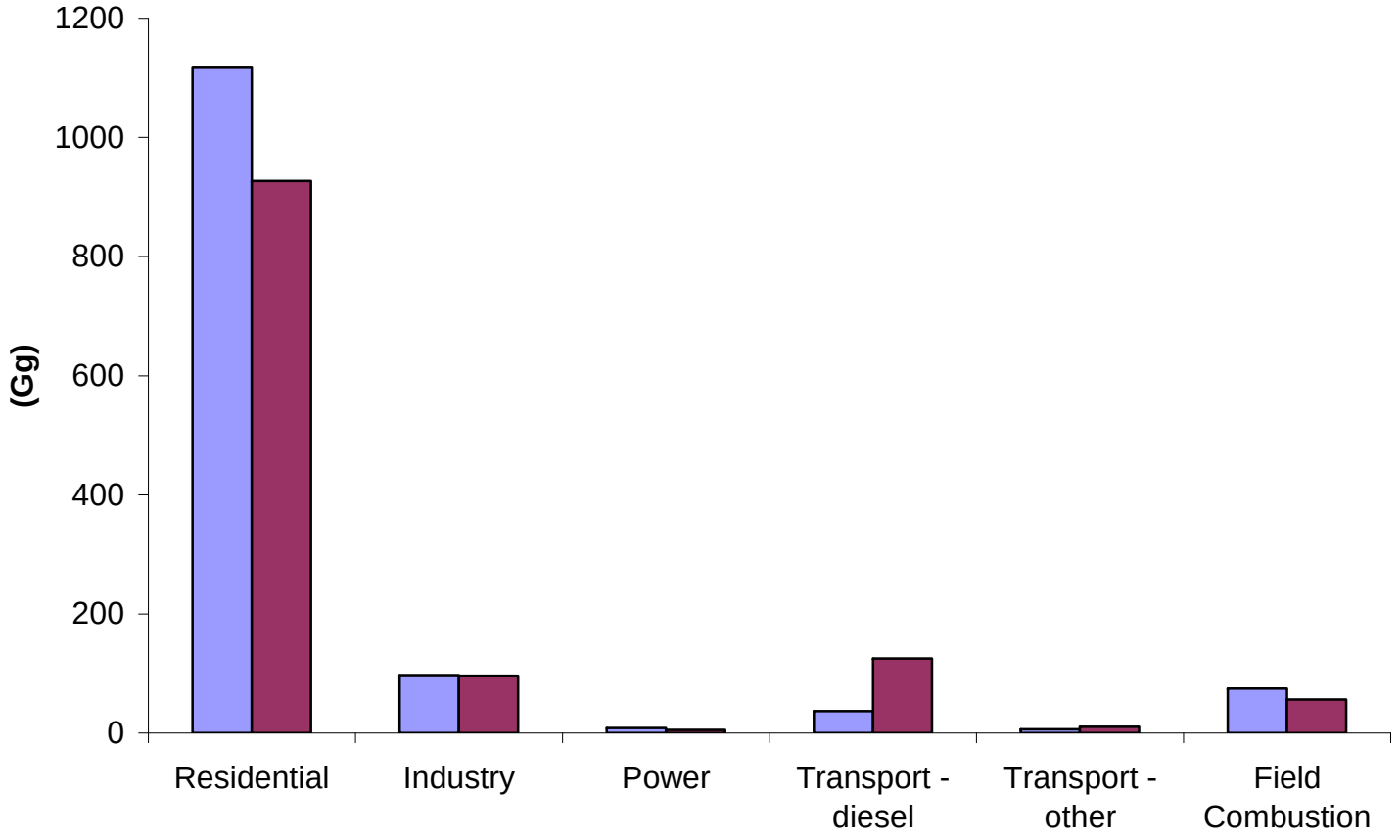
Costs of Inaction

- **Air quality**
  - ⇨ Estimates by WHO that only 31% of Chinese cities met air quality standards in 2004.
  - ⇨ Estimates of Health damages in China alone range between 2% to 5% GDP.
- **Sulphur Dioxide Emissions**
  - ⇨ 30% of China affected
  - ⇨ China accounts for 80% of North East Asia Emissions

Black Carbon (aerosol)

- **Health Impacts**
  - ⇨ Estimates included in air quality
- **Agriculture Productivity**
  - ⇨ Up to 30% reduction for wheat and rice
- **Local climate change**
  - ⇨ Droughts in northern China
  - ⇨ Floods in Southern China
- **Damage to Physical Structures**

Figure 6: Sources of Black Carbon in China in 1995 and 2020



Source: Streets D. (2004) "Black Smoke in China and Its Climate Effects" paper presented to the Asian Economic Panel, Columbia University, October 2004

Policy Solutions

- **Direct policy interventions at the national level**
  - ⇨ Sulphur dioxide
    - Closing high sulphur mines
    - Regulation on sulphur emission
    - Pilot sulphur trading schemes
      - These could be expanded
  - ⇨ Black Carbon
    - Yet to be tackled
    - Requires a technological solution at the household level for cooking and heating and agriculture practices

Policy Solutions

- **In China other policy priorities are also improving environmental outcomes**
  - ⇨ Alternative energy sources

    Nuclear (9 nuclear power plants – 30 planned)

    Hydro (3 Gorges Dam – equivalent to 50m tons of carbon per year)

    Wind

    Solar
  - ⇨ Direct policy interventions

    Air quality standards

    BUT growth overwhelms

Carbon Dioxide Emissions

Carbon Dioxide Emissions

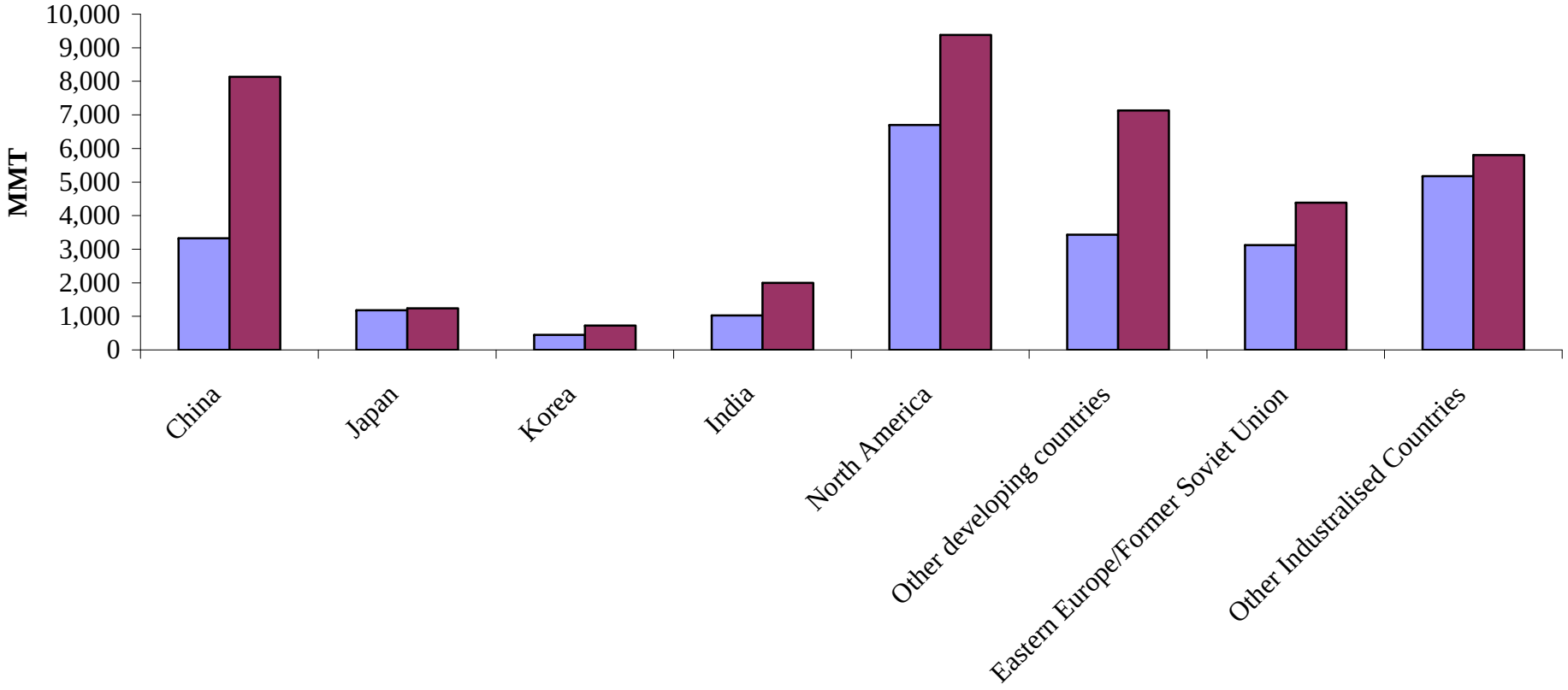
- **Carbon dioxide emitted in any country has the same impact on global climate change**
  - ⇨ A classic problem of the global commons
- **It is critical to have global and regional cooperation on this issue**
- **An obvious role of cooperative arrangements such as APEC to be involved in solutions**

Carbon Dioxide Emissions

- China is second largest carbon emitter (behind the USA) but new estimates by IEA suggest that China about to be largest

- Future emissions are projected to rise sharply

Fig2: Global Carbon Dioxide Emissions from Fossil Fuels 1990 and 2025



Source: Energy Information Adminishtration / International Energy Outlook 2004

Policy Solutions to Carbon Dioxide Emissions

- **Carbon Dioxide emissions**
  - ⇨ Yet to be tackled (Developing countries have ratified Kyoto Protocol but without a binding target)
  - ⇨ Carbon tax (Cooper)
    Technology transfer (Montgomery)
    CDM or Permit Trading (ala Kyoto Protocol)
    McKibbin Wilcoxen Blueprint

Role of Technology Transfer

- **Asia Pacific Partnership for Clean Development (AP6) is focused on this approach**
- **By itself will not be as effective unless a market incentive for take-up within the economy.**
- **Which technology will be best?**
- **Probably need a portfolio of technologies**

The Role of Prices

Figure 4: GDP, Energy Use, CO2 Emissions
Japan

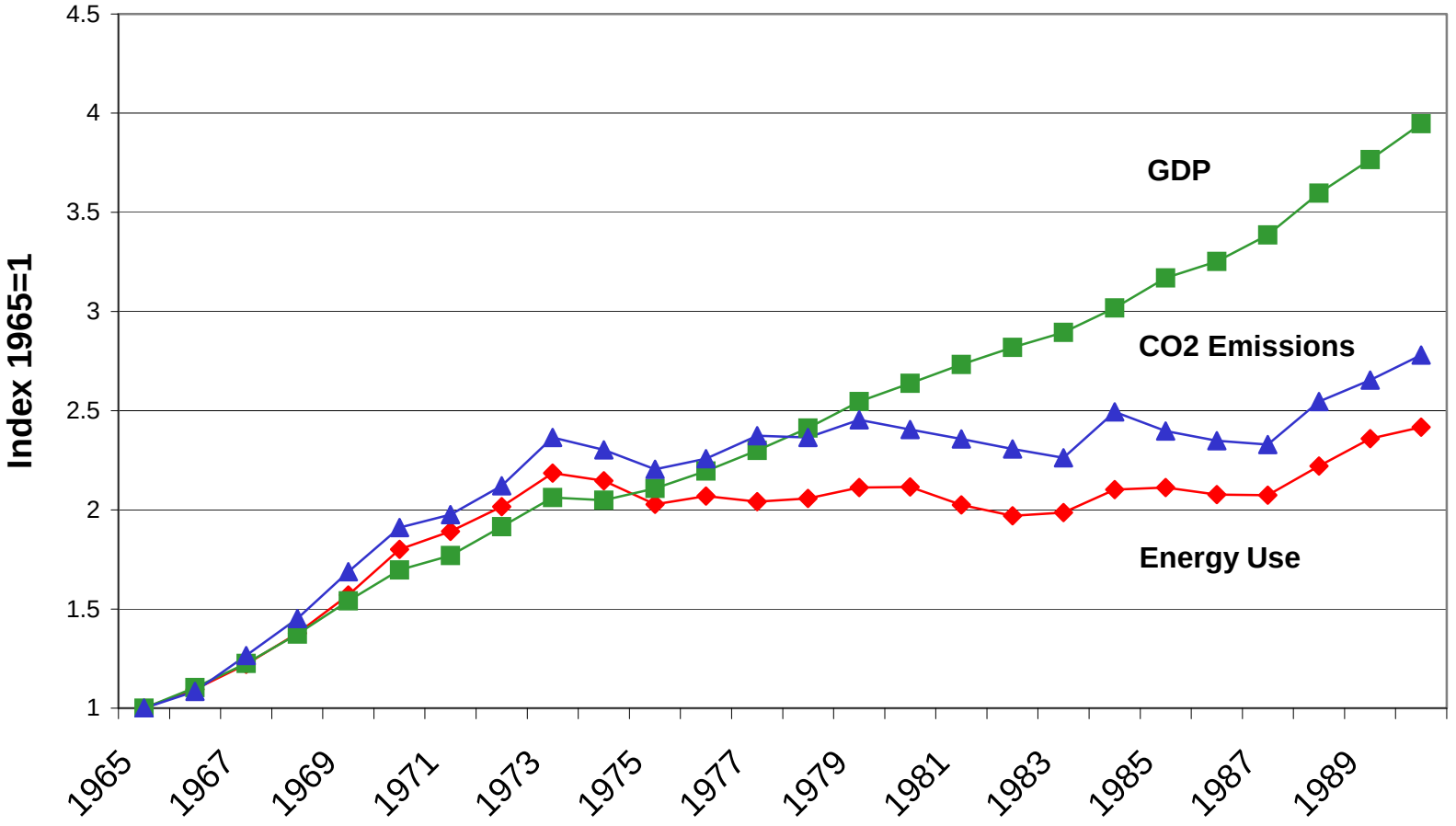
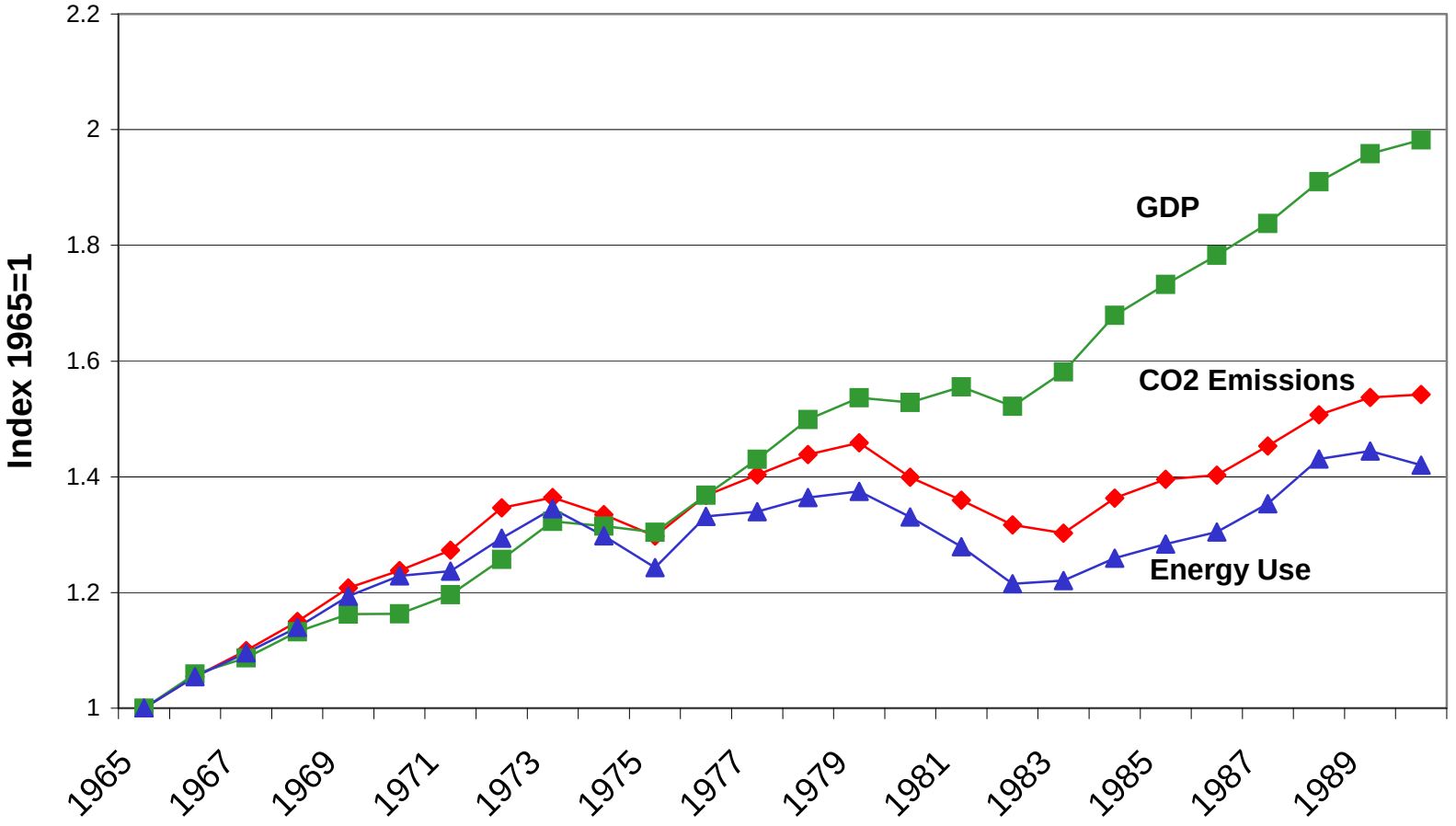


Figure 3: GDP, Energy Use, CO2 Emissions
USA



The Role of Prices

- **Price signals should be both short term and long term**
- **Price signals should be credible**
  - ⇨ Otherwise investment will not be forthcoming
- **Price signals are crucial for encouraging**
  - ⇨ Demand side management
  - ⇨ The emergence of alternative technologies
  - ⇨ The adoption and diffusion of alternative technologies

- **Short run prices can more easily be used than emission targets to line up costs with expected benefits**

Flexibility is important

- **Need to be able to start in individual countries with known costs**
- **Need to be able to add countries to a regional or global system over time**
- **Need to be able to adjust the system as information is revealed**
- **Need to allow for particular national circumstances**

A Way Forward:

The McKibbin-Wilcoxen Blueprint

The McKibbin Wilcoxen Blueprint

- **Aim**
  - ⇨ Impose a long term carbon goal for economies
  - ⇨ Generate a long term price for carbon to guide energy related investment decisions
  - ⇨ Line up short term economic costs with expected environmental benefits
  - ⇨ Provide a way for corporation and households to manage climate risk
  - ⇨ Can be an internationally coordinated system or a national system that evolves into an international system

Components of the Policy

- **National permits**
  - ⇨ Required to embody carbon in energy
  - ⇨ Good only in country of issue
- **Long-term permits**
  - ⇨ Allow 1 ton of emissions **each year**
  - ⇨ Quantity is the long run goal
  - ⇨ Fixed supply (can be diminishing – e.g. 60% reduction by 2050)
- **Annual permits**
  - ⇨ Allow 1 ton of emissions in **year of issue only**
  - ⇨ Elastic supply from national government
  - ⇨ Price fixed for ten years

Why National and not Global Permits?

- **Use existing domestic institutions**
  - ⇨ Legal system for enforcing property rights
- **Small loss of sovereignty**
  - ⇨ No need to cede authority to an international body
  - ⇨ No direct international transfers of wealth
  - ⇨ Enforcement maintains rights of **domestic** residents
- **Robustness and stability**
  - ⇨ Easy to join the agreement
  - ⇨ Robust to withdrawal by some participating countries
  - ⇨ Compartmentalization lowers transmission of shocks

Why Long-Term Permits?

- **Credibility**
  - ⇨ Build constituency supporting the policy
  - ⇨ Owners: vested interest in maintaining system
  - ⇨ Reduce the time-consistency problem
- **Additional benefits**
  - ⇨ Can tailor distributional effects via permit allocation
  - ⇨ Reduces risks (long term vs. short term bonds)
- **The longer the time period the more value to allocate**

Why Annual Permits?

- **Acts like a carbon tax at the margin**

- **Efficient**
  - ⇨ A price-based policy is preferable to a quantity target given flat damage curve

- **Pragmatic**
  - ⇨ Governments don't have to agree to hit a fixed target in any year regardless of cost
- **Flexible**
  - ⇨ Government can mandate who can issue annual permits – forestry, land use, renewables

Main Concept

- The long term permits are the medium term goals for emissions **without a precise timetable** of when they are reached

- The short term permits are the economic costs to the economy

- Move through a low cost path from the short run to the longer run in decadal steps with profit incentives to reduce emissions wherever cost effective

A Partial Analogy – Bond markets

- Long term government bond market prices interest rates over long horizons given a stock of government debt (like long term permits)

- Central banks set the short term interest rate - the supply of financial liquidity is generated by the market (like annual permits).

- The long term interest rate (which is flexible) is the expected value of future of short term interest rates (which are fixed in any period)

Overall

- **Creates incentives for investment**
  - ⇨ Raises the marginal cost of emissions into the future
- **Incentives are credible**
  - ⇨ Built-in constituency of long term permit holders
  - ⇨ Robust to accessions and withdrawals
  - ⇨ Operates within existing institutions
- **Provides a foundation on which to build**
  - ⇨ Completely consistent with technology policies
  - ⇨ Provides incentives for adoption and diffusion

Expandable

- **Because it is a domestic system, other abatement activities can be included within countries**
  - ⇨ generate annual permits with the revenue going to these activities instead of the government
- **National systems can be linked through cooperating on a common short term price cap.**

An Example

The same system in Australia and China

Where China is given time to reach a constraint but Australia begins to pay immediately

Emissions and Long Term Permits in Australia

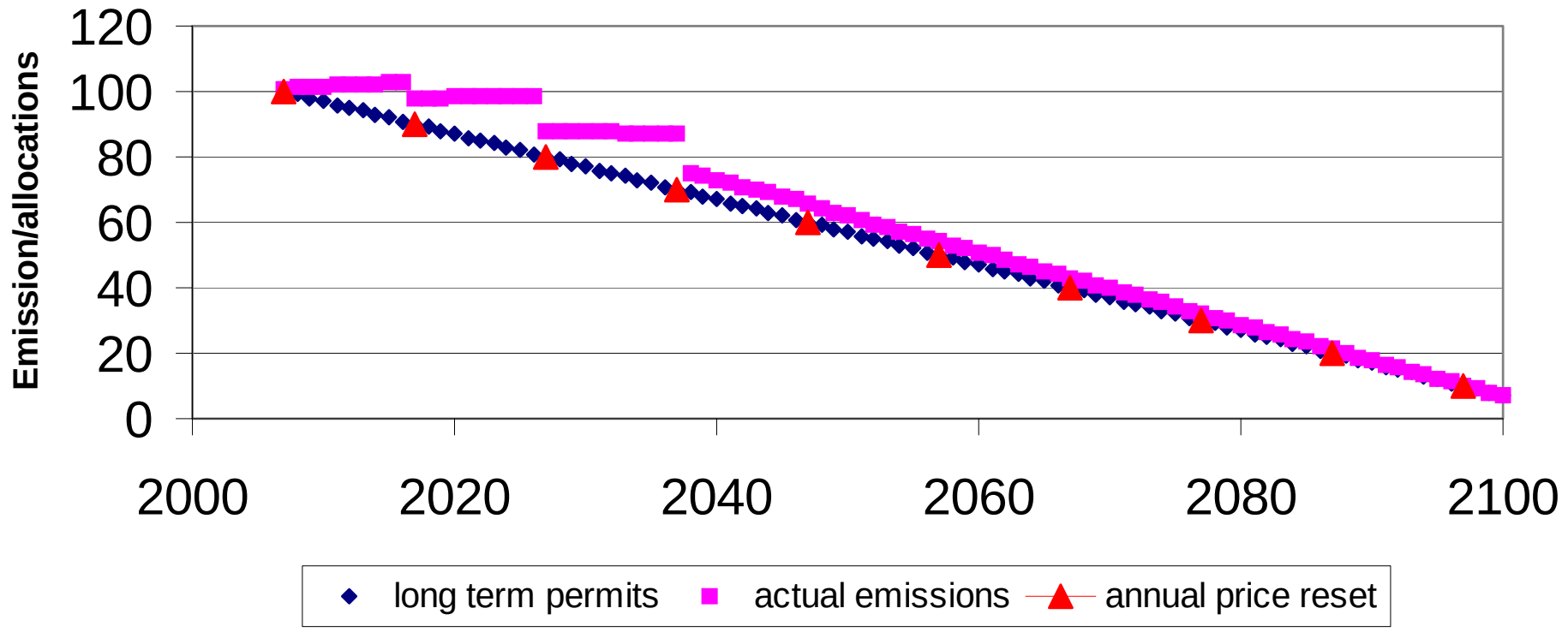


Figure 5: Annual Permit Price

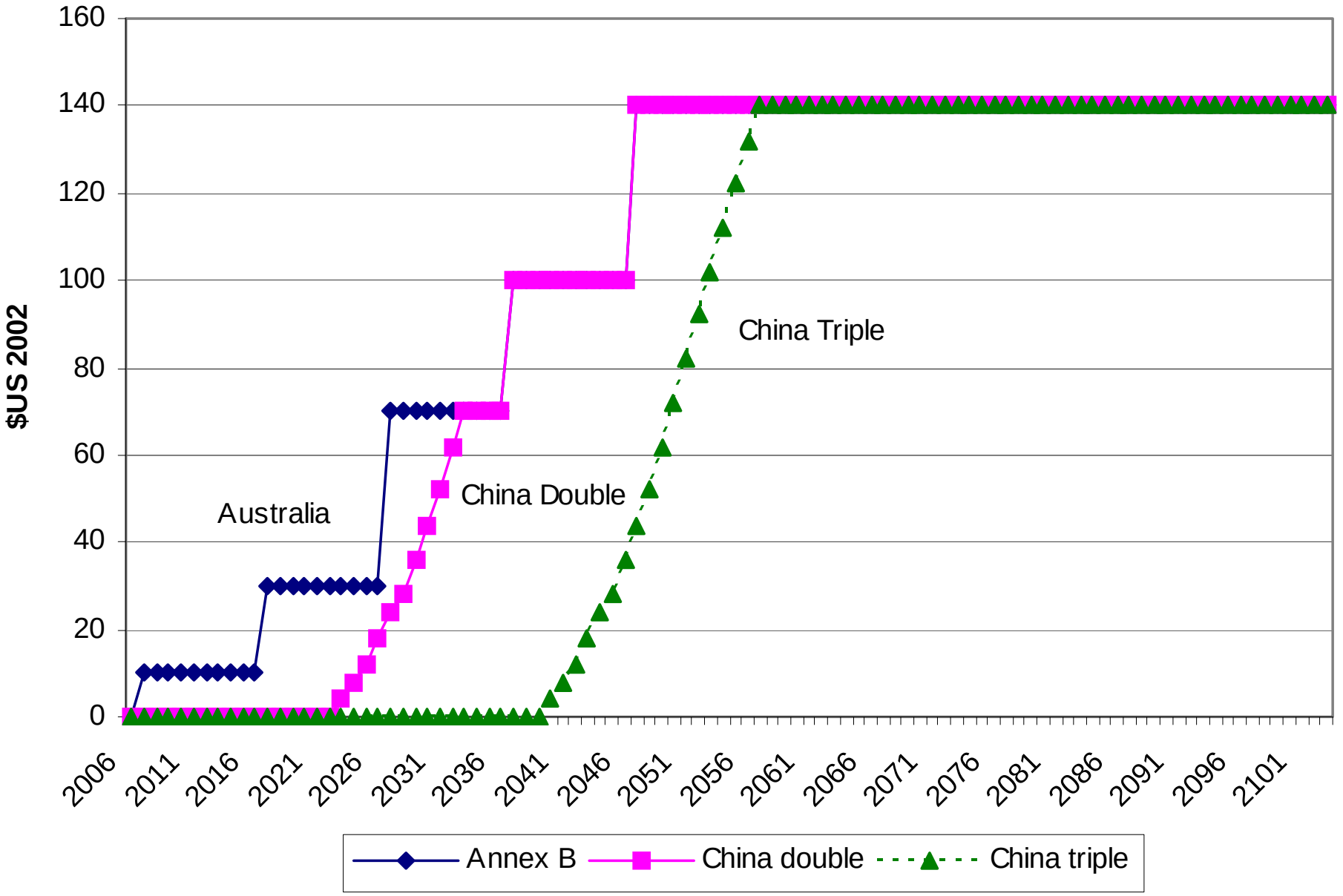
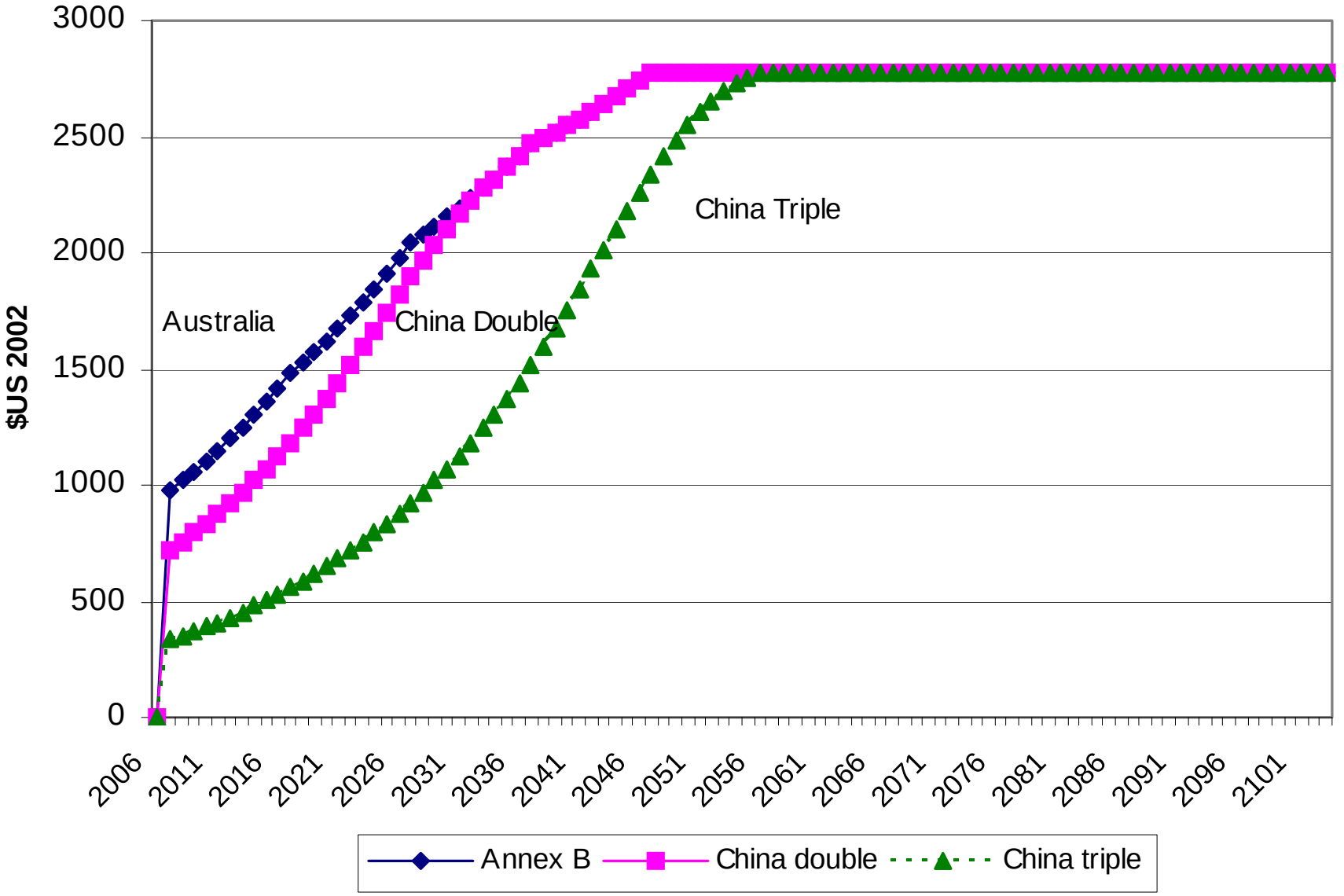
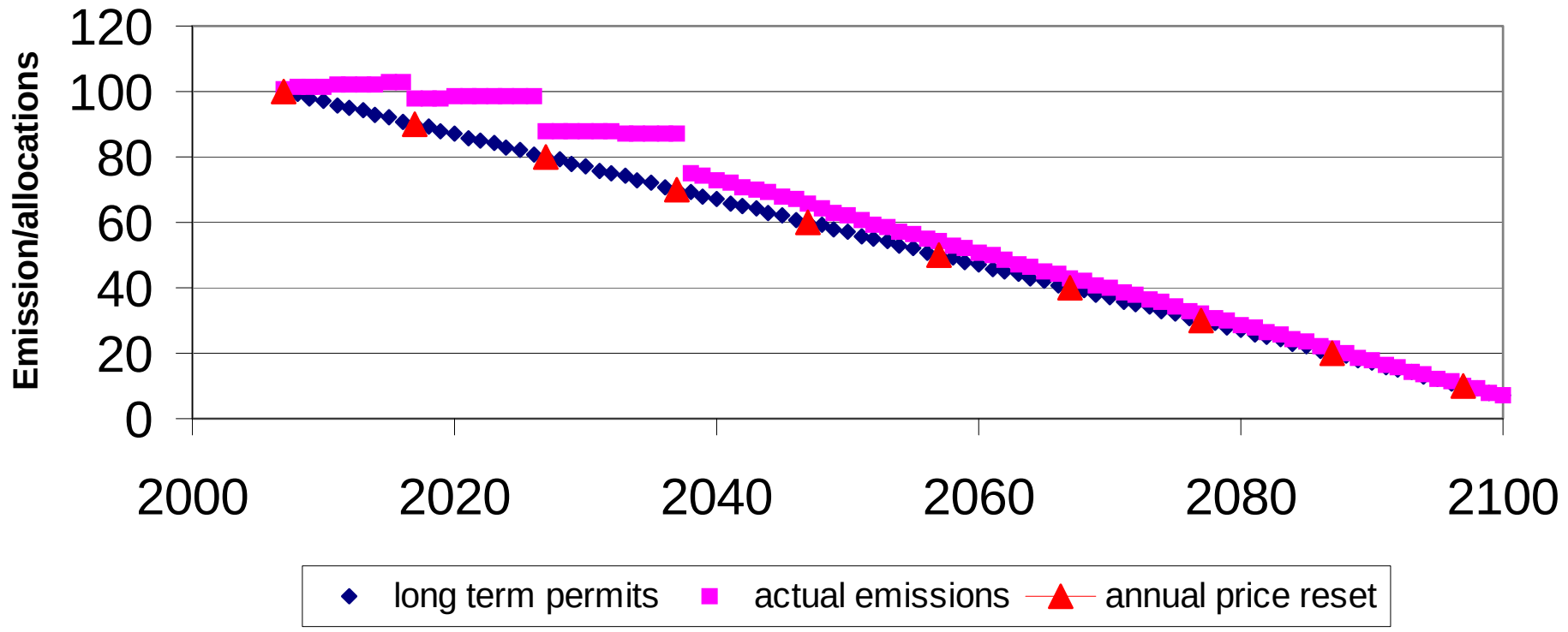
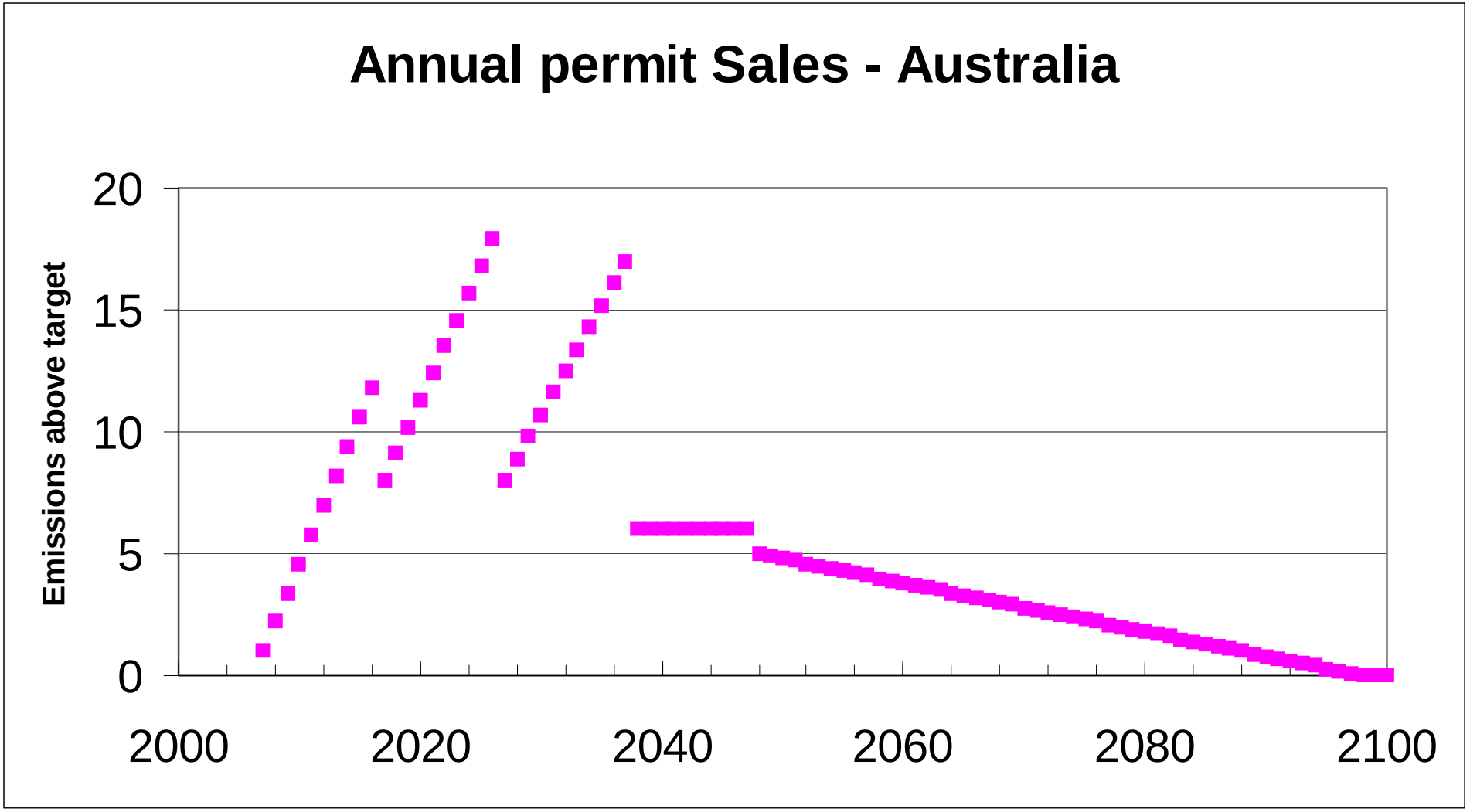


Figure 6: Value of Long Term Permits (r=5%)



Emissions and Long Term Permits in Australia




Annual permit Sales - Australia
Emissions above target
20
15
10
5
0
2000
2020
2040
2060
2080
2100

Conclusions

- **Substantial climate uncertainty implies responding now in terms of institutional design**
- **Need long term price signals to encourage development, adoption and diffusion of carbon saving technologies and to manage energy demand**
- **Need short term price signals capped at expected benefits to minimize economic cost**

Conclusions

- **Need climate related assets created in countries that can be used to attract FDI in emission reducing technology**

- **A regional and global approach is best implemented by coordinating national policies designed around a common price for carbon in the long run but differentiation in the short run.**

Background Papers

www.sensiblepolicy.com