

# ENERGY POLICY FOR BUILDINGS: WHY ECONOMIC INTERVENTIONS MAY BE INEFFECTIVE

Paper #1742<sup>i</sup>,

---

## Abstract

A significant body of research confirms the major contribution that improved building performance can make to national energy and greenhouse abatement policies. The challenge facing governments is how best to realize the potential of energy efficient buildings. This paper reviews the effectiveness of economic instruments for building energy policy compared with alternative interventions such as building regulation and information campaigns. The approach taken to building policy by Lord Stern in his seminal climate change report is a cornerstone of this analysis, as is national policy development in Australia as this provided the foundation for this country's controversial carbon-pricing regime. Regulatory reforms to the Australian Building Code over a decade provide economic analysis to support a historical review of the environmental economics discipline. Formal building code development processes are interrogated to establish the strengths and weaknesses of market based approaches to building energy policy. Study findings confirm that conventional economic interventions are likely to be ineffective as a vehicle for reducing greenhouse gas emissions from the building sector despite the significant potential benefits available therein.

**Keywords:** *building regulation, energy efficiency, greenhouse abatement, policy instruments*

---

## 1 Introduction

A landmark report by the OECD (9) identified the building sector's significant contribution to energy consumption and greenhouse gas emissions in developed economies. Energy use in the building sector was estimated at 25–40% of the total in OECD member countries. Subsequent analysis by the McKinsey Company (8) concluded that the building sector offers excellent prospects for greenhouse gas abatement in developed economies. Improving the energy efficiency of buildings can deliver abatement at a *negative* economy-wide cost per tonne of CO<sub>2</sub>. Which contrasts with significant cost burdens in other economic sectors such as centralized power generation and distribution. Analysis conducted for the International Panel on Climate Change [IPCC] by the Central European University (16) found that a reduction of almost 30% in building sector emissions could be achieved cost-effectively by 2020.

The paper analyses the comparative effectiveness of using economic instruments by governments in order to mitigate greenhouse emissions from the building sector. The analysis works from first-principle reflection on the principles of environmental economics; through consideration of market based intervention options; thence to referencing specific evidence-based reporting of market failures in the building sector in the Australian policy setting.

## 2 Principles of Environmental Economics

### 2.1 Defining the problem

The United States' National Environmental Protection Act 1969 was a milestone in environmental policy development. Policy makers were grappling with the best mechanisms for achieving environmental quality objectives being articulated in legislation. Intense and ongoing debates began between advocates of "command and control" policies, which rely on statutory mechanisms to enforce prescribed outcomes, and policy analysts who favoured notionally more flexible "market based" policy measures. Application of economic levers to environmental policies provided many alternatives for policy implementation, ranging from waste charges through pollution levies to pollution control subsidies.

The early focus of environmental policy was essentially local, dealing with industrial waste discharges to regional air sheds; watersheds and freshwater or marine water bodies. Diffuse pollution at a regional or global level had not yet reached the policy agenda. New challenges arose in the 1980s with growing awareness of the significance of global environmental issues such as the ozone hole and greenhouse effect. These concerns culminated in signing of the UN Framework Convention on Climate Change at the 1992 Rio de Janeiro Earth Summit. The objective of this treaty is to "stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interference with the climate system" (13). The 1997 Kyoto Protocol [citation] links to the 1992 Convention; the Protocol emphasizes use of market-based instruments to reduce global greenhouse gas emissions.

### 2.2 Economic tools for environmental protection

David Pearce's early work on Environmental Economics (10) provided a strong conceptual basis for addressing environmental problems using economic instruments. When analysing pollution control methods Pearce discusses the choice between environmental regulations and economic instruments and also, with remarkable prescience, raises the issue of "Pigouvian" taxes. These taxes represent a public policy response to the external, societal costs of pollution by levying charges on pollution generators.

Grafton (5) provides a comprehensive overview of the role to be played by market-based economic instruments in relation to climate change policy. In structure these options include either carbon taxes or emissions trading schemes [ETS]. The latter in turn can either have a cap-and-trade or a baseline-and-credit structure<sup>1</sup>. According to Grafton countries seeking cost-effective policies that embrace the rationale underpinning the Kyoto Protocol have tended to favour emissions trading over carbon taxes. This is because an ETS provides certainty about the *quantity* of greenhouse gas abatement. Compared with a tax, which provides greater certainty about the *cost* of abatement. Grafton explains that market-based instruments "are often a necessary but not sufficient [policy] measure when more than one market failure exists" (pxx). The market for energy efficient buildings will be shown to suffer from a range of substantive market failures in later sections of this paper.

---

<sup>1</sup> Cap-and-trade scheme: ETS scheme where limits are set on total emissions from specific sources to define permit levels  
Baseline-and-credit scheme: form of ETS where desired emission levels are used to credit reductions relative to the baseline

### 2.3 The Stern Report

Lord Nicholas Stern's report to the British Government in 2006 (12) represents a historic milestone in both climate policy and the application of economic analysis to a global environmental problem. Stern recommended strong and early action to stabilize emissions asserting that "policy to reduce emissions should be based on ... carbon pricing, technology policy, and removal of barriers to behavioural change" (p yy).

### 2.4 Lord Stern's conclusions concerning energy efficiency

Part IV of Lord Stern's report recognizes the need for climate change policies that go beyond simply pricing emissions and supporting technology development. Stern observes that "even if these measures are taken, barriers and market imperfections may still inhibit action, *particularly on energy efficiency*" (p yy) [emphasis added]. Stern argues that such "market imperfections" represent obstacles to the uptake of prudent mitigation options and diminish the uptake of technological innovations for energy efficiency. Although the Garnaut Report, Australia's key climate policy setting document (4) recommended an ETS as the policy cornerstone, the report also recognized the need for a suite of *complementary measures* to be adopted to address numerous identified market failures that obstruct uptake of energy efficiency opportunities in the building, transport and industry sectors.

## 3 Energy policy for buildings: instruments and options

Governments generally have a range of options available once a decision has been made to focus national greenhouse abatement policy on the built environment:

- *Economic measures* utilizing either positive or negative financial incentives
- *Direct regulation* by setting performance standards through building codes or similar instruments
- *Public information campaigns*, both targeted and broad-brush
- *Developing industry capacity* to facilitate market transformation

Research conducted for the United Nations Environment program (14) in an "Assessment of Instruments for Reducing Greenhouse Gas Emissions from Buildings" compares the effectiveness of the policy instruments available to governments to mitigate greenhouse gas emissions from the built environment. The study assessed the potential effectiveness and efficiency of policy instruments including building codes and appliance standards. Appliance standards and building codes were found to be "high" in effectiveness; although the efficiency of building codes was limited by lack of incentives to exceed minimum compliance standards. Economic instruments such as carbon taxes were judged to be "low" in both efficiency and effectiveness.

Further evidence for the transformative role of building codes on building performance is to be found in a report for the International Energy Agency (7) which observed that "buildings are characterized by a life expectancy of many decades ... while planning for energy efficiency at the design stage is relatively simple and cost effective, subsequent improvements in service may be problematic or simply impractical".

## 4 Economic basis of Australian building regulations

In the Commonwealth of Australia standards for all aspects of building performance are enshrined in the National Construction Code [NCC]. A rigorous institutionalized process operates in Australia for managing building code reforms. Government guidelines require changes to the NCC that might impose an additional cost burden on the community to be subject to detailed regulatory impact assessment including economic analysis (3). A key principle is that government intervention is justified only in situations of *demonstrated market failure*. Regulatory development processes are underpinned by a public document known as a Regulatory Impact Statement [RIS] that comprehensively addresses alternative policy options, considering both regulatory and non-regulatory approaches.

For to the NCC the RIS document is required to justify proposed measures by means of a cost-benefit analysis methodology detailed by the Australian Building Codes Board (2), the national body responsible for administering the Code. In the course of developing Australia's building energy standards over the last decade a series of RIS reports have been prepared for the national government. These reports not only demonstrate the benefits of energy efficiency standards enacted through the building code but also provide a source of independently verified evidence on the strengths and weaknesses of alternative energy efficiency policy instruments, whether fundamentally regulatory or economic in nature.

Eight individual RIS documents have been examined for the purposes of this paper; their findings are detailed in Table 1. Since each RIS must make a credible case for regulatory intervention by demonstrating the lack of effectiveness of alternative policy measures the document provides powerful insights into the relative merits of alternative policy vehicles for reducing building sector emissions. The finding that emerges from examination of these RIS reports is that conventional economic measures are ineffective in reducing buildings' emissions when compared with regulation of building performance through mandatory setting of energy performance standards. On evidence presented in the RIS reports the futility of pursuing economic policies lies in the fact that the building sector is characterized by numerous market failures that impede uptake of energy efficient building practices but are not amenable to correction through economic means.

### 4.1 Market failures in the building sector: the evidence

Table 1 confirms that widespread incidence of market failure in the building sector has been identified through Australia's formal regulatory impact assessment processes:

1. *Public goods* available to all without a direct charge and are consequently undervalued
2. *Externalities*: market transactions affecting third parties are not incorporated into the cost of the transaction; carbon pollution being a classic example
3. *Information failures*: inability to readily obtain and comprehend information on the lifecycle costs and benefits of energy efficient buildings
4. *Split incentives*: project builders and developers typically have little investment incentive as they don't have to pay buildings' operating energy costs, whose burden falls upon property owners or tenants
5. *Information asymmetry*: homebuyers' relative lack of knowledge and experience with the various benefits of energy efficiency puts them at a clear market disadvantage

**Table 1** Australian Regulatory Impact Statements for Building Code energy efficiency measures

Report title and [reference]	Date	Identified market failure mechanisms	Economic benefits
Regulatory Information Bulletin: residential buildings [Victoria]	9/2002	<ul style="list-style-type: none"> <li>• Public goods</li> <li>• Natural monopolies</li> <li>• Information failures</li> </ul>	NPV <sup>2</sup> \$570M
Energy measures: BCA Volume 2 [RIS2002/04]	12/2002	<ul style="list-style-type: none"> <li>• Policy options only include regulation by definition</li> </ul>	NPV \$485M
Proposal to Amend the BCA: Energy Efficiency for Residential Buildings other than Housing	2/2004	<ul style="list-style-type: none"> <li>• Externalities not factored into market decisions</li> <li>• Aggregation of private decisions not socially optimal</li> </ul>	BCR <sup>3</sup> 1.66:1
Energy Efficiency for BCA Class 5-9 Buildings [RIS 2005-01]	3/2005	<ul style="list-style-type: none"> <li>• Externalities not accounted</li> <li>• Split incentives</li> <li>• Inadequate market information</li> </ul>	BCR 4.6:1
Proposal to amend BCA to increase energy efficiency requirements for housing [RIS 2005-02]	4/2005	<ul style="list-style-type: none"> <li>• National energy policy measures complement BCA mandatory standards</li> </ul>	BCR 1.53:1
Proposal to amend BCA to increase energy efficiency for housing [RIS 2006-01]	3/2006	<ul style="list-style-type: none"> <li>• Consumers don't pay full cost of energy production</li> <li>• Market complexities obstruct rational decision-making</li> </ul>	BCR 1.27:1 abatement cost -3.6c/kg CO <sub>2</sub>
Revised Energy Efficiency Requirements for Residential Buildings [RIS 2009-06]	09/2009	<ul style="list-style-type: none"> <li>• Inelastic Energy demand: not responsive to market signals</li> <li>• Market barriers not addressed by carbon price</li> </ul>	BCR 0.88 NPV <b>-\$259M</b>
Revised Energy Efficiency Requirements for Commercial Buildings [RIS 2009-07]	12/09	<ul style="list-style-type: none"> <li>• Split incentives</li> <li>• Capital constraints</li> <li>• Excessive transaction costs</li> </ul>	BCR 1.6:1 abatement cost <b>-70c/kg CO<sub>2</sub></b>

## 4.2 The benefits of regulation

Cost-benefit ratios in Table 1 are quoted in government RIS reports where conventional economic techniques were used to compare capitalized building costs for improved design performance nation-wide in Australia with anticipated benefits of fuel savings from energy efficiency. Rather than attempt to a problematic conversion of historical costs to current dollar values taking inflation into account, Benefit Cost Ratios have been used to compare the results of economic analyses undertaken during the review period 2002-2009.

Detailed analysis of the RIS reports as outlined in Table 1 also yields information on the potential economic benefits resulting from mandatory building energy standards including greenhouse abatement cost savings of up to \$70/tonne CO<sub>2</sub> and generally positive benefit: cost ratios ranging from 1.27:1 as high as 4.6:1. To put these abatement costs into perspective, the McKinsey Company has estimated costs in \$/tonne CO<sub>2</sub> of a wide range of potential global emission reduction strategies (17).

<sup>2</sup> NPV – net present value

<sup>3</sup> BCR – benefit/cost ratio

## 5 Economic principles

It is beyond the scope of this paper to critique the principles of neo-classical economic theory that provide the foundation for application of market-based economic instruments to environmental problems such as climate change. Still, the reader's attention is drawn to a growing body of literature that does address this issue. For example in the works of Keen (6), Quiggin (11), Ormerod (18) and Davies (19). Key doctrines used in the application of market economics to the climate change problem are discussed in the following sections. Dennis' recent critique (21) is also pertinent to this analysis.

### 5.1 Climate change economics: are these actually blunt, ineffective instruments?

#### 5.1.1 Market approach: general principles

Free trade in the market is assumed to determine efficient allocation of environmental goods. However as Grafton (5) points out, achieving economically efficient resource allocation, meaning effective market operation, is contingent upon both *well defined property rights* and prices that *include all externalities*. Which is a rather improbable state of affairs according to critiques of market economics by Davies (19) and Dennis (21).

#### 5.1.2 The Coase Theorem

Ronald Coase's influential "Theory of Social Cost" states that assignment of a property right can be used to internalize an externality - as in the case of emission trading schemes. The critical caveat on application of Coase Theorem to climate change policy is that it holds true *only under quite idealized circumstances* (5) such that:

- Market actors do not behave strategically;
- Transaction costs are zero; and
- Information is perfectly accessible to market participants

#### 5.1.3 Pigouvian tax

The work of economist AC Pigou (20) provides the conceptual basis for the design of taxes applied to emissions or pollution designed to internalize environmental externalities. An emissions trading scheme is the archetypal example of a Pigouvian tax. Such a scheme is has been subject to criticism, including reservations expressed by Pigou himself, since it requires policy makers to possess market information that may be unobtainable in practice as Dennis (21) points out.

## 6 Case study: Australia's experience with climate change policy

In hindsight, Australia's troubled experience with climate change policy provides a useful case study illustrating the general issues being canvassed in this paper.

### 6.1 Policy foundations

Climate change policy in Australia was the outcome of analysis undertaken for the Australian Government in Professor Garnaut's Review (4), which found that climate change was expected to have a "severe and costly impact on agriculture, infrastructure, biodiversity and ecosystems in Australia"; however "these impacts would be significantly reduced with ambitious global mitigation". Garnaut concluded that [citation] "a well designed emissions

trading scheme has important advantages over other forms of policy intervention”; and that “the role of complementary measure is to lower the cost of meeting emissions reduction trajectories, as well as correcting market failures” [citation].

## 6.2 Policy implementation

Because Professor Garnaut examined policy options through an economic lens it is unsurprising that his recommendations favour the use of economic instruments by recommending introduction of an ETS. Nevertheless explicit reference was made in this report to the value of *complementary measures* to support the proposed carbon pricing mechanism. By adopting Garnaut’s recommendations to introduce an ETS in 2012 the national Labour Government caused a storm of political controversy and spawned political opposition that contributed to its subsequent loss of office. In 2014 incumbent Liberal Government repealed the ETS, ending the nation’s brief experiment with carbon price based climate policy.

Despite Australia’s dramatic experience with climate policy one might well ask whether the abortive ETS would actually have had a significant moderating influence on emissions from the building sector in the long run? Evidence presented in this paper suggests not.

## 7 Conclusions

The importance of greenhouse gas emissions from the building sector demands prompt, effective response from national governments; which have a range of potential policy responses. Application of economic instruments to environmental protection has a history of success in addressing both point source and diffuse pollution. However analysis provided herein suggests that simple translation of conventional economic instruments to building sector emissions policy is beset by fundamental weaknesses that inhibit effective deployment.

Lord Stern’s advice that market imperfections are relevant to energy efficiency initiatives has been applied to examination of the Australian building code regime to demonstrate that the building sector is beset by pervasive *market failures*. Established failure modes include split incentives, non-costing of externalities, lack of consumer information and excessive transaction costs. Many assumptions underpinning the application of economic instruments such as carbon pricing are open to challenge in that they rely on questionable models of idealized market behaviour embodied in doctrines such as the *Coase Theorem* and *Pigouvian* taxation models.

The Australian case study further demonstrates that building performance standards contained in the National Construction Code will not only deliver national climate policy objectives but also provide substantive economic benefits [positive benefit: cost ratios and Net Present Values] together with cost-effective abatement outcomes in terms of **negative** cost/kg CO<sub>2</sub>.

These findings imply that governments would do well to deploy non-economic policy instruments such as mandatory building codes in order to address the rapidly escalating greenhouse gas emissions attributable to the global building sector (16).



## Acknowledgements

*I wish to acknowledge the guidance provided by my PhD supervisors at Curtin University Professor Peter Newman and Dr Anne Matan; as well as the support I have received from Australia's Cooperative Research Centre for Low Carbon Living.*

## References

- [1] Anderson, M. S. 1994. *Governance by Green Taxes: Making Pollution Prevention Pay*. Manchester, U.K.; Manchester University Press.
  - [2] Australian Building Codes Board. 2011. "Regulation Impact Assessment Protocol." edited by Department of Industry, Canberra: ABCB.
  - [3] Council of Australian Governments. 2007. "Best Practice Regulation: A Guide for Ministerial Councils and Standard Setting Bodies." Canberra, ACT: Commonwealth of Australia,.
  - [4] Garnaut, R. 2008. *Garnaut Climate Change Review*. Canberra, ACT. URL: <http://www.garnautreview.org.au/update-2011/garnaut-review-2011.html>
  - [5] Grafton, R. Q. et al. (2012). *A Dictionary of Climate Change and the Environment*. Cheltenham, UK: Edward Elgar Cheltenham UK.
  - [6] Keen, S. 2011. "Debunking Economics: The Naked Emperor Dethroned". London: Zed Books.
  - [7] Laustsen, J. 2008. *Energy Efficiency Requirements in Building Codes, Energy Efficiency Policies for New Buildings*. Paris, France: OECD/IEA. <http://www.iea.org>.
  - [8] McKinsey Company. 2009. *Pathways to a Low Carbon Economy: Version 2 of the Global Greenhouse Gas Abatement Cost Curve*. NA: McKinsey & Company.
  - [9] Organization for Economic Cooperation & Development. 2003. *Environmentally Sustainable Buildings: Challenges and Policies*. 2, rue André-Pascal, 75775 Paris
  - [10] Pearce, D. W. 1976. *Environmental Economics*. London: Longman.
  - [11] Quiggin, J. 2010. *Zombie Economics: How Dead Ideas Still Walk among Us*. Princeton Press.
  - [12] Sir Nicholas Stern. 2006. *Stern Review on the Economics of Climate Change*. HM Treasury.
  - [13] United Nations. 1992. "United Nations Framework Convention on Climate Change."
  - [14] United Nations Environment Program. 2007. *Assessment of Instruments for Reducing Greenhouse Gas Emissions from Buildings*. Nairobi, Kenya.
  - [15] Ürge-Vorsatz, Diana, and Aleksandra Novikova. 2008. "Potentials and Costs of Carbon Dioxide Mitigation in the World's Buildings." *Energy Policy* 36 (2): 642-661.
  - [16] World Business Council for Sustainable Development. 2009. "Energy Efficiency in Buildings: Transforming the market". URL: [www.wbcsd.org](http://www.wbcsd.org)
  - [17] McKinsey Company. 2009. "Pathways to a Low Carbon Economy: Version 2 of the Global Greenhouse Gas Abatement Cost Curve".URL: [www.mckinsey.com](http://www.mckinsey.com)
  - [18] Ormerod, P. 1994. "The Death of Economics". Faber & Faber, London.
  - [19] Davies, G. 2013. "Sack the Economists and Disband Their Departments". BWM Books, Canberra, Australia.
  - [20] Pigou, A. C. 1920. "The Economics of Welfare". London: Macmillan.
  - [21] Denniss, R. 2016. "Econobabble". Redback Quarterly. Melbourne, Australia
-