EMAIL
admin@kinesis.org

OFFICE
02 8005 4290
FACSIMILE
02 9280 0953

MAIL
PO BOX 411 DARLINGHURST
NSW 1300 SYDNEY AUSTRALIA

kinesis

	RESEARCH ANALYSIS DOCUMENT	
PROGRAM	# Capital Cities Go Large	
PROJECT	## Examining the Abatement Potential of Australia's Capital Cities by 2030	
PREPARED FOR	Clover Moore MP Lord Mayor	*City of Sydney*
VERSION	FINAL	
AUTHORS	*Bruce Taper, Director* *David Holden, Climate Strategist – Urban Planning* *Matthew Sander, Policy Analyst* *Rob Helstroom, Principal Scientist*	*11 August 2009*

Contents

Acknowledgements and Limitations

This report has been prepared by Kinesis on behalf of the City of Sydney. Supporting data, mapping and analysis was provided by SGS Economics and Simpson+Wilson Architects.

Kinesis acknowledges the following limitations which are inherent within this report:

- This analysis was conducted on areas within each capital city that the consulting team have determined represent an urban form in which the actions outlined in the *Sustainable Sydney 2030* strategy are most applicable.
- It does not include the whole urban area of each capital city.
- Local data was used where possible, but, when not available, statewide and national data was used as a proxy.

Kinesis would also like to acknowledge that due to time constraints it was not possible to model existing greenhouse gas reduction strategies for Australia's other capital cities. No offence is intended by the absence of this analysis.

The purpose of this report is to outline the emissions reduction potential of Australia's capital cities, rather than advocate for a single strategy and Kinesis recommends that more detailed analysis be conducted by each city using locally available data, development strategies and investigating other locally relevant actions.

Executive Summary

The following paper considers what the effective emission reductions would be if all Australian cities implemented the actions (or similar) outlined in the Sustainable Sydney 2030 strategy.

Australia's capital cities represent a significant source of Australia's greenhouse gas emissions and its abatement potential. According to the Centre for International Economics Australia's residential and commercial buildings are responsible for 23% of greenhouse gas emissions.[1]

The City of Sydney's *Sustainable Sydney 2030* strategy aims to reduce Sydney's greenhouse emissions through a range of interventions including trigeneration, building retrofits, simple transport improvements and renewable energy.

This study has found that if these actions were replicated across all of Australia's capital cities over the next 20 years there would be approximately a 50% emission reduction against business as usual across major parts of Australia's capital cities by 2030.

Studies have suggested that the price signal from the CPRS will reduce emissions across all of Australia's buildings by an average of 8MT per year. This will result in a cumulative reduction of 135MT by 2030.[2]

The analysis outlined in this report, shows that a targeted strategy to reduce emissions in only a select part of Australia's capital cities, could reduce emissions by 48MT in the year 2030 and result in a cumulative emissions reduction of 540MT between 2010 and 2030; a factor of four improvement over the CPRS impact on Australia's buildings.

These reductions result in a 4% reduction against projected 2020 level emissions.[3] This is the equivalent of meeting one quarter of the Federal Government's unconditional 2020 reduction target.

---

[1] The Centre for International Economics (2007), *Capitalising on the building sector's potential to lessen the costs of a broad based GHG emissions cut*.
[2] ASBEC (2008), *The Second Plank*
[3] 2020 emissions projection is made in the absence of the CPRS. Department of Climate Change (2009), *Tracking to Kyoto and 2020*.

Introduction

Studies which attempt to estimate Australia's potential to reduce greenhouse gas emissions often refer to the built environment as a significant abatement opportunity. A report by the Centre for International Economics estimates that commercial and residential buildings are responsible for 23% of Australia's total emissions.

However, most discussion around emission reduction strategies relating to the built environment typically refers to buildings as if they exist without the context of the city and its occupants. Capturing the enabling ability of Australia's Capital Cities to drive the benefits of large scale fuel switching, retrofitting, design and technology efficiencies is crucial if Australia is to meet its proposed Copenhagen commitments.

In 2008 the City of Sydney released its Sustainable Sydney 2030 strategy. This strategy aims to capture the emissions reduction potential of cities. It sets out a comprehensive plan to reduce emissions within the City of Sydney local government area (LGA) by 57% by 2030. The plan is based on the utilisation of a variety of integrated actions and technologies including district level trigeneration, renewable energy, waste to energy technology, energy efficient lighting and appliances, reduced car parking and low emission transport technology.

This paper examines the total effective emissions reductions that could be achieved if all of Australia's capital cities implemented the strategies outlined in the Sustainable Sydney 2030 strategy. The paper has taken a conservative snap shot of every capital city and determined what constitutes a similar or applicable urban form to the City of Sydney local government area in order to replicate, where appropriate, the policy levers and analysis undertaken by the City of Sydney's 2030 strategy. This analysis does not cover the entire metropolitan area of each capital city.

The paper shows that there is significant potential within Australia's cities to reduce greenhouse gas emissions. Achieving this potential will, however, require a comprehensive, integrated strategy which moves beyond the building and examines cities as a whole.

Methodology & Analysis

In order to translate the actions contained within the Sustainable Sydney 2030 strategy to Australia's other capital cities, Kinesis analysed the core urban area within each capital city which shares comparable relative density and population figures to the City of Sydney LGA.

The core urban area of each Capital City was determined through an examination of land-use profiles, population and employment density of the eight cities and defined areas with the highest density of people and jobs. The areas studied capture the part of each capital city that is best suited for the actions outlined in the 2030 strategy. Figure 1 illustrates the boundary areas (marked in red) within each capital city that were analysed for this study.

The following data sourced from the 2006 Census and locally available employment and land use data was used to calculate business as usual emissions for each urban area:

- 2006 Population and Employment;
- 2006 Dwelling Profile and Net Dwelling Density;
- 2006 Office and Retail Floor pace Estimates;
- 2031 Population and Employment Projections.

For each urban area identified the business as usual emissions were projected out to 2030. The primary data sources used in this analysis are listed as an appendix to this report.

Once the boundary areas used in this study were determined, and the business as usual emissions calculated, Kinesis calculated the potential emissions reductions that could be achieved for each of the following actions:

1. **Residential and commercial building efficiency retrofits:**
   Approximately a 40% reduction in lighting electricity consumption by 2015 through the introduction of more efficient lighting technology; and a 10% reduction in appliance electricity consumption through Minimum Energy Performance Standards by 2030. Both these policies are applied to all buildings within the urban boundaries.

2. **District trigeneration:**
   Use natural gas to generate electricity and harvest of waste heat for the thermal loads in approximately 35% of residential dwellings and 43% of non-residential buildings by 2030. Note: due to the low greenhouse intensity of hydro-electricity in Tasmania, trigeneration was not applied to buildings in Hobart.

3. **Waste to energy technology:**
   Divert 50% of the non-recycled residential and non-residential waste stream from landfill by 2015 to produce methane for electric generation.

4. **Street lighting efficiencies:**
   Convert 100% of the urban area's street lighting to high efficiency LED lighting by 2030.

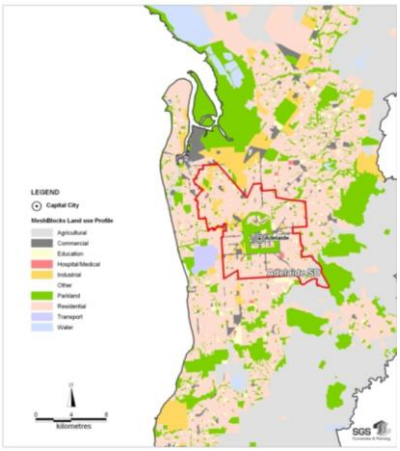
5. **Transport improvements:**
   Reduce emissions through improving public transport, encouraging the uptake of cycling, improving private vehicle fuel efficiency by approximately 50%, and transforming half the private vehicle fleet to electric vehicles by 2030.

6. **Employee Density:**
   Reducing the commercial floor area per employee by 20% by 2030 and thereby reducing the energy requirements to accommodate employment growth.

7. **Renewable energy:**
   Replacing 100% of low density residential and commercial dwelling hot water systems with solar hot water. In addition, 25% of the remaining electricity used by residents and businesses in the urban boundaries is generated from renewable energy.

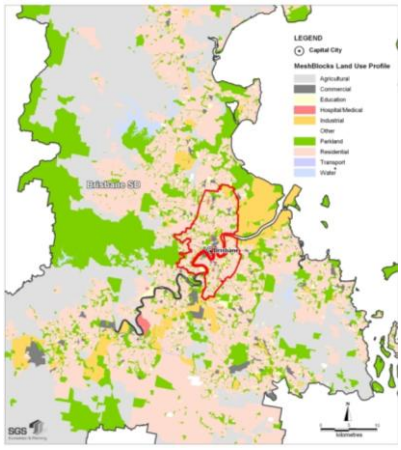
Figure 1: Urban Areas included in the Analysis

Adelaide



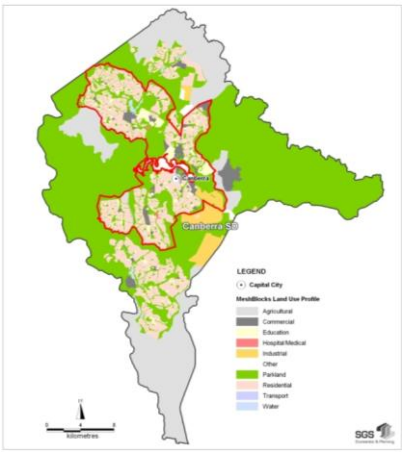
Area: 11,300 ha
Population: 201,000

Brisbane



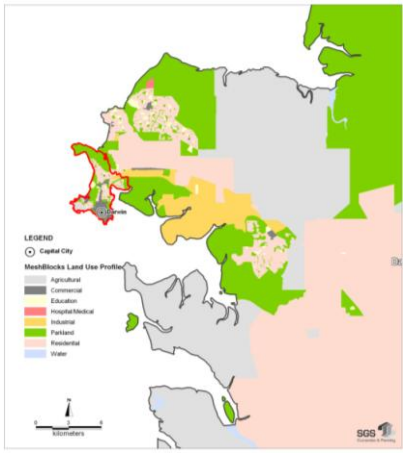
Area: 13,400 ha
Population: 323,000

Canberra



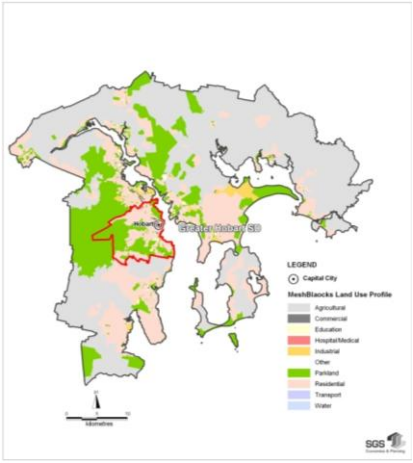
Area: 18,600 ha
Population: 199,000

Darwin



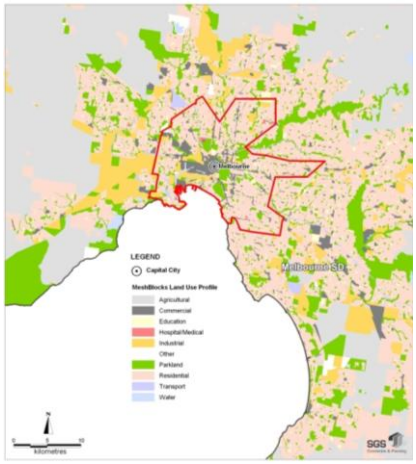
Area: 1,600 ha
Population: 16,000

Hobart



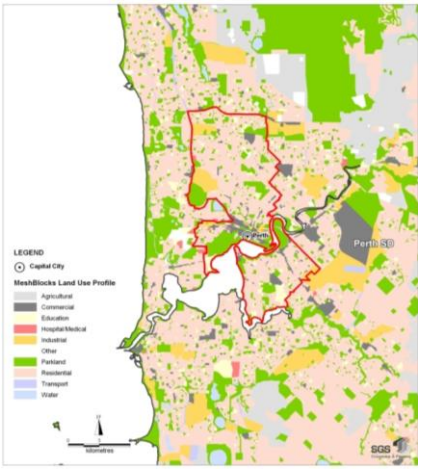
Area: 7,800 ha
Population: 48,000

Melbourne



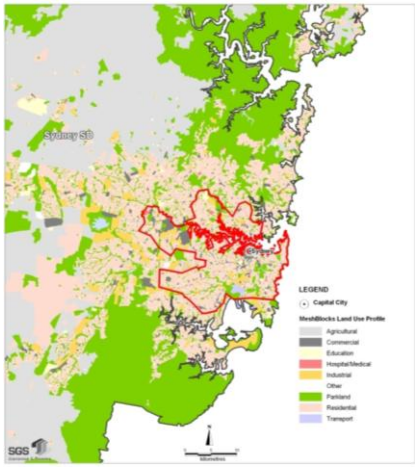
Area: 27,500 ha
Population: 809,000

Perth



Area: 13,600 ha
Population: 235,000

Sydney



Area: 34,900 ha
Population: 1,303,000

Results

If implemented over the next 20 years, the policy interventions modelled in this paper would see approximately a 50% emission reduction against BAU across major parts of Australia's capital cities by 2030. These reductions result in a 4% reduction against projected 2020 level emissions[4]. This is the equivalent of meeting one quarter of the Federal Government's unconditional 2020 reduction target.

The total annual emission reduction is estimated to be 48 MT in the year 2030 across all capital cities. The cumulative emission reductions would be 540MT which is equivalent to Australia being carbon zero for a year.

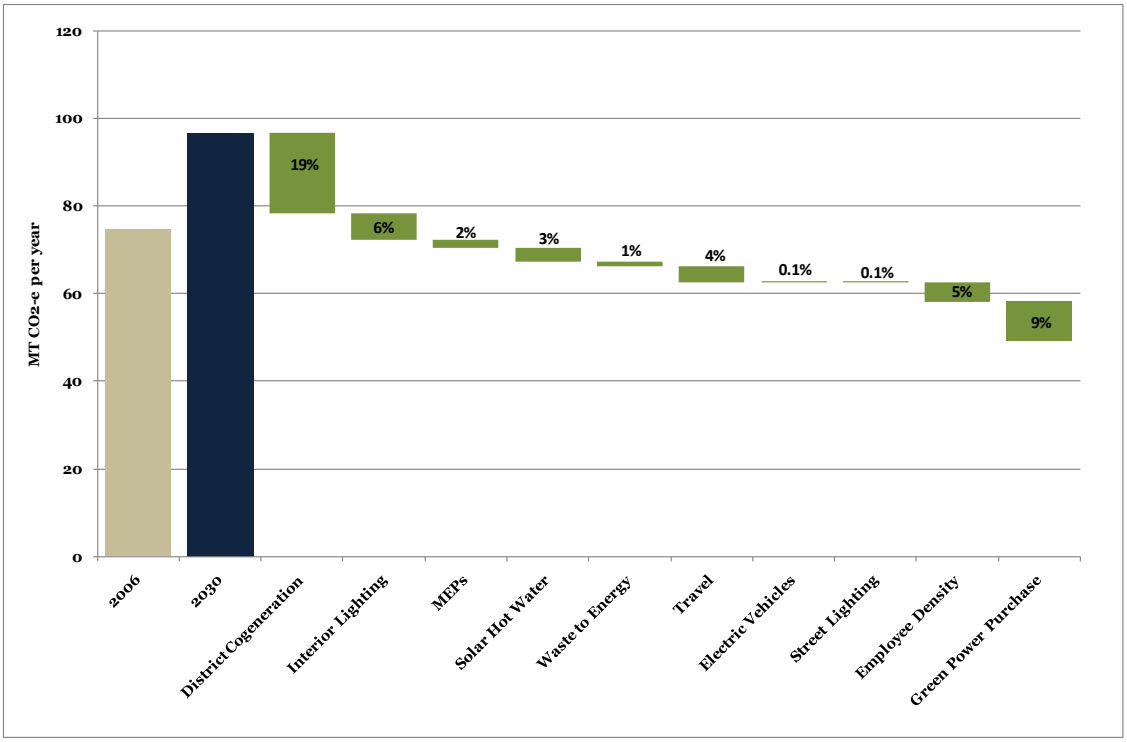


Figure 2: Capital Cities 2030: Emission Reductions Portfolio

[4] 2020 emissions projection is made in the absence of the CPRS. Department of Climate Change (2009), *Tracking to Kyoto and 2020*.

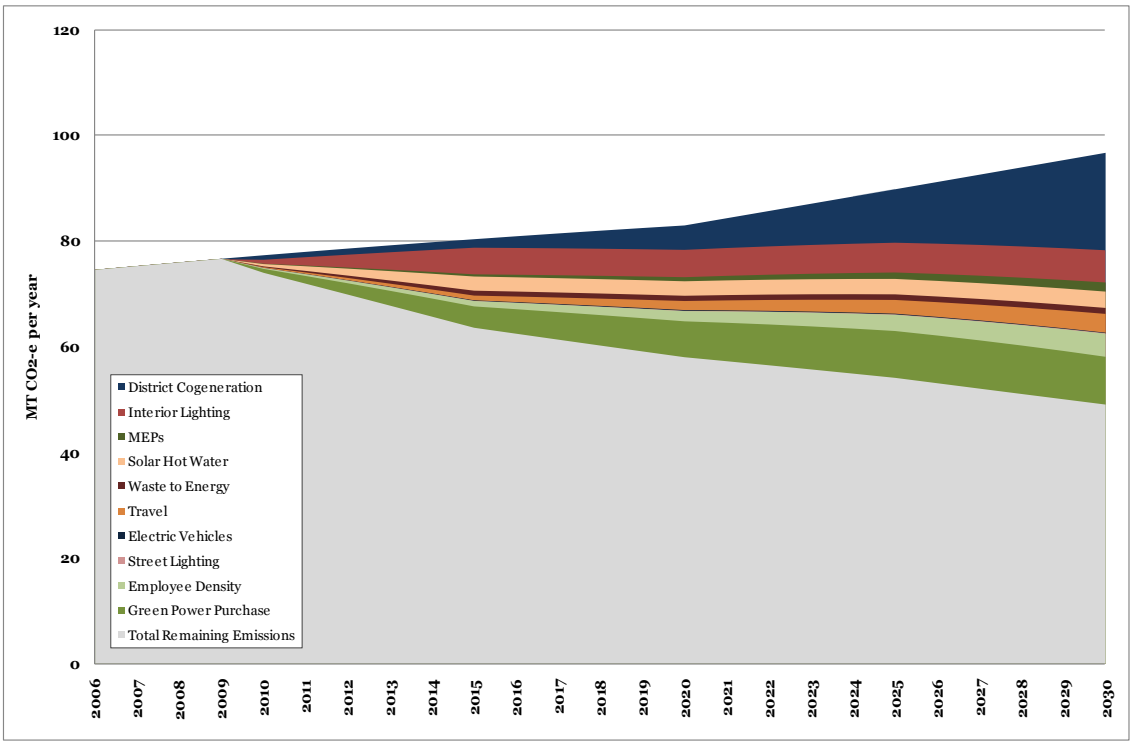


Figure 3: Capital Cities 2030: Cumulative Emission Reductions

Conclusion and Recommendations

The analysis outlined in this report has demonstrated the capacity for Australia's capital cities to make large reductions in their greenhouse gas emissions. Studies have suggested that the price signal from the CPRS will reduce emissions across all of Australia's buildings by an average of 8MT per year resulting in a cumulative reduction of 135MT by 2030.

This study has shown that a targeted strategy that only focuses on a limited area of each of Australia's capital cities and takes a city wide approach to emissions reduction by looking beyond individual buildings could result in a factor of four improvement over the CPRS price signal's impact on Australian buildings. This strategy would achieve a cumulative emission reduction of 540MT by 2030.

The City of Sydney's *Sustainable Sydney 2030* strategy provides a model for other cities to follow in order to achieve these reductions at the city scale. This analysis provides a strategic direction for emission reduction and shows the possibilities that can be achieved by replicating the City of Sydney's approach across all of Australia's capital cities.

However, to achieve these reductions it will be necessary for each city to adopt a city wide implementation strategy that commits to a city wide approach to emissions abatement.

While this analysis provides an estimate of the emission reduction potential of the actions specified, it is recommended that more detailed analysis be conducted by each city using locally available data, development strategies and investigating other locally relevant actions. This will enable each capital city to create an emissions reduction approach that best meets their specific needs and circumstances.

Appendix: Source Data

Data used to determine greenhouse gas emissions for the selected urban areas was sourced from best available electricity, gas and waste consumption estimates. In addition, an extrapolation of Sydney's Household Travel Survey and the ABS Survey of Motor Vehicle use was used to determine resident emissions from travel. The primary sources for emission and consumption data were:

- Australian Greenhouse Office (2008) Energy Use in the Australian Residential Sector 1986-2020
- Building Code of Australia (2007) Energy Efficiency Requirements in Commercial Buildings
- Australian Greenhouse Office (2008) National GHG Accounts Workbook, November

Non-residential floor area data was calculated using industry standard worker to floorspace ratios and Census of Population and Housing Journey to Work employment data. Where applicable, the floorspace estimates are adjusted based on actual land use surveys available at the Local Government Area level (e.g. City of Melbourne's CLUE data and City of Sydney's 2006 employment and land use survey).