

Energy, Housing, People and Estates – A Review

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Introduction

- In improving sustainability one of the critical issues we face is how do minimise energy use.
- Household consumption (e.g. electricity, gas and car usage) accounts for 56 per cent of total (energy related) greenhouse gas emissions.
- How do we assess energy use in different forms and kinds of residential development?
- At what spatial level should we measure energy use?



Housing and Energy Use

- Embodied Energy – is the store of ‘sunk’ energy in the built form and capital equipment of cities, i.e. the buildings, roads, pipes, vehicles and other infrastructure.
- Operational Energy – is the energy used from day to day in the city, i.e. electricity, gas and transport consumption.
- Over a 100 year period for a residential dwelling embodied energy represents around 40% of operational energy demands (AGO 1999).



Measuring Energy Use – Work already being done

- Embodied Energy – the environmental performance of the dwelling itself, i.e., the construction and materials used in the building and the infrastructure that supports it.
- Operational Energy – household energy consumption, i.e., the reasons why households consume energy (electricity, gas) in the way they do.
- Macro level (eg. City level, State level) and Micro level (e.g. household level).



Measuring Energy Use – Where to from here

- Studies that measure both the embodied and operational energy use – i.e, determining how far energy use is grounded in human behaviour and/or in the characteristics of the dwelling.
- Work that measures estate level development – i.e., energy use for different localities, densities and types of development



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Studies on the localised nature of embodied and operational energy use

Moriarty 2002

- Split five state capital cities into inner, middle and outer rings.
- Moriarty concluded that inner city residents use less energy and water when adjusted for income than their outer suburban counterparts. However, when ‘indirect’ inputs are considered the differences are small.
- Moriarty suggests that the largest potential for reducing energy emissions comes from reducing the use of petroleum based transport.

Perkins (2002-2003)

- Examined operational and embodied energy of households in a city fringe suburb and inner suburb of Adelaide.
- Perkins surveyed 212 households and collected information about appliances, the physical dwelling, transport use, on-site infrastructure, and socio-economic characteristics of the household.
- Perkins found that per household – the outer fringe households used twice as much energy as their inner city counterparts but this was due to higher transport use in the outer suburb. Other kinds of energy consumption were only slightly higher in the outer suburb.



Perkins (2002-2003)

- Perkins suggests that site area, location, number of shared walls, dwelling type and dwelling energy efficiency rating were the most significant determinants of energy use (particularly operational energy use).
- Interestingly, Perkins found that socio-economic factors, in particular household size, did not show any consistent influence on energy use.

Troy et al (2003)

- Collected measures of embodied and operational energy from existing data sources. They interrogated 3 data sets. Embodied energy was calculated from property/titles information and infrastructure maps. Operational energy was calculated from utility supplier records (i.e., electricity and gas authorities). Characteristics of the households were collected from the Census.
- Selected six case study areas across Adelaide of different built forms and socio-economic profiles. Case study areas were based upon Census collector districts (CDs).

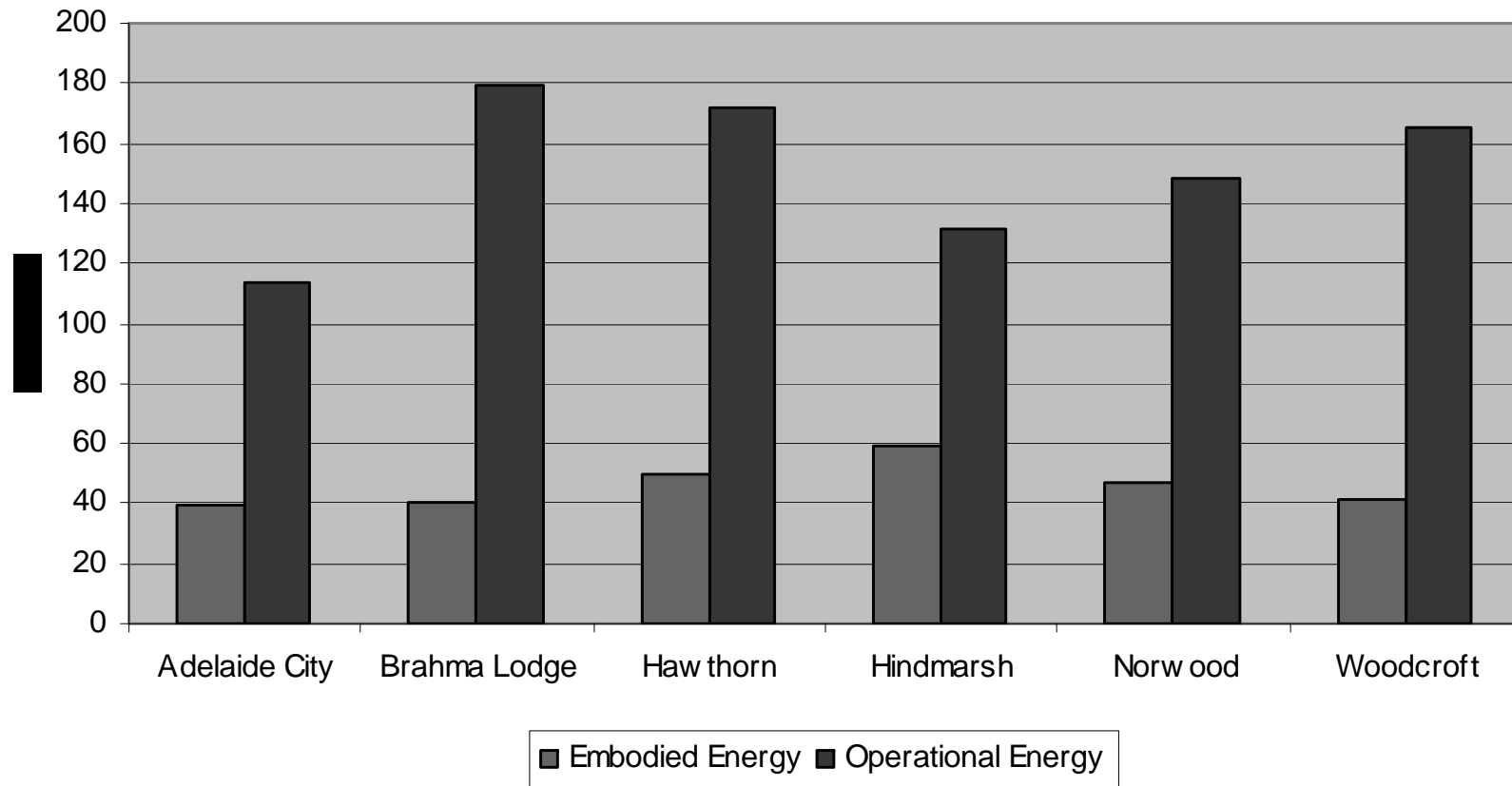
Troy et al (2003)

- Troy et al suggest that energy use is influenced by dwelling size, household size, and the socio-economic character of the areas (in particular income).
- Found that transport consumption and electricity use - operational energy – were significant contributors to household energy use.

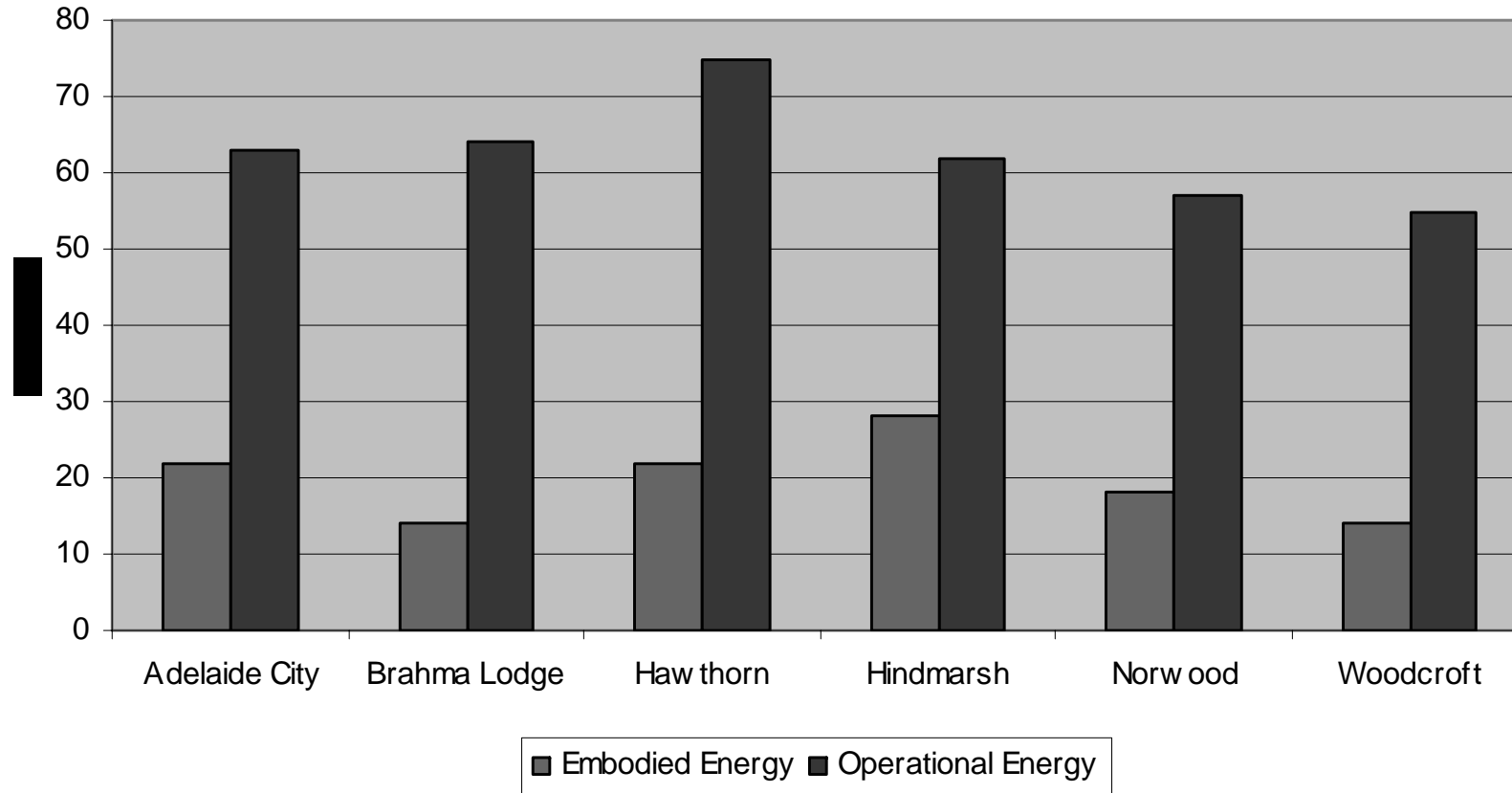
Map of Adelaide Case Study Areas



Annual Embodied and Operational Energy Use per Household



Annual Embodied and Operational Energy per Capita



Further Research

- Needs to be more exhaustive work on the determinants of energy use to better understand the influence of built form and the behaviour of households, and the spatial nature of these influences.
- Important to have desk based information like that employed in the Troy et al study, but also be backed up by on-ground survey work.
- Can be extended to commercial and industrial activities



Policy Implications

- Pricing structures/ Education programs
- Planning tool – appropriate designs and development controls to improve energy use for housing developments and re-developments.
- Broader policies e.g. transport policies
- Spatial based policies
- Evaluation of policies and energy use over time – Troy et al study





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