

RP1017

DEVELOPMENT OF AN EVIDENCE BASED BEHAVIOUR MODEL FOR DWELLING ENERGY CONSUMPTION TO SUPPORT SUSTAINABILITY ASSESSMENT, INFORM BUILDING DESIGN AND POLICY DECISIONS

Research Question

It is salient to understand energy consumption behaviour factors as they contribute significantly to actual energy savings in BASIX compliant dwellings.

Question: How does dwelling energy consumption behaviours contribute to actual energy savings?

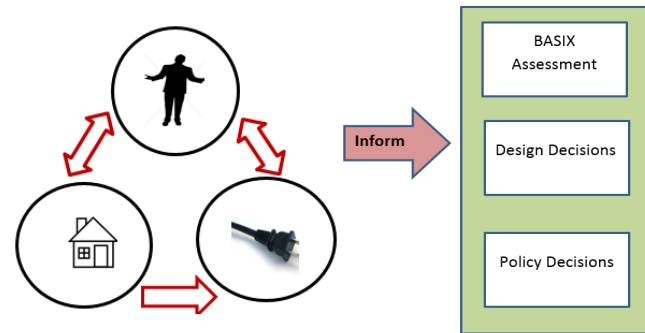
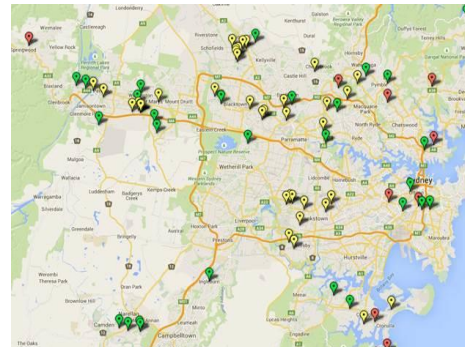


Figure 1: The research outcomes would inform the BASIX assessment, future design & policy decisions.

Survey

- The research survey is in process.
- Survey sample: BASIX compliant houses in Greater Sydney region
- Sample size: 100 single + 30 multi dwellings
- Data are collected through questionnaires, interviews, data loggers, meter readings & building condition information (qualitative and quantitative)



Theoretical Framework

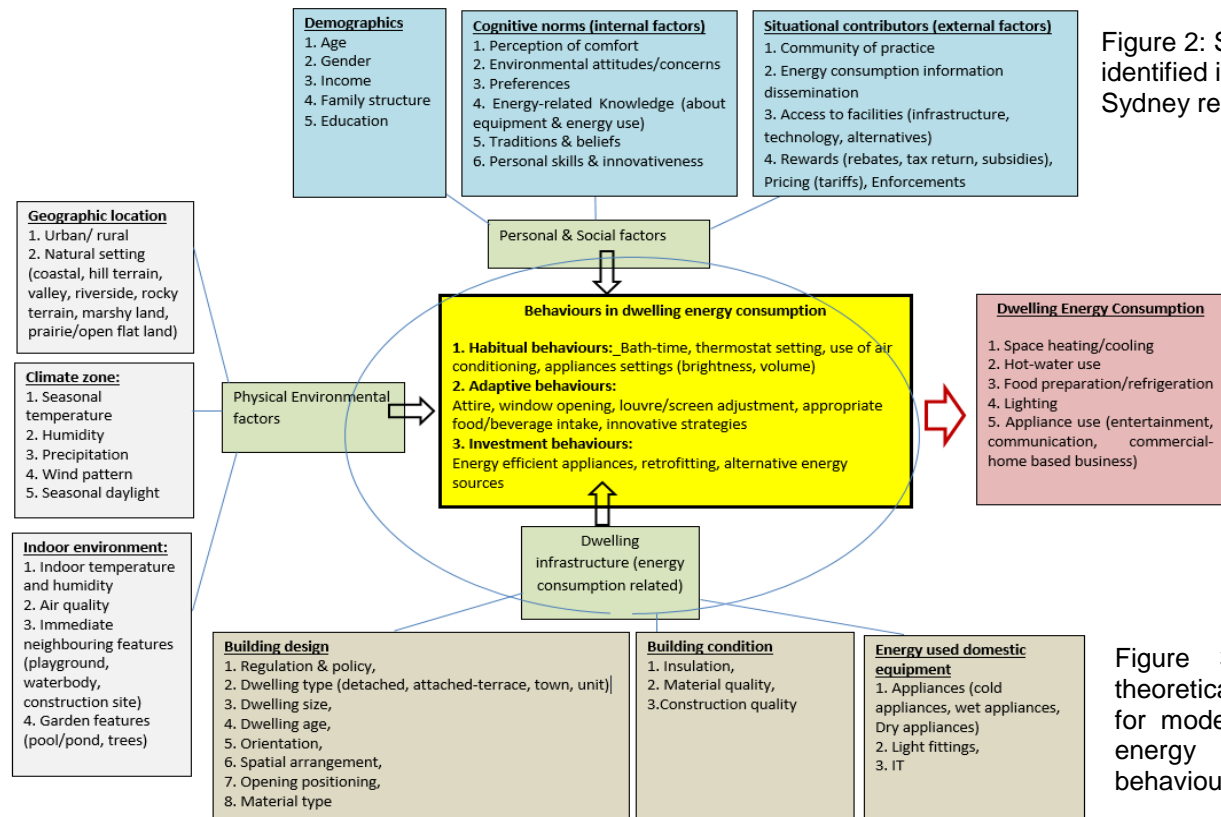


Figure 2: Samples identified in Greater Sydney region

Figure 3: Proposed theoretical framework for modelling dwelling energy consumption behaviour

Drawing insights from theories of environmental psychology and behaviours, a theoretical Framework was developed (Figure 3). It investigates factors affecting dwelling energy consumption behaviours and the **interactions** of such factors on actual energy performance.

The proposed theoretical framework is focussed on the following three main factors:

- Personal and social factors (cognitive norms, situational contributors, demographics)
- Physical and environmental factors (geographic location, climate zone, indoor environment)
- Dwelling infrastructure (Building design, building condition, appliances used)

Research Progress

Interview questionnaire is developed to align with the proposed theoretical framework (Figure 4).

Interview structure for winter data collection (Heating behaviour)	
Question theme	Example questions
A. Perception on thermal comfort	<ul style="list-style-type: none"> • How do you feel in your home during cool seasons without any heating (indoor thermal comfort)? • What actions do you usually take to make yourself more comfortable?
B. Space heating behaviour	<ol style="list-style-type: none"> 1. Heating appliances 2. Design aspects 3. Usage <ul style="list-style-type: none"> • Have you experienced any problem with existing heating system(s)? Have you considered any changes to them? • What are the design features in your house/unit that you are NOT happy with (in relation to thermal comfort and energy savings) and why? • What do you do to make your heating system more efficient? (i.e. seal the room before turning heater on)
C. Adaptive behaviour	<ul style="list-style-type: none"> • What actions do you normally do to stay thermally comfortable at home during a cool day without using a heating system? (E.g. warm clothing, warm food/drinks, hot baths, paste bubble-wrap on windows, etc.)
D. Investment behaviour	<ol style="list-style-type: none"> 1. Upgrade appliances 2. Upgrade design 3. Alternative energy sources <ul style="list-style-type: none"> • Have you or do you want to purchase/upgrade your heating system and/or other household appliances to a higher star rating (i.e. more energy efficient) ones? If so what are your plans and why? • Have you modified or are you planning to modify your house to improve thermal comfort or reduce energy use and greenhouse gas emissions? If so what are your plans and why? • Are you aware of any technologies that can satisfy part of your energy needs at your own home? (Alternative energy sources i.e. solar panels, bio gas, wind power, etc.)
E. Energy related knowledge	<ol style="list-style-type: none"> 1. Knowledge on space heating appliances 2. Knowledge on energy saving techniques <ul style="list-style-type: none"> • What efficient ways to use space heating appliances are you aware of? How have you made use of this knowledge to save energy at home? • What kind of general household energy saving knowledge are you aware of? How have you made use of this knowledge to reduce your energy bill?
F. Government & community	<ol style="list-style-type: none"> 1. Rebates/ rewards/enforcements 2. Community activity <ul style="list-style-type: none"> • Have you utilized any government rebate or subsidies for improving household energy efficiency in your house? What are they? What was the main motive behind this? • What community awareness programs (such as newsletters, media reports, etc.) that explain energy saving strategies attract your attention?

Figure 4: Interview schedule for winter data collection

The evidence based behaviour model would contribute to identifying key influential factors on occupants' energy consumption behaviours that contribute to actual dwelling energy performances.

Methodology

Qualitative analysis methods are under development to generate insights.

Contact

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