Carbon Neutral Adelaide

Scientia Professor Deo Prasad AO
CEO: CRC for Low Carbon Living:
Enabling Low Carbon Buildings, Cities and Communities
11th November 2015

Innovations for a Sustainable Australian Built Environment
Our purpose is to lower the carbon emissions of the built environment while driving the competitive advantage for Australian industry.

Our mission is to engage in collaborative research that provides social and technology solutions and policy evidence, to capture community imagination and facilitate the transition to a lower carbon built environment.
We are committed to three integrated research programs for our research activity and projects:

1. Integrated Building Systems
Developing new low-carbon products and services, and finding ways to communicate best practice design through rating tools, standards and display homes.

2. Low Carbon Precincts
Creating new planning techniques, models and data for delivering low carbon developments at a precinct scale. Communicating best practice in sustainable city planning through precinct design and assessment tools.

3. Engaged Communities
Creating a new community appetite for low carbon living, through strategies for social networking, education and media. Communicating the vision of a prosperous, livable and sustainable society to business and government through living laboratories and economic modeling.

Our projects and activities translate across these eight impact pathways, a journey towards a low carbon economically viable built environment.
How – By Integrating end user response

**Evidence base for ~$1 billion/yr investment in government programs**

**Incubating next generation multi-purpose building products**

**Enabling world class low carbon property development**

**Tools for Australia’s building design services industry**

**Government**
- NSW Government
- Office of Environment & Heritage
- Government of South Australia
- Australian Government
  Department of Climate Change and Energy Efficiency
- City of Sydney

**Manufacturing**
- CSR
- BlueScope Steel
- NOVADeko

**Development**
- Urban Growth NSW
- Building Commission
- Brookfield Multiplex
- BM
- Renewals SA
- People Partnerships Progress
- Government of South Australia

**Professionals**
- AECOM
- Consult Australia
- HASSELL
- Australian Sustainable Built Environment Council
- Australian Institute of Architects

**Manufacturing**

**Development**

**Professionals**
A powerful Industry Network

- CRC engages with many thousands of SMEs through industry bodies
- Two way communication: end user advice, vehicle for implementation
- Led by Professor Ken Maher – Gold Medal winning architect and Chair of Hassell Group
So how have we been progressing broadly ...

- 75 Approved Projects
  - 19 Completed projects
  - 56 Active projects
  - Within these projects, we have 11 Living Laboratory projects
  - 6 projects are in commercialisation/utilisation stages

- We have completed 74 Commonwealth Milestones out of a possible 85
  - This includes completing 15 utilisation milestones
Australia's Post-2020 Emissions Reduction Target: Australia can achieve the 2030 target by improving productivity, reducing costs and through technology.

CRCLCL projected estimates of 87-116MT (Ave 102MT) of Carbon Emissions Reductions by 2030 from its current research activities.

- **National Energy Productivity Plan (energy efficiency)** – Commonwealth target carbon abatement of around 150MT by 2030.

  The CRCLCL recently wrote to Minister Macfarlane, citing examples of how the CRC’s research activities support the actions articulated in the Energy White Paper “Increasing energy productivity to promote growth”.

  With around 50% of our projected carbon saving relate to energy efficiency, the CRCLCL might be able to contribute as much as one third towards this source of emission reduction by 2030.

- **Technology improvements and other sources of abatement** – Commonwealth target abatement of about 200MT by 2030.

  The other half of the CRC’s projected carbon reductions are linked to our research activities in technology improvements, recycling and lowering the embodied carbon in building materials.

  Therefore the CRCLCL might be able to contribute as much as one quarter towards this source of emission reduction by 2030.

*Source: Cwth 2030 Carbon Target presentation, 11 Aug 2015*
Judith Schinabeck and Tommy Wiedmann, University of New South Wales | 11 November 2014

Leading industry organisations AECOM, Aurecon, BlueScope Steel and Sydney Water, in conjunction with research institutions UNSW Australia, the University of Melbourne and the University of South Australia, are collaborating to comprehensively quantify greenhouse gas emissions related to the built environment in Australia. The aim of the project is to identify the main factors responsible for carbon emissions in the design, construction and operation of the built environment. Armed with this information, designers, construction companies and legislators will be able to make evidence-based design decisions on the most effective way to reduce carbon emissions.
Integrated Carbon Metrics – Project Goals

- Enable the analysis of the 'carbon fabric' of the built environment
- Provide data and tools to
  - Assess the carbon performance of precincts and cities
  - Quantitatively evaluate low-carbon scenarios
Levels of Carbon Emissions and ICM Tools

- Industry sectors
- Precinct, city
- Buildings
- Building materials
- Precinct, city
- Scenario analysis
- Precinct carbon app
- Project analyser
- LCI database
- Product explorer
- City carbon map

11/12/2015
Carbon Neutral Adelaide

C embodied in services

C embodied in materials

C embodied in equipment (capital goods)

Operational C

C embodied in electricity

C embodied in transport
Integrated C Metrics for Adelaide 1: "City Carbon Map"

**Carbon Map of the City of Adelaide**

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<th>ORIGIN: Emissions from industries</th>
<th>DESTINATION: Emissions embodied in products</th>
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**Total carbon footprint of Adelaide City:**
1.1 Mt CO$_2$e

11/12/2015
Integrated C Metrics for Adelaide 2: Precinct Modelling

Precinct (Re)Development Scenarios & Data

- Urban densification
- Mixed use (retail, car parking, offices, apartments)
- Transport-oriented development
- Inner-city renewal (utilising existing buildings)

Precinct Life-cycle Energy & Emission Modelling Tool

- Precinct Energy Management System
- Energy Intensity
- Requirements
- Solar Simulation
- Operational Energy
- Recurrent Energy

Precinct Scenario Analysis and Planning

- Precincts Annual Capita Energy Consumption
- Precincts Annual Energy Off-set

- Embedded Energy Consumption
- Operational Energy Consumption
- Travelling Energy Consumption
- Total

- Solar hot water
- PV electricity
- Total

Low Carbon Living CRC
ICM Tools for Planning Carbon Neutrality
Standards for City GHG Accounting

PAS 2070:2013
Specification for the assessment of greenhouse gas emissions of a city
Direct plus supply chain and consumption-based methodologies

GLOBAL PROTOCOL FOR COMMUNITY-SCALE GREENHOUSE GAS EMISSION INVENTORIES (GPC)
Draft Version 2.0 – July 2014
Scopes for City GHG Accounting

**Scope 1:** All GHG emissions from sources located **within** the boundary of the city

**Scope 2:** All GHG emissions occurring as a consequence of the use of grid-supplied **electricity**, heating and/or cooling within the city boundary

**Scope 3:** All other GHG emissions that occur **outside** the city boundary as a result of activities within the city’s boundary
PROJECT SUMMARY
The aim of this research is to identify the best suited building typologies for PV-T systems and to determine the air transport solutions which provide the greatest benefit at the minimum running cost and energy consumption for the PV/T roofing in various climates of Australia. A major project aim is integrate a PVT air system with the heating ventilation and air conditioning (HVAC) system of two real buildings.

PROJECT OUTCOMES
The outcome of this study will support the commercial implementation of PVT air systems in buildings in Australia either as stand alone systems, or as a supplement to conventional HVAC systems. Given that the project will be specific to PVT in Australia and be premised on the thermal constraints and design of the BlueScope Steel PVT system, BlueScope Steel will lead utilisation of the project IP.
RP1012 Next generation low-emissivity pliable membranes for moisture management in building construction (Stage 1 of 3)

PROJECT SUMMARY
The project addresses emerging moisture management and condensation risk in Australian buildings. The potential moisture damage to homes is on a national scale and has been closely identified with increased standards for home insulation. Without adequate moisture management, the energy-efficiency gains from increased thermal insulation cannot be realized as the performance of most insulation is compromised by dampness.

PROJECT OUTCOMES
The research outcome will include development of the next-generation of low-emissivity pliable membranes for moisture, both liquid and vapour management. Without adequate moisture management in design and construction, the energy-efficiency gains from increased thermal insulation cannot be realized as the performance of most insulation is compromised by dampness. This project aims to provide the necessary technical evidence and design guidelines for the Australian building industry to incorporate appropriate moisture management systems in high performance, low carbon buildings in order to deliver long lasting, low carbon outcomes.

Water vapour moves from regions of high vapour pressure into regions of low vapour pressure.
**PROJECT SUMMARY**
This project is designed to develop a shared platform for integrated ETWW (energy, transport, waste and water) demand forecasting and scenario planning under low carbon futures. It has a focus on synergies, alternative approaches, gaps and required research directions.

**PROJECT OUTCOMES**
Objectives include the development of integrated tools for demand forecasting and scenario evaluation covering ETWW with identified commonalities in data requirements and model formulation. An integrated framework for demand forecasting be fully developed and implemented with inclusions for the impacts of household behaviour change in demand forecasting at the precinct level. In this way the overall carbon impacts of urban developments or redevelopments can be assessed effectively and efficiently by the end user.
This project aims to reduce the carbon intensity of infrastructure projects by trialing the inclusion of carbon reduction constraints in the tender requirements of various State Government agencies responsible for development of the built environment.

The living laboratories will focus on identifying suitable potential new tender clauses and road-testing these with the supply chain to identify barriers and benefits to enhance their uptake. The project will then assist the trialling of such clauses, and the response from the supply chain, to increase low carbon outcomes of projects. The project will be a valuable showcase of the use of tender requirements to support low carbon procurement and provide insightful and operational 'living laboratories'.
Solar PV Status Map

- PV installation density by postcode
- PV capacity by postcode
- PV installation density by LGA
- PV capacity by LGA
- PV installation density by electorate (QLD)

5235 (Cromer, Eden Valley, Flaxman Valley, Mount Pleasant, Springton, Taunton)
Est. dwellings: 826
Installations: 434 (approx. 50.7% of dwellings)

Total installed capacity: 1448 kW
Domestic capacity: 1261 kW
Commercial capacity: 187 kW