



## **CRC for Low Carbon Living, Project RP2005**

### **Minutes of Meeting - Workshop #3, 26 September 2014**

#### **'Urban Microclimates- Comparative study of major contributors to the Urban Heat Island effect in three Australian cities: Sydney, Melbourne, Adelaide'**

#### **CRC-LCL, Project RP2005: Urban Microclimates- Comparative study of major contributors to the Urban Heat Island effect in three Australian cities: Sydney, Melbourne, Adelaide**

**Participation** – see record of attendance – page 5.

#### **A. Introduction**

- Lu Aye, The University of Melbourne (MC for the day) welcomed participants to the meeting
- Participants introduced themselves and their organizations.
- John Boland, the Project Leader, gave an overview of the day's program.
- Conrad Philipp, (Post doc Research Fellow) updated on progress with the project
  - Next step is to promote the project with joint conferences
  - A booklet (almost complete) will be circulated to the team at the end of next week
  - A slide was presented listing conferences visited in Australia and overseas
  - Urbanclimates.org – website is updated weekly since it was set up in July

#### **B. Post-doc and PhD Project Presentations Overview**

##### **1. Gertrud Hatvani-Kovacs (UniSA, PhD candidate)**

##### **Urban microclimates: retrofitting Australian precincts for heatwave resilience**

- Issue – Urban heatwaves: urban heat island and heatwaves are an important issue because of the high level of urbanisation.
- Problem – negative consequences of heatwaves – for example, inappropriate material used have indirect consequences.
- Literature review – Heatwave resilience and how to measure the intensity of heatwaves. Noted there is a direct link between mortality and EHF. Two vulnerability maps were presented. More space for research in this area. Climate conditions differ across different parts of the city.
- Research gaps – six listed.
- Research Method – five case study areas - selected areas with low and high incomes.
- Locations – three in Adelaide and two in Sydney.
- UHW impact indicators - Health, Energy, Water, Opinion, Traffic.
- Precinct Resilience and influential factors – mitigation, adaptation, population and precinct
- Retrofitting tool kit

**2. Judy Bush (UoM, PhD candidate)**

**Urban greenery and mitigation of the urban**

- Mitigating the urban heat island effect with greenery in Australian cities
- Started the project six months ago - spending time scoping this and the data to be collected.
- Aims to identify policy for retaining and maximising urban greenery
- Framing the research question into 3 elements
  - urban heat island and greenery
  - urban greenery and policy – needed to expand urban greenery - will put together policy framework (talked about at the February workshop)
  - policy and communication
- Theories of sustainability transitions – aim to explain process, pathways and actions. Research here is relatively new. Has been little work on how transition theories can be applied in practice and interested in looking at this.
- Progress to date – undertaking subjects and short courses. Journal article submitted. Doing a subject in public policy and developing a pilot research project – will use results to inform further research. Undertakes confirmation in late October/early November.

**3. Jonathon Fox – (UNSW, PhD candidate)**

**The Effect of Facades on Outdoor Microclimate**

- Perspective from an Architect.
- Focus - urban microclimates and materials.
- Physical Basis for Urban Effects – surface properties play a vital role.
- Surface Energy Balance equation.
- Urban structure cover and fabric regulate the efficiency
- Can modify micro climate if we can modify the materials.
- Problem – individual buildings create the urban climate – architects need tools - Gaps in Application – vertical surfaces are underrepresented.
- Significance of Vertical Surfaces – Example in London when car melted
- Impact of green facades – many benefits
- Research includes assessment of green facades
- Ask - what aspects of the façade make it warm and hot?
- Subordinate Research Domains – physics of materials – challenges around the observations
- Presented summary of variables
- Data Acquisition - listed independent variables and the equipment sources used.

**4. Lu Aye – presented on behalf of David Fowler (UoM, Master Candidate)**

**Urban Street Canyon impacts on the Cooling Effect of Vegetation**

- Gave overview of minor thesis
- Focussed on green space and building height street width ratio
- Looked at narrow streets and tall building, but will also look at large scale issues
- Quantification of green space and vegetation
- Based on weather station data (sixteen in Melbourne) and spatial domain in wider Melbourne
- Follow up should be made directly with David Fowler on any questions
- Paul Osmond (question) - Has David reviewed the work of Matthia' PhD thesis in UNSW – strong overlap? Lu Aye will follow up.
- What are the specifics of the vegetation - trees, greenery? Lu to provide David's report for more detail

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- Graeme Hopkins noted that he was involved in a survey with the Victorian Government

**5. Ehsan Sharifi (UniSA, PhD candidate)**

**Thermal Resilience: A New Logic for Urban Greenery**

- UHI behaviour in three Australian Cities – issue of temperature across the city
- Melbourne UHI winter – looked at 9 weather stations and at conventional behaviours
- The mechanism of the UHI effect is not as we expected in Australian Cities
- PhD thesis – about what is happening inside the heat island and effects on people's behaviour – outdoor and physical attributes
- Spatial Thermal Resilience and Urban Greenery – need a different benchmark related to people
- Found in Sydney that there are closer temperature ranges, but others have a wider range of temperatures.
- Scattered greenery keeps the temperatures closer to the mean which was common to Adelaide, Sydney and Melbourne
- Benchmark could be a thermal resilience by users of the space.

**6. Conrad Philipp (UniSA Post doc Research Fellow)**

**Land Surface temperature investigation of Australian CBD and suburbs: Case Study  
Adelaide**

Background in geography

- Started with Adelaide and can extend to Melbourne and Sydney
- Question – What are the thermal conditions of the CBD of Adelaide compared to the suburbs?
- Overview how to measure the surface temperature – eg. Drones, handheld thermal cameras, satellite
- Undertook case study on urban heat analysis of informal settlements within Cairo
- Coverage of Landsat 7 in Adelaide
- Weather balloon data is important in the investigation of aerial conditions
- Looked at temperature and humidity as basic parameters for thermal calculations.
- Used GIS to measure heat spread in Adelaide (some suburbs hotter than the CBD – 24% of inhabitants)
- Could use this technique to calculate impact
- Spent three years to create a method to measure the surface temperature
- Investigation into seasonal difference as well.

**7. Graeme Hopkins (Fifth Creek Studio, external researcher)**

Practitioner and Researcher – normally funds own research

- **White roofs versus green roofs**
- Explored white roofs for their effectiveness
- They behaved in different ways for different cities
- Study - Walmart Big Boxes Building show that green roof compared to white roof save 1-6% energy and costs 45% less.
- Need to also look at both studies
- Solar Radiation – need to also look at paving, as well as roofs
  
- **Living walls**
- Urban canyons/geometry - air patterns for removal of pollutants
- Air flow patterns in urban canyons – caused by heating.

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- Living architecture technology can be used effectively – e.g. the deeper the urban canyon, the greater the removal of the pollutants. Trees can hold pollutants in, however, if there is a deep canyon, may not solve the problem.
- Can look at the public realm – e.g. constructed trees in Singapore.
- Combined with urban geometry, can design areas – built form as a Climate Change mitigation device - Urban Cool Island Effect

#### **8. Geoff Smith (UTS Sydney, external researcher)**

##### **Low cost, easily deployed thermal radiation data collection and urban thermal model**

- What is reflected goes into outer space
- Goals including accurate simulation of night time cooling rates and heat storage
- Cheap ways to monitor IR radiation
- Green walls and cool roofs
- Surface temperatures and thermal mass: metal roof, coatings large difference
- Also Studying UHI - Interested in how fast things cool as well as how hot they get.
- UHI Control: high or low thermal mass? Looked at the UTS building.
- Directional pyrgeometers – 6 degrees half-angle field-of-view
- Cost is important - Sky radiation data for \$20 versus \$7,000 (accurate x 4, \$100!)
- Some of the cheapies are limited, but can get by on this.
- Extracting the incoming thermal radiation  $P_{in}$  – thermopile basics
- The “representative angle”
- RT Accuracy statistics and sky conditions
- Average difference (standard deviation) Pyrgeometer reading
- Comparison modelling with IRT data versus PYG

#### **9. Sharolyn Anderson (UniSA, external researcher: Non-CRC)**

##### **Mapping the Green Infrastructure of the Greater Adelaide Area**

- Will go beyond green space and talk about green infrastructure
- Definition from Botanic Gardens – describes the network of green spaces and water systems
- Benefits of green Infrastructure
- Climate change adaptation and mitigation.
- Question - Where is the green infrastructure?
- Have images which tell you how green is green (picks up green vegetation)
- Goal - to map the green infrastructure. Looked at the Liverpool study.
- Mapping the green infrastructure
- Focused her presentation on evaporative cooling – two ideas shade or evaporative cooling
- Evapotranspiration for Urban Heat Island Mitigation
- ET Cooling as a Functional Surface in UGI Mapping
- Grass decreases surface temperature
- Questions - natural (native plants) environments do not transpire during the day. Why use a plant system using a lot of water in a built up area? Need transpiring plants that cool during the day for urban environments. Need to put in, say, recycled water.

**C. People moved around and provided feedback to PhD candidates.**

**D. Project Steering Committee (PSC) meeting: CRC project report, milestones, project structure, industry/government stakeholder updates**

Chair: Gail Hall

**Record of Participation**

No.	Attendance	Given	Family	Organisation
1	Yes	Jamie	Adams	BlueScope Steel
2	Yes	Sharolyn	Anderson	University of South Australia
3	Yes	Lu	Aye	The University of Melbourne
4	Yes	John	Boland	University of South Australia
5	Yes	Judy	Bush	The University of Melbourne
6	Yes	Christine	Charman	The University of Melbourne
7	Yes	Robert	Crocker	University of South Australia
8	No	Tom	Cole	CRC-LCL
9	Yes	Jonathan	Fox	UNSW
10	Yes	Gail	Hall	City of Melbourne
11	Yes	Gertrud	Hatvani-Kovacs	University of South Australia
12	Yes	Graeme	Hopkins	FifthCreek, Adelaide
13	From 2.30pm	Yvonne	Lynch	City of Melbourne
14	From 12.30pm	Peter	Newton	SwinU
15	No	David	Nolan	BlueScope Steel
16	Yes	Paul	Osmond	University of New South Wales
17	Yes	Conrad	Philipp	University of South Australia
18	Yes	Brett	Pollard	Hassell, Sydney
19	Until 12.30pm	Tom	Roper	ASBEC
20	Yes	Ehsan	Sharifi	University of South Australia
21	Yes	Lucy	Sharman	City of Sydney
22	Yes	Geoff	Smith	University of Technology Sydney
23	Yes	Paul	Smith	City of Adelaide
24	Yes	Susan	Thompson	University of New South Wales
25	No	Matthew	Waltho	DMITRE

Draft minutes finalised on 2 October 2014  
Draft minutes distributed for feedback on 4 October 2014  
Minutes finalised on 17 October 2014