Enabling Carbon Reductions through Composting Food Waste for Food Production: fitting recycling models to urban forms

Prepared by Dr Vivienne Waller
Swinburne University of Technology
for 1st Steering Committee
Friday, 18 December 2015

The research project, *Enabling Carbon Reductions through Composting Food Waste for Food Production: fitting recycling models to urban forms,* will compare different models of on-site composting with off-site composting in different types of precinct in terms of GHG reductions, microbial ecology and people's engagement with the food separation process and use of the compost

Currently, 95% of the food waste generated in Victoria is sent to landfill.

Food waste constitutes roughly half of municipal waste that goes to landfill.

In 2012, net emissions from landfill in Australia comprised at least 1.6% of Australia's total GHG emissions for 2012.

In Victoria alone, in 2010-11, 832,000 tonnes of food waste were sent to landfill at a cost of more than $50 million in annual landfill levies.

Producing compost for growing food is the best and highest use of inedible food waste.

Benefits of producing compost for growing food	Relevant areas:
• Reduce need for landfill	WASTE MANAGEMENT
• Improve water retention in soil	WATER USE
• Improve soil quality	SOIL CONDITION
• Promote higher yields of crops	FOOD SECURITY
• Reduce or eliminate the need for synthetic fertilizers, herbicide and fungicide	HEALTH
• Bioremediation (ie decontaminate soil)	ENVIRONMENT/CLIMATE CHANGE
• Reduce greenhouse gases	

Other benefits can include:

• Community building	SOCIAL
• Commercial value of compost	
• Cost savings	ECONOMIC
• Commercial value of carbon storage under Carbon Farming Initiative	

The research challenge
The achievements of large, high density cities (such as Portland, San Francisco and Vancouver) prove the success of offsite composting for diverting food waste from landfill. What is not known, however, is how different systems for onsite composting compare with offsite composting in terms of GHG reductions, compost quality and people's engagement and satisfaction with how their food waste is dealt with. As cities throughout Australia consider alternatives to landfilling food waste, the need for this information becomes more critical.

The onsite composting pilots range across different types of urban precinct and use either in-vessel composters or Hungry Bin Worm farms. The models of onsite and offsite composting will be compared in three different work domains looking at:

1) ***Which is more effective in reducing GHG?***
The UNISA team will focus on two aspects of the project. One involves the specific modelling of the uptake of carbon by the soil via various composting routes. The other is the use of Input-Output analysis to estimate the whole of economy effects of diverting food waste through composting. This will give the total carbon benefits, not just the uptake in soils. A specific critical research challenge is to actually marry up the predicted effects of the different compost methods in reduction of GHG with actual results from on ground trials, and learn from any discrepancies in order to improve implementation of the preferred method. The modelling aspect of the research will quantify the benefits of the two forms of onsite composting, worm farms and in-vessel system, versus transporting the food waste away and then transporting compost back.

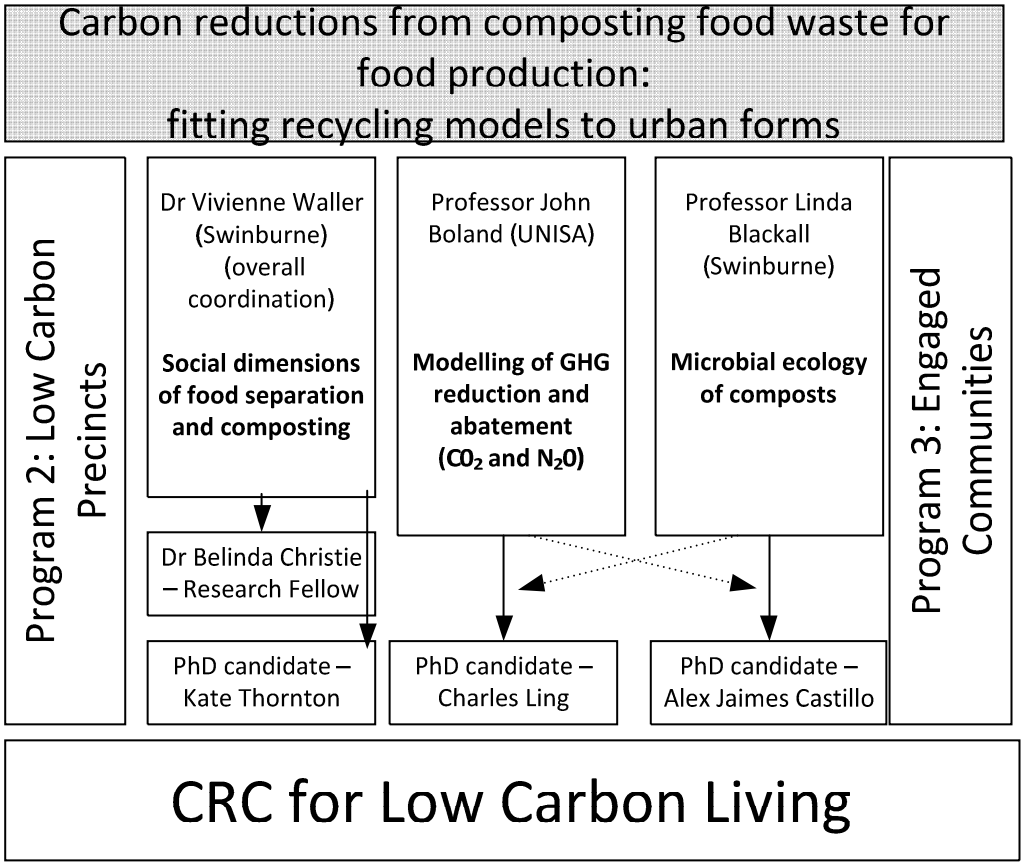
2) ***Which results in the better compost product?***
The microbial ecology of various composting materials, from household, through community to council/city level will be studied. Lab and pilot-scale solid waste bioreactors (e.g. Closed Loop's Cloey; Hungry Bins; Osca) will be set up and the feed, bioreactor contents and final product will be chemically (including gas volume and composition determination during processing) and biologically analysed. Modern molecular ecological methods including high throughput DNA sequencing, metabolomics and bioinformatics will be used to understand the indigenous microbes and bioprocesses involved in organic waste composting. A critical element of the research will be to determine the incidence and types of health related bacteria in compost and, if present, to develop mitigation strategies for these organisms from finished compost. The nutritive value of the final product will also be ascertained.

3) ***Which is more successful in terms of people's engagement?***
The sociological component examines the social dimensions of engagement with food separation, composting and compost use. Case study methodologies will be employed at each pilot site, including observations of systems, interviews and focus groups with those required to separate their food waste, those directly involved in composting and end users of the compost product. A quantitative survey will be undertaken of residences provided with a combined food and green waste bin for kerbside collection. Research pilots will be also be compared with similar existing sites where food waste is separated and collected for off site composting by a commercial waste operator.

The three distinct work domains of the project complement each other in contributing to a clearer picture about the environmental, social and economic co-benefits of using food waste to generate compost for food production, under various scenarios applied to different types of urban precinct.

The project will help businesses, residents and government to achieve low carbon living with respect to management of food waste. All of the models of food waste management that are being piloted in this project are scalable.

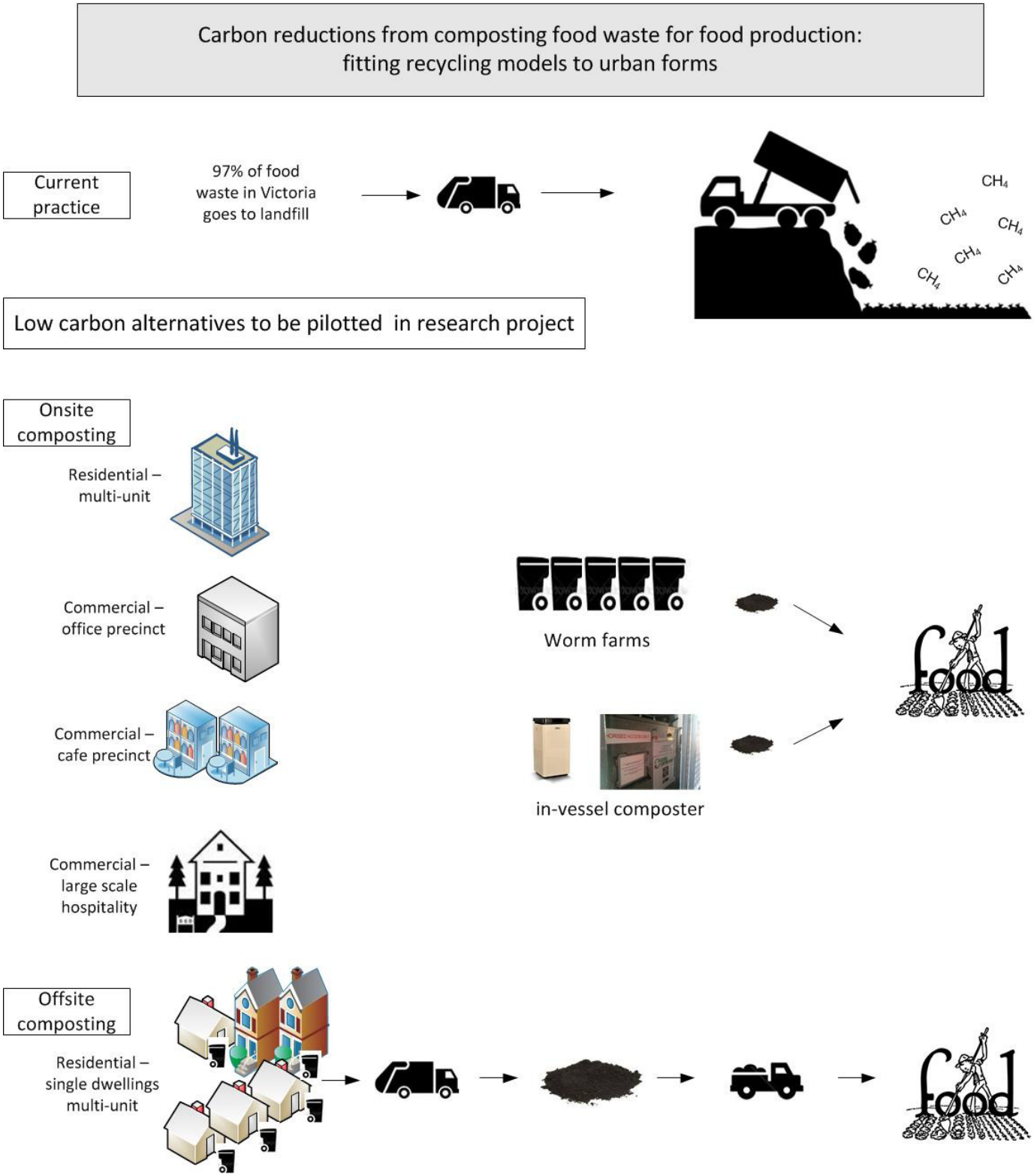
The organizational structure of the project is depicted in the following diagram:



Project Strategy

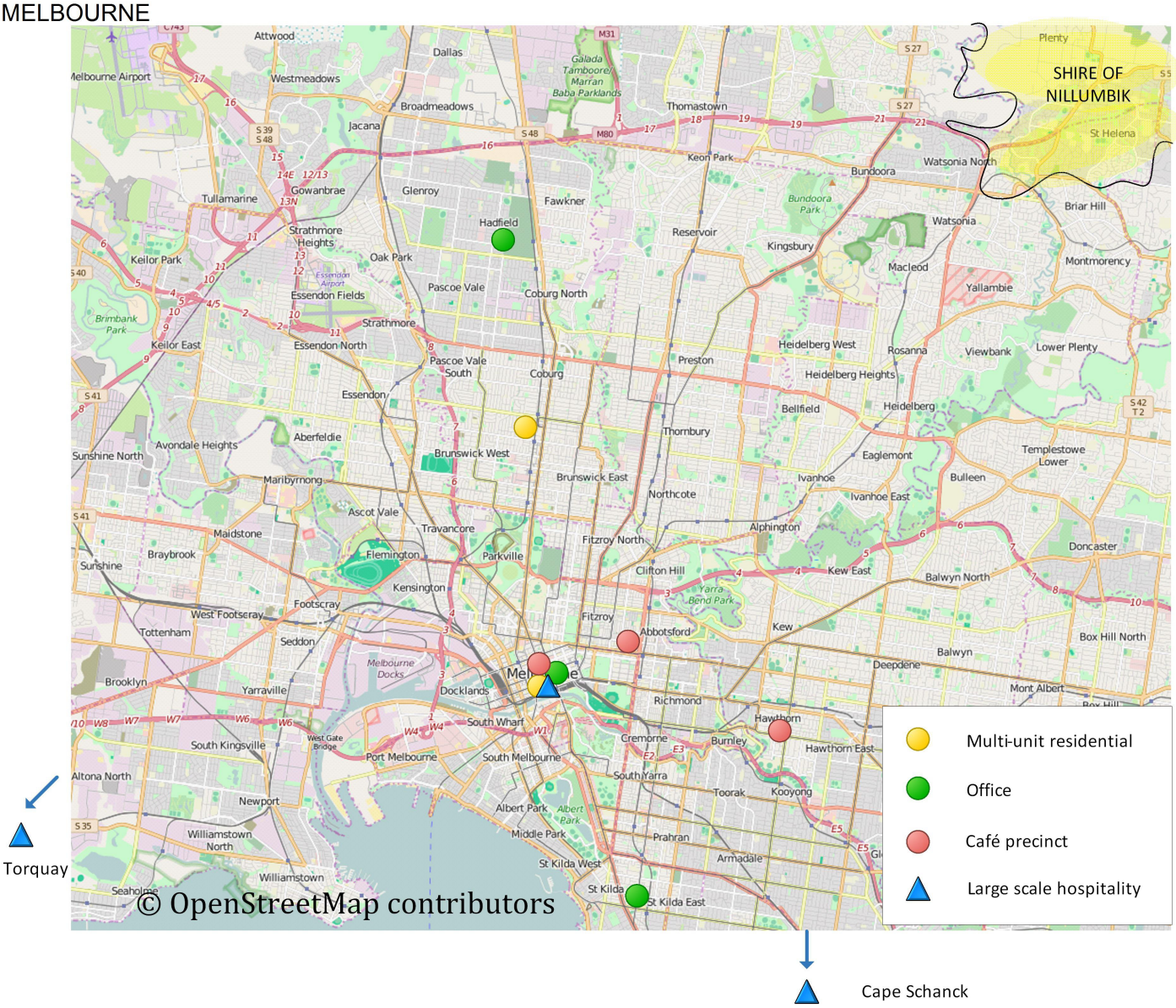
Central to this research project is the real world piloting of models of onsite and offsite composting of food waste in different types of precincts. The proof of concept built into the project will, in combination with the GHG modeling and case study methodology, provide a clear pathway for utilization of the research outcomes by other councils, the construction industry and businesses producing food waste.

The following diagram depicts the models to be piloted in the research project.

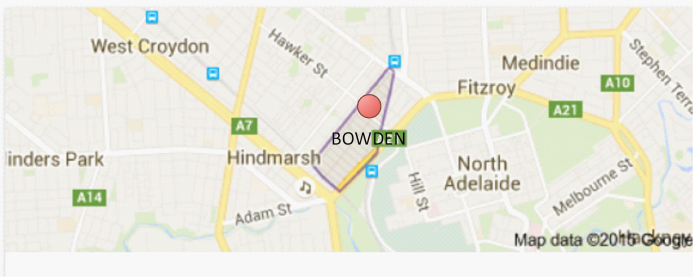


MAP OF RESEARCH SITES AS AT 16 DECEMBER 2015

MELBOURNE



ADELAIDE



Fieldwork, analysis, and tracking of research pilots will continue throughout 2016 and 2017.

Key Deliverables from the project include:

- A website tracking progress of the research - ongoing
- A short film on the various composting solutions (November 2017)
- An integrated decision tool to inform future low-carbon design of precincts (August 2018)
- A practical handbook of food separation and composting solutions for different types of urban form, based on the research findings (August 2018)
- A national symposium tailored to waste management and sustainability areas of government and business (September 2018).

MORE INFORMATION:

Contact: Dr Vivienne Waller
Swinburne University
(03) 9214 5752
vwaller@swin.edu.au

Website: www.foodcompostfood.org

Instagram: @foodcompostfood

Like: www.facebook.com/foodcompostfood