AUSTRALIAN RESEARCH COUNCIL
Linkage Projects
Proposal for Funding Commencing in 2017

LP

PROJECT ID: LP170100315

First Investigator: Dr Marcus White

Admin Org: The University of Melbourne

Total number of sheets contained in this Proposal: 205

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Certification

Certification by the Deputy/Pro Vice-Chancellor (Research) or their delegate or equivalent in the Administering Organisation

I certify that—

- I have read, understood and complied with the ARC *Funding Rules for schemes under the Linkage Programme (2016 edition)* (the Funding Rules) and to the best of my knowledge all details provided in this Proposal form and in any supporting documentation are true and complete in accordance with these Funding Rules.
- Proper enquiries have been made and I am satisfied that the Participants and the organisations listed in this Proposal meet the requirements specified in the Funding Rules. I will notify the ARC if there are changes to any named Participant or organisation after the submission of this Proposal.
- To the best of my knowledge, all Conflicts of Interest relating to parties involved in or associated with this Proposal have been disclosed to this Administering Organisation, and, if the Proposal is successful, I agree to manage all Conflicts of Interest relating to this Proposal in accordance with the *Australian Code for the Responsible Conduct of Research* (2007).
- The listed Participants are responsible for the authorship and intellectual content of this Proposal, and have appropriately cited sources and acknowledged significant contributions to this Proposal.
- I have obtained the agreement, attested to by written evidence, of all the relevant Participants and organisations necessary to allow the Project to proceed. This written evidence has been retained and will be provided to the ARC if requested.
- This Proposal complies with the eligible research requirements set out in the ARC Medical Research Policy located on the ARC website.
- This Proposal does not duplicate Commonwealth-funded research including that undertaken in a Commonwealth-funded Research Centre.
- If this Proposal is successful, I am prepared to have the Project carried out as set out in this Proposal and agree to abide by the terms and conditions of the Funding Rules and the ARC *Funding Agreement regarding funding for schemes under the Linkage Programme (2016 edition).*
- The Project can be accommodated within the general facilities in this organisation and, if applicable, within the facilities of other relevant organisations specified in this Proposal, and sufficient working and office space is available for any proposed additional staff.
- All funds for this Project will only be spent for the purpose for which they are provided.
- The Project will not be permitted to commence until appropriate ethical clearance(s) has/have been obtained and all statutory requirements have been met.
- I consent, on behalf of all the parties, to this Proposal being referred to third parties, who will remain anonymous, for assessment purposes.

Part A - Administrative Summary (LP170100315)

A1. Proposal Working Title

(Provide a short working title of no more than 75 characters (approximately ten words). Avoid the use of acronyms, quotation marks and upper case characters.)

A multicriteria design platform to enhance active school trips

A2. Person Participant Summary

(Add all people participating in this Proposal as a Chief Investigator or Partner Investigator. Note that a person's RMS email address must be used to invite them to participate in this Proposal. Click on the information icon or refer to the Instructions to Applicants for further information.)

Number	Name	Participant Type	Current Organisation(s)	Relevant Organisation
1	Dr Marcus White	Chief Investigator	The University of Melbourne	The University of Melbourne
2	Prof Mark Stevenson	Chief Investigator	The University of Melbourne	The University of Melbourne
3	Dr Dominique Hes	Chief Investigator	The University of Melbourne	The University of Melbourne
4	A/Prof Stephen Livesley	Chief Investigator	The University of Melbourne	The University of Melbourne
5	A/Prof Wesley Imms	Chief Investigator	The University of Melbourne	The University of Melbourne
6	Dr Robyn Schofield	Chief Investigator	The University of Melbourne	The University of Melbourne

A3. Organisation Participant Summary

(Add all organisations participating in this Proposal. Click on the information icon or refer to the Instructions to Applicants for further information.)

Number	Name	Participant Type
1	The University of Melbourne	Administering Organisation
2	TRANSPORT ACCIDENT COMMISSION	Partner Organisation
3	KENSINGTON PRIMARY SCHOOL	Partner Organisation
4	ASPECT STUDIOS PTY LTD	Partner Organisation
5	MOVENDO PTY. LTD.	Partner Organisation
6	NH ARCHITECTURE PTY LTD	Partner Organisation
7	PCA ARCHITECTS	Partner Organisation
8	City of Maribyrnong	Partner Organisation
9	stella maris catholic primary school	Partner Organisation
10	SOUTH MELBOURNE PRIMARY SCHOOL - FERRARS STREET	Partner Organisation
11	VicRoads	Partner Organisation
12	WYNDHAM CITY COUNCIL	Partner Organisation

A4. Proposal Summary

(Provide a written Proposal summary of no more than 750 characters (approximately 100 words) focusing on the

aims, significance, expected outcomes, benefits and impacts of this Project. Avoid the use of acronyms, quotation marks and upper case characters. Please click on the information icon or refer to the Instructions to Applicants for further information.)

Declining rates of active school journeys correspond to a growing prevalence of physical inactivity and increasing levels of obesity; obesity is a leading cause of premature death and illness in Australia at a cost of over $55 billion per annum. Reversing the inter-generational trend of inactivity requires a radically different strategic approach.

The proposed research project aims to quantify the environmental factors that facilitate the desirability of making active journeys, including pedestrian accessibility, topography (steepness), thermal comfort, pedestrian risk, and pollution, and provide a decision support system to enable systematic evaluation of existing urban areas and future design scenarios to enhance active journeys.

A5. Impact Statement

(In no more than 500 characters (approximately 75 words), outline the intended impact of the Project. Click on the information icon or refer to the Instructions to Applicants for further information.)

This project will provide an important insight into key environmental factors associated with active school journeys. Importantly, it will develop a decision support tool that will enable systematic evaluation of such factors thereby enabling local councils, policy decision makers, urban designers, schools, parents and children to understand, design, and redesign urban areas that promote higher levels of active school journeys, thereby enhancing the likelihood of childhood physical activity.

A6. Is this Proposal similar to a previously submitted unsuccessful Proposal in the LP17 round?

(The ARC would consider a Proposal to be similar if the aims and methodology of the Project Description and Participants have not substantially changed.)

No

A7. Please provide the Proposal ID and detail how this Proposal differs from the previous Proposal.

(For each of the unsuccessful proposals submitted in the LP17 round, please enter the Proposal ID and describe in no more than 750 characters (approximately 100 words), how the current Proposal differs from the previously submitted proposals.)

Part B - Classifications and Other Statistical Information (LP170100315)

B1. Does this Proposal fall within one of the Science and Research Priorities?

Yes

Science and Research Priority	Practical Research Challenge
Environmental change	Resilient urban, rural and regional infrastructure.

B2. Field of Research (FOR)

(Select up to three classification codes that relate to your Proposal. Note that the percentages must total 100%. Click on the information icon for further information.)

Code	Percentage
120507 - Urban Analysis and Development	40
120508 - Urban Design	30
120599 - Urban and Regional Planning not elsewhere classified	30

B3. Socio-Economic Objective (SEO-08)

(Select up to three classification codes that relate to your Proposal. Note that the percentages must total 100%. Click on the information icon for further information.)

Code	Percentage
889899 - Environmentally Sustainable Transport not elsewhere classified	45
880106 - Road Infrastructure and Networks	35
880109 - Road Safety	20

B4. Interdisciplinary Research

(This is a 'Yes' or 'No' question. If you select 'Yes' two additional questions will be enabled:
1. Specify the ways in which the research is interdisciplinary by selecting one or more of the options below.
2. In no more than 375 characters (approximately 50 words), indicate the nature of the interdisciplinary research involved.)

Does this Proposal involve interdisciplinary research?

Yes

Please specify the ways in which the research is interdisciplinary by selecting one or more of the options below.

Investigatory Team
Methodology

In no more than 375 characters (approximately 50 words), please indicate the nature of the interdisciplinary research involved.

This research project brings together, for the first time, the disciplines of transportation (road safety- pedestrian risk), climate science (pollution and human thermal comfort), and urban design (topography and transport network connectivity). These disciplines bring an insight to the challenge of designing healthy, livable built environments that is unique.

B5. Does the proposed research involve international collaboration?

(This is a 'Yes' or 'No' question. If you select 'Yes' two additional questions will be enabled:

1. Specify the countries which are involved in the international collaboration.
2. Specify the nature of the proposed international collaboration by selecting one or more of the options below.)

No

B6. If the proposed research involves international collaboration, please specify the country/ies involved.

(Commence typing in the search box and select from the drop-down list the name of the country/ies of collaborators who will be involved in the proposed Project. Note that Australia is not to be listed and is not available to be selected from the drop-down list.)

B7. What is the nature of the proposed international collaboration activities?

(Select all options from the drop down list which apply to this Proposal by clicking on the 'Add' button each time you select an option.)

B8. How many PhD, Masters and Honours places will be filled as a result of this Project?

(The ARC is interested in reporting the number of Research Students that would be involved in this Proposal if it is funded. Enter the number of student places (full-time equivalent) that will be filled as a result of this project:)
Number of Research Student Places (FTE) - PhD

0

Number of Research Student Places (FTE) - Masters

0

Number of Research Student Places (FTE) - Honours

0

Part C - Project Description (LP170100315)

C1. Project Description

(Please upload a Project Description as detailed in the Instructions to Applicants in no more than eight A4 pages and in the required format.)

Uploaded PDF file follows on next page.

Project Title: A Multi-criteria Design Platform to Facilitate Active School Journeys

Aims and Background

Declining active school commuting – a public health challenge affecting Australian children

The promotion of children walking to school is critical not only for environmental and social benefits, but importantly, active communities and child health (Giles-Corti et al., 2011). In Australia, active journeys to school, namely walking or cycling, have been declining. For example, in Sydney, the number of children walking to school declined from 57.7% in 1971 to 25.5% in 1999-2003 (Van der Ploeg et al. 2008) and in Brisbane, only 39% of children ever walk to school (Zaccari and Dirkis, 2003). In Melbourne, children walking to school dropped from 55.3% in 1970 to 18% who walk every day (Gerrard 2009). These declines in active journeys have significant public health implications. Children who walk or cycle to school are more likely to meet recommended levels of physical activity and achieve a lower body-mass index (BMI) than those who do not (Davison et al. 2008; Lee et al. 2008). Higher levels of childhood physical activity promotes the prevention of childhood obesity and contributes to lifelong habits of active mobility (Tudor-Locke et al. 2001) leading to healthier adults, reduced risk of cardiovascular disease, stroke and hypertension (WHO, 2010, Warburton et al, 2006) and potentially saving Australian taxpayers billions of dollars in future health care costs (Stephenson et al. 2010).

A growing body of evidence confirms an association between the quality of the built environment and levels of physical activity. Pedestrian-friendly neighbourhoods with mixed land use, higher densities, connected accessible street networks, and attractive urban design encourage walking for transport and recreation (Transportation Research Board and Institute of Medicine of the National Academies 2005). Urban designers need to consider not only where a school is situated and the street design in school neighbourhoods (Giles-Corti et al., 2011; Owen et al., 2007, 2004), but also how elements of city design may act as barriers to active school journeys. There is an urgency for research that investigates these elements and provides tools to evaluate solutions to reverse the declining rates of active journeys among Australian school children.

The proposed research will result in a design decision support system (DDSS) that integrates multiple urban factors which impact the decision to choose active commuting to school. The DDSS will be made available to urban designers, planners and policymakers to design and advocate for enhanced urban environments that facilitate active school trips.

Urban factors that impact upon active commuting (walking) to school

There are several factors that reduce the likelihood of children and parents undertaking active school journeys including, the child's age, gender, ethnicity, socioeconomic status and work flexibility characteristics of the parents (Yarlagadda & Srinivasan, 2008). There is also an array of physical features of the environment that act as significant barriers to children taking active journeys; factors such as long travel times, poor street permeability (ease of movement around the neighbourhood), heavy traffic volumes, poor street crossings, steeply inclined routes (Timperio et al. 2006), as well as highly polluted and noisy streetscapes with high thermal stress (Dannenberg et al. 2005). The proposed research will integrate many physical environmental factors into a design tool and thereby provide, *for the first time*, key stakeholders with a comprehensive understanding of how best to design urban environments that facilitate active school trips. The following physical environmental factors will be integrated into the DDSS:

Pedestrian network access: There are many approaches to spatial network analysis and pedestrian modelling that have been developed over recent decades with important formative contributions by Pushrarev and Zupan (1975), Hillier (1996), Batty (2001) and Torrens (2003). Significant improvements in computer power mean that sophisticated pedestrian modelling that would have been computationally unfeasible ten years ago, is now both possible and available to urban designers (Helbing, 2012, p. 61).

Until recently, modelling proximity to services such as schools was limited (Sander et al. 2010), with 'Euclidean buffers' or 'circular catchments', an as-the-crow-flies distance from services being the most common approach (Andersen and Landex 2009). The approach of drawing a circle of 800m radius to represent 10 minutes' walk at 1.3 m/s (Hess 2012; Pushkarev 1975) to approximate a pedestrian catchment for a chosen node is still widely used. This is despite criticism of inaccuracy, incomplete accounting of street networks and walkability barriers such as rivers or railroad tracks, overestimating catchment areas (Sander, et al. 2010). The approach also fails to consider physical environmental aspects that influence walking such as gradients, perceived safety, and climatic conditions (Giles-Corti et al. 2001), or allow 'what if' scenario testing. Development of proprietary GIS software with additional network accessibility (ESRI™ Arc Map with Network-Analyst™ plugin) has dramatically improved accessibility catchment modelling (Andersen and Landex 2009) with vector distance based Service Area Approach or 'pedsheds'. This method can produce more accurate and useful accessibility analysis, but can be prohibitively expensive and require high-end GIS software and specialist staff (Badland et al. 2013).

In response to these limitations, CI-White led the development of the PedCatch tool (www.PedCatch.com), to analyse pedestrian catchment areas using simple agent-based modelling (ABM) (White 20017; Badland et al. 2013). Pedestrian access is measured in the tool using large numbers of intelligent agents to measure the pedestrian catchments for a central node. The agents (output shown in Figure 1) make basic decisions in moving away from the central node (eg. school), at walking speed, interacting with the streets, traffic, and crossings, measuring and mapping all the possible journeys that can be walked in a specified time (eg. 10-minute period). The analysis, an animated isochrone with catchment area analytics output, is suitable for comparative scenario studies and for stakeholder engagement as it highlights pedestrian access barriers, and allows urban design and planning users to propose and rapidly test design options or interventions.

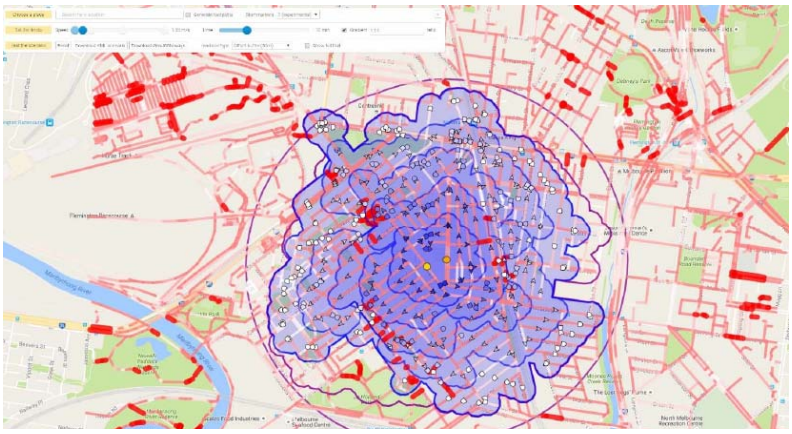

Figure 1: Screen grab of pedestrian accessibility analysis tool, the base PedCatch v1.0 platform used to analyse access to Kensington Primary School.

Although the PedCatch tool has proven useful in urban design research and practice (with over 3000 uses in the past six months), the tool is limited to the single network accessibility factor. The tool does, however, provide an extensible platform to build upon and allow integration of other crucial physical factors impeding walking journeys as proposed in this research project.

Urban topography (slope) is an additional built environmental factor that can significantly impact pedestrian accessibility, particularly for people with mobility impairment, older adults and children. Common scenarios, such as parents pushing prams, children riding bikes or grandparents walking grandchildren to school, are all impacted by steep gradients (Hanibuchi et al., 2011).

Although there have been significant developments of technology for analysing topography, such as ESRIs new Aspect-Slope Raster Function (2017), or the more user-friendly hillmapper.com (slope map of San Francisco), these tools are not currently integrated into pedestrian accessibility modelling applications. There is a growing need for urban designers to have access to tools to model accessibility in their community, assess gradients to identify topographical barriers and to then design solutions that provide more inclusive urban environments.

Pedestrian risk, and the safety of a journey, is a critical factor in assessing the desirability of active school journeys. Pedestrians and cyclists account for 13% and 4% of road traffic deaths, respectively, in Australia (World Health Organization 2015) and child pedestrian injury (aged 0-14 years) ranks highly as a major cause of premature mortality in Australia (Commonwealth of Australia, 2016). As such, parental concern about traffic safety has been identified as a barrier to school children undertaking active school journeys in Australia and globally (Centers for Disease Control and Prevention 2005; Kerr et al. 2006). Consequently, the risk to school children making active school journeys must be acknowledged. Understanding these risks and providing a means to examine the urban design and road networks to address these risks is a key step to creating opportunities for active and safe school journeys.

Human thermal comfort (HTC) is also an essential element when selecting active transport for school journeys and yet there is a paucity of research assessing the role this may play in mode choice. It is often recognised in walkability assessments that amenities such as shading can increase the walkability of an area (Millington et al. 2009; Gallin 2001; LSA Associates 2003), but these factors are generally difficult to quantify and are rarely considered in isolation from other streetscape aesthetic properties. Poor HTC can negatively impact active transport, making it difficult and less desirable (Buys and Miller 2011; Eves et al. 2008), reduce the level of physical activity (Merrill et al. 2005), and contribute to increases in the perception of exertion (Sheffield-Moore et al. 1997).

Ultraviolet (UV) exposure is a critical issue to consider in designing for active journeys by utilising sun protection (via shading) and limiting UV exposure. Shading from a tree canopy can provide a sun protection factor (SPF) of 2, with denser canopies providing between 5 and 15 (Grant et al. 2002). This is particularly important in Australia which has one of the highest incidences of skin cancer in the world (Fransen et al. 2012).

Assessing the impact of shade provided by trees has developed significantly in the past decade with substantial contributions to this area of science by both CI Hes (Hes et al. 2007) and CI Livesley (Berry et al. 2013). The digital modelling of street trees and their shade has also seen significant efficiency improvements – it is now feasible to digitally simulate large-scale urban scenarios with geometrically accurate trees (White & Langenheim, 2014). The incorporation of such modelling into an active school journey tool is highly desirable.

Air pollution is acknowledged as an environmental amenity which can make areas less walkable (Marshall et al. 2009) but currently, there is no metric established to determine the exact impact of these pollutants on the desirability of making an active journey. High densities of vehicular traffic lead to increased emissions particularly particulate matter

($PM_{2.5}$ and PM_{10}) and can increase the likelihood of respiratory disease when undertaking active journeys (Giles-Corti et al. 2016). Importantly, air pollution, as a consequence of vehicle emissions, also reduces the desirability of making an active journey to school. Pollution include air pollutants (NO, NO_2, O_3, CO, SO_2), particles such as $PM_{2.5}$ and PM_{10}, and noise.

To date, no design tools are available for urban design decision makers to map out less polluted routes for walking or to test potential design scenarios to improve air quality in key walking areas. Although there is some discussion indicating that these factors create less walkable areas, there are no available metrics to assess their impact on the desirability of making active journeys. In addition to providing such metrics, we propose to integrate these significant factors into our DDSS.

Significance and Innovation

In the last 15 years, the prevailing research about physical environment to determine how friendly an area is for walking, or 'walkability', has focused on creating scoring indexes using macro-scale measures derived from the "three Ds" intersection density, residential density, and land use mix or diversity (Ewing and Handy 2009; Lo 2009; Kelly et al. 2007; Giles-Corti 2016). These walkability index tools are useful for comparative analysis between cities, identifying problem suburbs, take advantage of the readily available macro-level data, and comparative ease of analysis using desktop GIS applications (Park et al, 2015). In contrast, micro-level factors such as the footpath continuity, universal access characteristics, path directness, safety at road crossings, heavy or high-speed traffic, pedestrian separation from traffic and landscape quality, which also significantly impact on mode choice, have been largely excluded due to the time, cost and difficulty associated with data collection and analysis (Park et al, 2015). For urban designers and policymakers, the significance of this research gap is exacerbated by the practical reality of macro-scaled "three D" measures being dramatically more costly and difficult to "modify" than micro-level factors, particularly in existing urban areas (Rodríguez et al. 2008). For example, the cost-benefit of modifying micro-level streetscapes by increasing tree coverage, ensuring continuity of footpaths and introducing traffic calming measures is far higher than increasing street intersection densities or changing land-use in existing urban areas.

Our proposal departs from a macro-level walkability focus of previous research and moves towards and beyond a micro-level path walkability measure described by Park et al. (2015). Through our innovative use of emerging technology and big-data sources, our research seeks to develop, *for the first time*, a tool that assesses desirability factors for active transport journeys at both precinct scale and micro-level. It will be the first planning tool to bring together the highlighted physical and environmental factors into a single system to assess barriers to active trips.

The proposed DDSS will not only enable the auditing of existing urban areas, as walkability indexes currently do, but the tool will allow micro-scaled physical and environmental factors to be applied at a precinct scale, and therefore integrated into a local area design and planning process. The tool will allow industry partners to examine questions that until now, have not been possible to answer. The proposed DDSS will also enable local councils to consider *for the first time*, thermal comfort and the influence of air pollution on active transport, to systematically audit their local transport networks, and *make informed decisions* about transport and infrastructure options.

Our partner organisations will be able to use the DDSS during the planning process of projects to identify problem areas needing remediation and create infrastructure strategies to encourage more active school journeys. Design firms will be able to bridge the gap between detailed CAD building modelling and regional scaled precinct plans with a micro-scaled assessment of the local area. This will be the first-time design firms will have this vital information in a format suitable for informing their designs for active journeys. Key government agencies will also be able to use the DDSS to plan and implement strategies to encourage active journeys and utilise the application in their efforts to develop integrated safe and sustainable future transport. Without the proposed tool, it is not currently possible to assess future changes in urban morphology and traffic networks to determine if they will increase or decrease the desirability of making active journeys.

The expected project outcomes cut across multiple *Science and Research Priorities,* aligning broadly with priority *9.Health*, through encouragement of active communities as a preventative strategy to improve physical and mental well-being; and more specifically with priority *3.Transport*, with respect to development of resilient cites and enabling sustainable mobility while lowering carbon emissions and pollution by providing tools addressing the Practical Research Challenge *3.2 improved urban design*; and *8.Environmental Change* particularly the Practical Research Challenge: *8.2 Resilient urban, rural and regional infrastructure* through the project's innovative merging of road and footpath design with green infrastructure analysis and design.

Due to the pressing urgency to increase physical activity of the nation's children for the significant health implications, and because children are particularly vulnerable, this study prioritises active journeys to schools in Australia. It is important to note, however, that the DDSS will make significant improvements more generally to designing for active journeys for many other destinations such as to public open spaces, community facilities, transit nodes and designing

for transit oriented development (TOD) policies, and the technology has immense potential for application globally, particularly in countries with growing health and mobility challenges such as China and the USA.

Approach and Training

As highlighted earlier, the proposed research will build on the PedCatch Platform established by CI White. The flexibility of this agent-based modelling (ABM) platform allows key environmental factors (described above) to be added, establishing a new, multi-criterion, spatio-temporal design decision support system (DDSS).

Conceptual framework – design thinking and agile development

The proposed research will be undertaken using an iterative cycle for the research and technology development of each environmental factor to be integrated into PedCatch. The iterative development cycle will combine aspects of "*Design Thinking*" (Denning 2013) and "*Agile*" software development (Highsmith 2002) methodologies.

Instead of the traditional "waterfall" (top-down) approach, where a piece of software (or research) is conceived, designed, developed and then distributed once it is completed, in the 'agile model', elements of the research (in this case, the various physical factors, are incrementally delivered based on a short design, development, and release cycle). During the DDSS development process, the additional environmental factor modules will be added soon after the methodologies and formulas are determined, allowing staged delivery and time for partner organisations to test and refine each module before the final delivery of the project. In Figure 2, we illustrate the cyclical process for the four physical factors being developed as modules to be added to PedCatch. Each module development will cycle through five stages – framing, design, prototype, test and refinement.

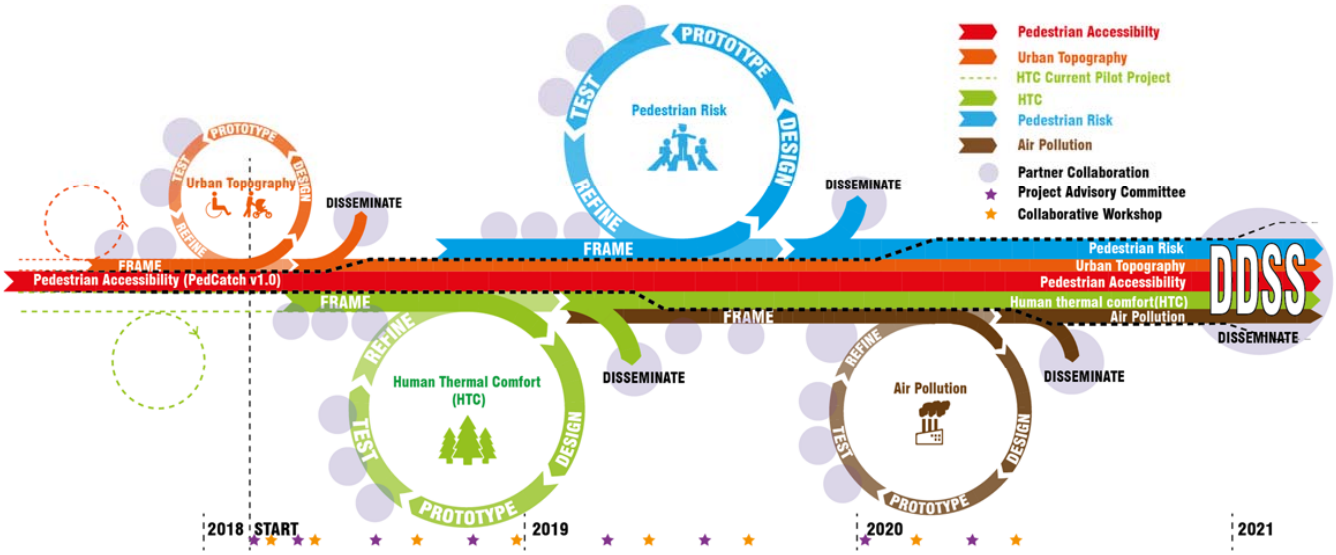

Figure 2: Process flow diagram showing the development of the multi-criteria active journey analysis tool, from PedCatch to full DDSS.

Frame: involves the framing of the problem based on the literature and research discovery undertaken in collaboration with partners, input from stakeholders, and developing specific requirements for analytic outputs. We will integrate the methods and data necessary for understanding the role the various factors play in the desirability for active commuting to school. Importantly, two of the factors namely, air pollution and thermal comfort, have no existing metric in terms of active journeys in the literature and will, therefore, require research to be conducted by a research fellow, assisted by a research assistant.

Design: entails determining the data required and designing the technology for analysis of the specific factor. The design of the technology module will vary depending on the specific urban factor (discussed below) and detailed partner framing and feedback, but will likely involve generation of a raster impact intensity 'heat-map' analysis layer (GeoTiff) with which pedestrian agents interact by restricting movement or excluding undesirable pathways.

Prototype: involves the development of a working prototype module as an add-on to the PedCatch platform. The prototype modules will initially be developed using a mix of custom java script and proprietary software (eg. Rhino 3D with Grasshopper scripting) and further developed with each cycle to fully integrate with the DDSS, as detailed in sections i) to iv).

Test: involves testing the module on both theoretical urban conditions and more complex real case studies undertaken in collaboration with partners. During the testing, feedback will be recorded by the research team along with the practice partners in relation to accuracy and usability, as well as secondary feedback from stakeholders and the broader community through public consultation.

Refine: involves the refinement of the module based on partner/user feedback. This refinement may require reconsidering data collection or processing, and altering the framing of the module. At the conclusion of this stage, the

process will cycle through again, moving back to the design stage. We envisage each physical factor undergoing three full cycles of development with dissemination through peer-reviewed publication at the end of the third cycle.

i) Urban topography (slope analysis) module

The method to capture the urban topography will build upon the prototype modelling developed by CI-White (White and Kim, 2017). This involves the integration of NASA's SRTM elevation and terrain data. Street segments are measured for steepness by sampling points along the pathways against elevation values to calculate the gradient (rise over run) for each section of street. Steep streets can be excluded from the street network based on a user-specified gradient threshold (eg. gradients over 1:14 may be too steep to traverse). The first prototype of this add-on funded by the Melbourne Social Equity Institute has been integrated into PedCatch (Figure 2). This factor will be further developed to allow more detailed survey data and the process refined based on partner feedback in the Urban Topography cycle at the project's inception.

ii) Pedestrian risk module

We propose to adapt a risk rating system developed by Logan et al. (2013). This method combines five traffic factors that contribute to the risk of injury whilst a pedestrian namely, 1) the speed limit at the crossing point, 2) the traffic volume (vehicles per hour) at the crossing, 3) the width of the road to be crossed, 4) the number of conflict points encountered during the crossing, and 5) the type of crossing facility provided (i.e. traffic signal, school crossing, or zebra crossing). The system will be enhanced to allow assessment of pedestrian risk across an entire journey and research conducted to provide a better understanding of how pedestrian risk impacts on the desirability of making active school journeys.

iii) Human Thermal Comfort (HTC) module

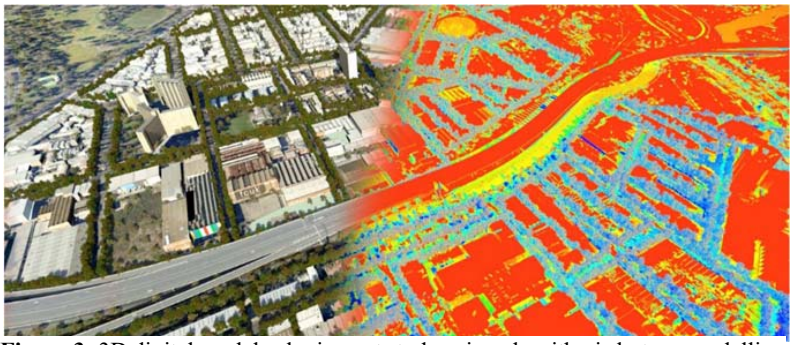

Figure 3: 3D digital model solar impact study using algorithmic botany modelling within animation software, (White & Langenheim 2014).

Using observations and modelled output of HTC, human experience research will be conducted to find the relationship and establish a metric between the HTC of various active journey routes and the desirability of each of those journeys. Modelling will be performed on selected precincts (linked to the partner organisations), incorporating a three-dimensional urban morphology, urban vegetation layout, solar exposure and climate conditions to find the expected HTC along all the possible routes through the 'trial' precinct. Using these relationships and model outputs, HTC will be incorporated into the PedCatch platform. Besides assessing the selected precincts, we will also undertake analysis over a wide range of scenarios and capture the impact of shading (Figure 3), radiation loading, and urban vegetation on these journeys. A heat map of thermal discomfort zones will be used to slow down and shorten journeys that can be completed comfortably in the catchment. A pilot study is currently being conducted with the City of Maribyrnong testing the application of algorithmic botany (accurate 3D tree) models with precinct solar impact modelling combined with pedestrian accessibility modelling and will form the basis for generating these catchment heat maps.

iv) Air pollution module

During the 'frame stage' of this module development, we will identify selected precincts (linked to the partner organisations) and we will produce air pollution maps of common pollutants for hours of the day, monthly wind roses, and MET profiles, based on road network (road length and orientation), building locations and heights, and traffic densities and fleet profiles. A network of sensors will be deployed to collect observations over a variety of days, street locations, and weather conditions and these observations will be used to validate the modelled pollution mapping process described above. Using these pollution maps, human experience research will be conducted to find these impacts, of pollutants (air and noise) on the desirability of active journeys. Exploiting CI Schofield's expertise in air pollution, satellite maps of pollution observations integrated using land use regression will provide detailed urban pollution mappings into the DDSS tool and allow journeys to be rated for pollution exposure. The resulting catchment pollution heat maps will be used to impede agent progress through a catchment, shortening, slowing down, or eliminating journeys through uncomfortable streetscapes in a similar manner to the HTC module.

Integration of the physical factors to create DDSS

The DDSS will integrate the findings from the analysis of the physical attributes outlined in Figure 2. For the urban topography module, we will build on existing research and technology (by CI White), allowing a quick delivery of this module. The other factors will require significantly more time and resources for development.

HTC will build on a pilot study with the City of Maribyrnong, but due to its spatial and temporal complexity, it will require significant scoping (including climatic data collection). The pedestrian risk factor will build on prior pedestrian

risk research of CI Stevenson and test the potential to integrate risk with accessibility. The pollution factor will require significant discovery as the relationship between pollution and mode choice are not clearly established, requiring formulating methodologies and metrics to quantify this factor's effect on journey mode selection.

The proposed graphic user interface for the DDSS will allow for various levels of user expertise. A basic mode will be targeted towards schools, parents, and students, providing methods to explore active journey options within their areas. This aspect will contribute to school pedagogical and curriculum research, and integrate with each primary school's "inquiry-based-learning units" allowing exploration of "issues of environmental impact, distance and time, safety, orientation and direction, and cartography" (see letter from KPS Primary School for details). A toggle switch revealing more advanced options, targeting local councils, developers, and design firms. These additional options will allow more sophisticated analyses to be performed, such as scenario building and varying urban parameters, to perform future planning and test different options to improve existing conditions. User-adjustable priority sliders in the advanced mode will allow prioritisation of factors. For example, an urban designer may consider the effects of pedestrian safety over topography. These prioritisation decisions made by users will be collected as data for continuing metric analysis and future project development.

Data Sources

The proposed research will access a variety of data sources. Importantly, the partner organisations will provide unique data upon which we will be able to develop the DDSS. We will obtain street networks and vehicle density, tree species and placement, and footpath data from Australia's urban intelligence network namely, the Australian Urban Research Infrastructure Network (AURIN), located at the University of Melbourne. AURIN, which is a $24million Super Science federally funded e-infrastructure, comprises an online workbench of over 1,000 datasets and 100 spatial-statistical tools to support urban researchers, planners, and decision makers across Australia (Pettit et al, 2015). AURIN offers access to data from disparate sources such as the Department of Sustainability and Environment, Census, Health, PSMA (road data) and State and Local Governments. We will also take advantage of open-source data including Open Street Map (OSM) and Open-topo, and potentially the deep learning "semantic segmentations" of Mapillary™ to ensure applicability beyond chosen case study areas.

Partner Organisation Commitment and Collaboration

The strong research team has the commitment from exceptional partner organisations including local government - *Maribyrnong* and *Wyndham* councils, State level - *VicRoads* and *TAC*, transport engineers - *Movendo*, and urban design firms *NHA*, *Aspect Studios* and *PCA*. The proposal has been developed collaboratively with the aims, methods, milestones and outputs shaped by input from partner organisations. All Partner Organisations have the aims of the proposed research at the core of their strategic direction. Each organisation is committed to understanding how urban design impacts on the desirability of active school journeys. Each brings expert knowledge and skills to the project in areas of urban design and transport. Local councils and urban design practices will contribute to the design and testing of tools and will provide practical case studies based on current real-world projects. They will provide insights into current policy development and implementation challenges, technical analysis workflow limitations, offer valuable feedback on the practicality of the project's research, and provide input on possible future collaborative research.

The three school partners – *Kensington*, *Stella Maris* and *South Melbourne Primary,* are committed to facilitating engagement with parents and students to examine the relationships between physical environmental factors and active school journeys. Partner school teachers will also provide input into the potential for the tool and learnings to become embedded into the curriculum as a teaching device and form the basis for future, ongoing collaborative research.

Role of Personnel

CI White – is an architect, urban designer and senior lecturer in digital architecture and urban design in the Melbourne School of Design at the University of Melbourne. CI White bring his vast design practice research and management experience to the project. He will be responsible for the oversight of the overall project and will lead the work around the PedCatch and DDSS tools and the impact of topography on active school journeys. He will chair the Project Advisory Committee and will also oversee all other aspects of the project including partner engagement and coordination of DDSS testing case studies.

CI Stevenson – an epidemiologist, professor of urban transport and public health and Director of the Transport, Health and Urban Design Research Hub in the Melbourne School of Design, is committed to leading the work around pedestrian risk and active school journeys. Also, as the sole epidemiologist on the study, his engagement with public health practice, transport safety and quantitative analysis means he is highly experienced and will bring this expertise to the integration of the human understanding of active journeys due to the factors of thermal comfort, air pollution, risk, and topography.

CI Hes - the Director of the Thrive Research Hub and a senior lecturer in sustainable architecture in the Melbourne School of Design, is committed to leading the work around environmental implications and co-benefits of active journeys. Her specialities include identifying and filling the knowledge gaps in sustainability practice and application

in the built environment, specifically using concepts such as biophilia (explored in the health and wellbeing application www.plantlifebalance.com.au), and offsets against fossil fuel-based transport.

CI Livesley - an associate professor of Ecosystem and Forest Sciences, will lead the work around the impact to active journeys of micro-climates and human thermal comfort. CI Livesley's urban ecosystem research and teaching interests relate to the role of trees, soil and other vegetation systems in providing environmental and social benefits, such as microclimate cooling, energy saving, carbon sequestration, biodiversity habitat and improved nutrient / water cycling.

CI Schofield - a senior lecturer in Earth Sciences, will lead the work around air pollution, its relationship with urban form and traffic data and its impact on active journeys. As an atmospheric chemist, she researches and teaches in global pollutants and climate change. Her specialities include air quality and health and coupled atmospheric chemistry-climate modelling.

CI Imms - an associate professor at the Melbourne Graduate School of Education, is committed to leading the work around pedagogical and curriculum research and engagement with schools, students, teachers, and parents. CI Imms brings his vast experience in partnering with, and disseminating research to influential education sector stakeholders.

Communication of Results

The team is committed to enhancing the interface between research, design and policy, and promoting evidence-informed design and policy. Key partner organisation personal, alongside representatives from professional bodies including Australian Institute of Architects, Planning Institute of Australia, and Australian Institute of Landscape Architects will join members of advocacy groups for walking and cycling to make up the Project Advisory Committee (PAC). The PAC will make a substantial contribution to communicating research findings to government policy makers, urban design professionals, walking and cycling communities, the education sector, and wider public.

Knowledge translation is a major component of this research program. As highlighted, the findings from this research will fill a knowledge gap in how the design of urban areas can impact the desirability of making active school journeys. In addition, a decision platform, using these findings as a robust evidence-based methodology to analyse urban areas, will be delivered through this project. This platform, in its basic settings mode, will allow schools, students, and parents to explore their local areas and identify desirable routes to school. In addition, the platform, using its advanced settings mode, will allow local councils, designers, and developers to assess local areas in great detail, identifying problem areas and explore existing scenarios and test future scenarios to find the most effective ways to make improvements. These findings and tools will be directly used by partner organisations involved in the case studies. After the completion of those studies, every effort will be made to disseminate the findings and tools both nationally and internationally.

In addition, we intend to publish the findings in international peer-review journals such as Lancet, IJEPR and Atmospheric Measurement Techniques. Data sets will also be published and made globally available in such sites as the PANGAEA Data Publisher for Earth & Environmental Science. Of note, members of the research team are on the editorial boards or publish regularly in these journals. It is expected that a minimum of six peer-reviewed publications will result from the project. The findings will also be widely disseminated at national and international conferences related to urban design and active journeys, as well as via the internet, through Centre/Institute and Partner Organisation websites and our bi-monthly research news update.

Management of Data

This project will be conducted in compliance with the University of Melbourne's Management of Research Data and Records Policy (MPF1242). The project will generate data in several areas and types and plans to make this data openly accessible for independent research verification and as the basis for future research in these areas. Observational data sets (micro-climate and pollution) will be collected and shared on platforms such as AURIN and Figshare after the publication of the results. Project working data will be stored in the cloud in an encrypted format using 256-bit AES and shared securely using TLS (Transport Layer Security) enable collaboration with the project's industry partners.

Some data collected, such as human experience surveys of thermal comfort and pollution, will be subject to research ethics policies and will be stored securely in University approved locked storage areas. The later re-examination and reuse of these data sets will be enabled through the completion of a research ethics procedure.

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C2. Medical Research

(Does this Project contain content which requires a statement to demonstrate that it conforms with the eligible research requirements set out in the ARC Medical Research Policy located on the ARC website?)
Please select 'Yes' or 'No'

No

C3. Medical Research Statement

(If applicable, in no more than 750 characters (approximately 100 words), justify why this Project complies with the eligible research requirements set out in the ARC Medical Research Policy located on the ARC website.)

C4. Please list the objectives of your proposed Project.

(Please list each objective separately by clicking 'add answer' to add the next objective. You may enter 500 characters (approximately 70 words) per objective.

This information will be used for future reporting purposes if this Proposal is funded.

(This question must be answered))

Objective

Produce a Design Decision Support System (DDSS) that, for the first time, enables urban designers, landscape architects, planners and engineers to integrate microclimate modelling, with accessibility and safety factors into a flexible decision-making process. The research will provide practical, tested-in-industry tools to help facilitate design for walkability in a changing environment.

Objective

Provide the means for urban designers to engage with and communicate complex modelling of school walkability and accessibility with the non-design stakeholders and the broader community.

Objective

Produce a series of new metrics for urban environmental factors not previously established, including metrics for determining the impact of pollutants, thermal stress and slope on active journey mode choice, and improving existing metrics for measuring pedestrian risk.

Objective

Produce a DDSS that integrates pedestrian risk modelling and informs strategic pathways to reducing pedestrian risk for school journeys - potentially leading to reduced car use, further reducing risk.

Objective

Produce a DDSS that allows ‘what if’ scenario testing for pedestrian safety in a way that can link modelling back into transport and vehicular traffic modelling tools via an application programming interface (API).

Objective

Provide a means for parents to examine and understanding key road related risks to school children making active school journeys and help parents determine safer and more comfortable routes for their children.

Objective

Provide a means for teachers and parents to encourage active transport, providing user-friendly desktop assessment modelling to aid and plan for walking programs such as the "walking school bus" and "walk part-way to school".

Objective

Produce an online tool that can become part of curriculum development in schools and an integrated resource for teaching children about safe and active transport, health, mathematic concepts (vectors, distance and time), and the environment.

Objective

Use the DDSS as an ongoing source of data collection and ongoing research by harvesting usage data including logging of locations, time settings, distance, speed and gradient settings, as well as recording the configuration of flexible 'sliders' for weighting of factors. This harvesting of usage data will provide further future insights into different user group prioritisation and feedback into ongoing research.

Part D - Partner Organisation Details (TRANSPORT ACCIDENT COMMISSION)

D1. Is this a Partner Organisation whose funds are appropriated predominantly from Commonwealth or Australian State or Territory funding sources for the purposes of research?

No

D2. Type of Partner Organisation

(Is this Partner Organisation an Exempt Archive and Public Record Office, an Exempt Charity, an Exempt Herbarium, an Exempt Museum and Collecting Organisation, an Exempt Non-Profit Organisation, an Exempt Small Business or an Exempt Start-up? Please refer to Sections D3 and D8.2.6 of the Funding Rules and the Instructions to Applicants for further information.)

No

Type of Exempt Organisation

D3. Evidence of collaboration with the Administering Organisation/Other Eligible Organisation and the alignment of the Project with the Partner Organisation's overall strategic plan

(In no more than one A4 page, provide evidence of new or on-going collaboration between the Partner Organisation either directly with the Administering Organisation, and/or with an Other Eligible Organisation on the Proposal, including details of how the Project fits into the Partner Organisation's overall strategic plan and how the Project is of value to each of the Partner Organisation(s) involved.)

Uploaded PDF file follows on next page.

The Transport Accident Commission (TAC) is the statutory organisation charged with both with assisting those who are injured on Victoria's roads and with promoting road safety to prevent those injuries happening in the first place. To fulfil this second role, the TAC engages in and funds research to reduce road trauma in Victoria.

This project aligns in a number of ways with the TAC's mission and engagement in research into preventing road trauma. The project seeks to quantify and understand the risks associated with active transport and how that impacts the desire to make these active journeys and encourage walking and cycling. It also seeks to provide methods for systematic assessments of school catchments to determine which sections require remediation to provide safer infrastructure. Finally, TAC sees a role for the decision support system tool in facilitating rehabilitation of those injured on the roads.

TAC has previously partnered with CI Stevenson on a number of successful ARC Linkages, including LP150100680, LP130100380, and LE130100050. This track record gives them confidence in the successful outcome of this project.

To support the project, the TAC is providing cash support of $90,000 and $50,000 in-kind equivalents. The in-kind support will include data (road trauma data) and analysis, feedback on the methodology process and resulting tool, attending meetings, and providing workshops.

D4. Attach a letter of support for this Proposal including Partner Organisation certification

(Please attach a PDF of no more than two A4 pages of the Partner Organisation letter of support, signed by the CEO or delegate. Please refer to Section A6.2.4 of the Funding Rules for details of the required content for this letter.)

Uploaded PDF file follows on next page.

6 September 2017

Executive Director
Linkage Projects, Australian Research Council
Level 2, 11 Lancaster Place
Majura Park
Canberra ACT 2609

Dear Sir/Madam,

Re: ARC Linkage Application LP170100315

A multi-criteria design platform to facilitate active school journeys - Dr Marcus White

We are pleased to respond to the invitation to support the proposed ARC Linkage project.

The Transport Accident Commission (TAC) undertakes and supports research to improve outcomes for our clients and to help reduce road trauma in Victoria. At the TAC, we take seriously our responsibility to the Victorian community and we support initiatives and organisations that reflect our values and engage with our stakeholders in meaningful ways.

We appreciate that walking and cycling is a valuable contributor to health but are concerned about potential conflicts that can exist between pedestrians and car-based travel. Consequently, the TAC sees potential in the development of these tools for encouraging walking and is keen to ensure that road safety is a key consideration.

Though the focus of the research is primarily directed towards facilitating school journeys, the TAC recognises that the researchers see potential for the tools to be used in a rehabilitation setting.

We have confidence in the research team's ability to deliver this ambitious project based on our prior experience with CI Stevenson on several successful partnership projects including:

- Competitive ARC Linkage Grant LP150100680. The effects of feedback and incentive-based insurance on driving behaviour. Investigators: Prof M Stevenson, A/Prof D Mortimer, Prof A Harris, Prof A Tapp, Mr F Peppard, Ms S Collins.
- Competitive ARC Linkage Project Grant LP130100380. Safer cycling in the urban road environment. Investigators: Prof M Stevenson, Dr M Johnson, Dr J Oxley, A/Prof L Meuleners, A/Prof B Gabbe, Prof G Rose, Prof J Dill, Dr R Katz, Mr P Bourke, Ms J Bartel, Mr D Moyses, Mr M Nieuwesteeg.

1300 654 329 / 1800 332 556
GPO Box 2751 Melbourne VIC 3001
DX 216079 Melbourne
ABN. 22 033 947 623
tac.vic.gov.au

- Competitive grant funded by the Australia Research Council. ARC LIEF Grant LE130100050. Integrated facility for recording driver and road user behaviours. Investigators: Prof M Regan, Prof A Williamson, Prof R Grzebieta, Prof M Stevenson, Dr J Charlton, Dr M Lenne, Dr P Salmon, Prof B Watson, Prof N Haworth, A/Prof A Rakotonirainy, Dr J Woolley.

The contribution from the TAC will be to commit $30,000 per year over three years - a total of $90,000 in financial support. We will also contribute approximately $50,000 worth of in-kind support over the three-year period. This in-kind support will include supplying feedback to the research team, attending meetings and workshops, and access to meeting rooms.

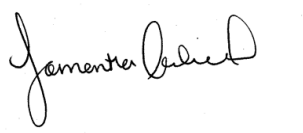
Total In-kind Contribution ($)	Total Cash Contribution ($)
50,000 (equivalent)	90,000

I certify that no part of the TAC Cash Contribution is drawn from funds previously appropriated or awarded from Commonwealth or Australian State or Territory sources for the purposes of research.

I further certify that TAC will meet the requirements outlined in the standard Funding Agreement, including the requirement to enter into arrangements regarding Intellectual Property which do not unreasonably prevent or delay academic outputs.

We look forward to the opportunity to work with the research team on this exciting project.

Yours sincerely



Samantha Cockfield

Lead Director, Road Safety

Signed on behalf of Chief Executive Officer Joe Calafiore

D5. Partner Investigator participating on this Proposal for this Partner Organisation, where applicable

Part D - Partner Organisation Details (KENSINGTON PRIMARY SCHOOL)

D1. Is this a Partner Organisation whose funds are appropriated predominantly from Commonwealth or Australian State or Territory funding sources for the purposes of research?

No

D2. Type of Partner Organisation

(Is this Partner Organisation an Exempt Archive and Public Record Office, an Exempt Charity, an Exempt Herbarium, an Exempt Museum and Collecting Organisation, an Exempt Non-Profit Organisation, an Exempt Small Business or an Exempt Start-up? Please refer to Sections D3 and D8.2.6 of the Funding Rules and the Instructions to Applicants for further information.)

No

Type of Exempt Organisation

D3. Evidence of collaboration with the Administering Organisation/Other Eligible Organisation and the alignment of the Project with the Partner Organisation's overall strategic plan

(In no more than one A4 page, provide evidence of new or on-going collaboration between the Partner Organisation either directly with the Administering Organisation, and/or with an Other Eligible Organisation on the Proposal, including details of how the Project fits into the Partner Organisation's overall strategic plan and how the Project is of value to each of the Partner Organisation(s) involved.)

Uploaded PDF file follows on next page.

Kensington Primary School has previously been engaged with CI White, through a master planning process. This community engagement process uncovered strong local support for active school journeys and a desire to enable school children to increasingly adopt active transport.

Both the process building the methodologies and the resulting tool from this project are of strong interest to Kensington Primary School. Using the school as a test bed for the tool will allow the children, parents, and school staff to explore and understand in greater detail their local catchment area. The process will allow active transport and its benefits to be introduced into the curriculum, and give the students a hands-on opportunity to understand how the design of their local area can help or hinder their active transport.

During the research phase of the project, the parents, students, and staff of Kensington Primary School will contribute the in-kind equivalent of $20,000. Many of the factors impacting the desirability of making active journeys have not been quantified before and will require human experience research into the impacts of factors on the desirability of making an active journey. Kensington Primary School will provide this in-kind contribution through the time and effort of the parents, children, and staff of this school contributing to this research and testing the resulting methodologies.

Kensington Primary School anticipates that the research process and the resulting decision support system tool will go a long way towards facilitating active school journeys in its catchment, as well as serve as an effective tool to advocate for changes in the catchment area to increase the desirability of making these active school journeys.

D4. Attach a letter of support for this Proposal including Partner Organisation certification

(Please attach a PDF of no more than two A4 pages of the Partner Organisation letter of support, signed by the CEO or delegate. Please refer to Section A6.2.4 of the Funding Rules for details of the required content for this letter.)

Uploaded PDF file follows on next page.

Kensington Primary School

13 May 2017
Kensington Primary School
62-74 McCracken St, Kensington VIC 3031

Executive Director
Linkage Projects, Australian Research Council
Level 2, 11 Lancaster Place, Majura Park
Canberra ACT 2609

Re: ARC Linkage Application LP170100315
A multicriteria design platform to enhance active school trips - Dr Marcus White

Dear Sir/Madam,

We are pleased to respond to the invitation to support the ARC Linkage. In support of our submission, we provide the following:

Kensington Primary School, a public school located four kilometres from the centre of Melbourne, is one of the oldest schools in Victoria. It has served its vibrant and rapidly changing inner city neighbourhood since 1881 and is proud of the role it plays in community life today. The school community believes that a diversity of cultures and values brings a richness to the school, developing tolerance and understanding and exposing students to other ways of thinking. We also hold environmental sustainability as a core value, with understanding and teaching of environmental issues taking a high priority for highly motivated teachers and parents.

Students' health, safety and wellbeing are crucial to learning and development and encouraging an active lifestyle is an essential ingredient for a first-class educational environment. We firmly believe that this research will be of great value to our school through the facilitation of active travel and the potential benefits for children's health, concentration levels, and awareness of the built environment.

The research team leader, Dr White, has provided pro-bono master planning for Kensington Primary School in the past two years where he led the stakeholder engagement process gaining feedback responses from over 200 people including staff, student and parents which revealed a strong desire for facilitation of active travel. He also aided in the incorporation of the feedback into the overall master plan design for the school.

The proposed research has tremendous potential for integration into our school's curriculum lending itself well to our inquiry-based-learning units, developed by our teaching team. We can see potential for exploring issues of environmental impact, distance and time, safety, orientation and direction, and cartography.

The main contribution from Kensington Primary School will be to in the form of in-kind contributions by our teaching staff, as well as from the parents and children of our school.

Total In-Kind Contribution ($ equivalent)	Total Cash Contribution ($)
$20,000	N/A

I further certify that we Kensington Primary School will meet the requirements outlined in the standard Funding Agreement, including the requirement to enter into arrangements regarding Intellectual Property which do not unreasonably prevent or delay academic outputs.

We look forward to the opportunity to work with the research team on this exciting project.

Yours sincerely,

Nigel Holloway
Principal

D5. Partner Investigator participating on this Proposal for this Partner Organisation, where applicable

Part D - Partner Organisation Details (ASPECT STUDIOS PTY LTD)

D1. Is this a Partner Organisation whose funds are appropriated predominantly from Commonwealth or Australian State or Territory funding sources for the purposes of research?

No

D2. Type of Partner Organisation

(Is this Partner Organisation an Exempt Archive and Public Record Office, an Exempt Charity, an Exempt Herbarium, an Exempt Museum and Collecting Organisation, an Exempt Non-Profit Organisation, an Exempt Small Business or an Exempt Start-up? Please refer to Sections D3 and D8.2.6 of the Funding Rules and the Instructions to Applicants for further information.)

No

Type of Exempt Organisation

D3. Evidence of collaboration with the Administering Organisation/Other Eligible Organisation and the alignment of the Project with the Partner Organisation's overall strategic plan

(In no more than one A4 page, provide evidence of new or on-going collaboration between the Partner Organisation either directly with the Administering Organisation, and/or with an Other Eligible Organisation on the Proposal, including details of how the Project fits into the Partner Organisation's overall strategic plan and how the Project is of value to each of the Partner Organisation(s) involved.)

Uploaded PDF file follows on next page.

ASPECT Studios is a design firm engaged in design-led solutions, committed to quality landscape and public realm projects. Aspect's mission seeks to provide a culture based on research and education and using cutting edge technology.

This project aligns with Aspect's strategic plan by providing them with an expanded design toolset, allowing them to consider design implications that were previously not possible. This new design support system will support their design decision making process, allowing them to examine the impacts of factors such as human thermal comfort, pollution, and risk on active journeys in their designs.

Aspect has committed $12,000 in cash and $24,000 of in-kind equivalents. The in-kind contributions will include providing landscape architecture design expertise. They will also contribute time and resources to landscape planning knowledge and hardware and software expertise to help design the factor's methodologies and build and integrate the final decision support system tool.

D4. Attach a letter of support for this Proposal including Partner Organisation certification

(Please attach a PDF of no more than two A4 pages of the Partner Organisation letter of support, signed by the CEO or delegate. Please refer to Section A6.2.4 of the Funding Rules for details of the required content for this letter.)

Uploaded PDF file follows on next page.

18 August 2017

Dr Marcus White
Master of Urban Design Program Coordinator
Faculty of Architecture, Building and Planning
The University of Melbourne VIC 3010

Dear Marcus

ARC Linkage Project

Thank you for the opportunity to provide our letter of intent for the ARC Linkage Project.

ASPECT Studios has grown on the strength of its reputation for design-led solutions and has seen its landscape and public realm projects realised with multi award-winning results throughout Australia and internationally. An important component of our success is our healthy culture of research and education, and our engagement with cutting edge technology. We consider this Linkage Project as an excellent opportunity to expand our design toolset and see great potential benefits in the proposed modelling platform to aid our design decision making processes.

We would be delighted to partner in providing Landscape Architecture design services for this initiative. We understand that this would involve a design led focus approach to planning.

At this time we would be able to commit in-kind time and resources for the project. This would include time from Kirsten Bauer, Director for the scoping components and additional staff across the Melbourne Studio ranging from Graduate Landscape Architects through to Senior Associates to contribute time and resources such as the use of hardware and software and design knowledge and expertise.

In addition we are able to commit $4,000.00 per year for 3 no. years to the project.

Please note that the in-kind hour's commitment will be to a greater value than that of the financial commitment for the project.

Total In-kind Contribution ($)	Total Cash Contribution ($)	Source of Cash Contribution
$24,000.00	$12,000.00	from internal R&D fund

Melbourne
P +61 3 9417 6844
F +61 3 9417 6855
E melbourne@aspect.net.au
Level 1, 30-32 Easey Street
Collingwood VIC 3066 Australia

Studios
Adelaide
Brisbane
Melbourne
Sydney
Shanghai

ASPECT Studios Pty Ltd ABN 11 120 219 561

I certify that no part of the ASPECT Studios Cash Contribution is drawn from funds previously appropriated or awarded from Commonwealth or Australian State or Territory sources for the purposes of research.

I further certify that ASPECT Studios will meet the requirements outlined in the standard Funding Agreement, including the requirement to enter into arrangements regarding Intellectual Property which do not unreasonably prevent or delay academic outputs.

ASPECT Studios are a leading landscape architectural design practice in Australia and we are committed to ongoing research and study in relevant areas. Please accept this letter as our intent to support this project.

Please accept this letter as our intent to support this project.

Yours sincerely

Kirsten Bauer
Director

kirsten.bauer@aspect.net.au

D5. Partner Investigator participating on this Proposal for this Partner Organisation, where applicable

Part D - Partner Organisation Details (MOVENDO PTY. LTD.)

D1. Is this a Partner Organisation whose funds are appropriated predominantly from Commonwealth or Australian State or Territory funding sources for the purposes of research?

No

D2. Type of Partner Organisation

(Is this Partner Organisation an Exempt Archive and Public Record Office, an Exempt Charity, an Exempt Herbarium, an Exempt Museum and Collecting Organisation, an Exempt Non-Profit Organisation, an Exempt Small Business or an Exempt Start-up? Please refer to Sections D3 and D8.2.6 of the Funding Rules and the Instructions to Applicants for further information.)

No

Type of Exempt Organisation

D3. Evidence of collaboration with the Administering Organisation/Other Eligible Organisation and the alignment of the Project with the Partner Organisation's overall strategic plan

(In no more than one A4 page, provide evidence of new or on-going collaboration between the Partner Organisation either directly with the Administering Organisation, and/or with an Other Eligible Organisation on the Proposal, including details of how the Project fits into the Partner Organisation's overall strategic plan and how the Project is of value to each of the Partner Organisation(s) involved.)

Uploaded PDF file follows on next page.

Movendo is transport and traffic engineering, environmental, and education consultancy active in the infrastructure, planning, community building, and social sectors. Their works places a strong emphasis on cost effective solutions after evaluation of multiple alternative scenarios by blending “novel approaches and new technologies” to deliberately consider the human dimension of transport. The organisation’s strategic direction challenges the impulsive application of guidelines that result in dated policies and oversupply of infrastructure. Their objects focus on transport and town master planning, sustainable transport strategies, and environmental analysis (including air and noise pollution).

These objectives align well with the proposed Linkage Project in that the research and resulting technology will contribute to the novel approaches and new technologies used by the organisation to allow for more a more iterative design approach letting the consultants to rapidly test many different scenarios with immediate and clear results suitable for comparative analysis.

Collaboration with Movendo has been a relatively recent occurrence, a very strong alignment of theoretical and practical approaches has been found between the team’s CIs and Movendo. Within a short period of time, multiple potential projects have been spawn including a pedestrian activity monitoring system research project.

The contribution from Movendo will be a cash contribution of $16,000 during the 3 year project. In addition, Movendo will also contribute the equivalent of $34,000 of in-kind support over the 3 year project. This in-kind will include the preparation of project data and scenarios, testing and providing feedback on the analysis tool, and attendance at workshops.

D4. Attach a letter of support for this Proposal including Partner Organisation certification

(Please attach a PDF of no more than two A4 pages of the Partner Organisation letter of support, signed by the CEO or delegate. Please refer to Section A6.2.4 of the Funding Rules for details of the required content for this letter.)

Uploaded PDF file follows on next page.

movendo
engineering / science / technology / research

7 November 2017

movendo
Ground Floor, 25 Ross Street
South Melbourne, VIC 3205

Executive Director
Linkage Projects, Australian Research Council
Level 2, 11 Lancaster Place, Majura Park
Canberra ACT 2609

Re: ARC Linkage Application LP170100315
A Multicriteria Design Platform to Enhance Active School Trips - Dr Marcus White

Dear Sir/Madam

We are pleased to respond to the invitation to support ARC Linkage Application LP170100315 – *A Multicriteria Design Platform to Enhance Active School Trips*. In support of our submission, we provide the following:

movendo is an engineering and environmental consultancy with an intense research and development (R&D) focus, and active in the transport, infrastructure, planning, community building, social and health sectors. We stand at the crossroads of technology, ecology and culture. We believe that active travel must be the fundamental design element of human systems. We support the diversity of relationships between people and encourage their interactions with nature and the built environment for the realisation of sustainable outcomes.

movendo engages in multidisciplinary R&D activities on a wide range of engineering and scientific topics, including indicators for the creation of healthy human habitats, multi-criteria measurement of transport and mobility performance, emissions and energy monitoring, land use and freight generation modelling, impact metrics for freight activity, movement detection protocols, and parameters to support sustainable mobility decision-making and optimal choice theory.

movendo sees great value in collaborating with the research team on this Linkage project. A key philosophy of movendo is valuing and nurturing its relationships with independent and multi-faceted organisations and individuals that are recognised and respected as leaders in their fields. We habitually collaborate and partner with like-minded researchers and professionals who complement our knowledge and enable us to provide clients with an unprecedented range of skills and services.

The insights gained through this project into what makes active journeys desirable and the resulting tool allowing a systematic analysis of school catchments for these factors will be extremely advantageous in devising sustainable and active transport strategies for our clients. The knowledge gathered through this project, together with the tool ultimately developed, will enable us to offer unparalleled insights to a wide range of clients, from local government agencies to private developers.

Our collaborative relationship with the research team is relatively new. However, this proposed ARC Linkage is one of two projects we are in the process of setting up with the research team. The other complementary project involves the use of our advanced human activity detection system that determines travel mode, trip purpose, origin/destination pairs and a wide range of other transport/planning parameters in real-time using smartphone sensors. The proposed parallel work is to explore research extensions of this novel technology, as well as applications with a wide range of users, including transport operators, insurance companies and government agencies.

The contribution from movendo will be a cash contribution of $16,000 and the equivalent of $34,000 of in-kind support over the 3-year project. This in-kind contribution will include the preparation of project data and scenarios, testing and providing feedback on the analysis tool, and attendance at workshops.

Total In-Kind Contribution ($ equivalent)	**Total Cash Contribution ($)**
$34,000	$16,000

I certify that no part of the movendo's cash contribution is drawn from funds previously appropriated or awarded from Commonwealth or Australian State or Territory sources for the purposes of research. I further certify that movendo will meet the requirements outlined in the standard Funding Agreement, including the requirement to enter into arrangements regarding Intellectual Property which do not unreasonably prevent or delay academic outputs.

We look forward to the opportunity to work with the research team on this exciting project.

Yours sincerely

Jose Mantilla
Director, movendo Pty Ltd

Jose Mantilla • Director • jose.mantilla@movendo.com.au • M: +61 499 888 081
movendo Pty Ltd – Australia • www.movendo.com.au • ABN 15 162 173 551
Ground Floor, 25 Ross Street, South Melbourne, VIC 3205, Australia

D5. Partner Investigator participating on this Proposal for this Partner Organisation, where applicable

Part D - Partner Organisation Details (NH ARCHITECTURE PTY LTD)

D1. Is this a Partner Organisation whose funds are appropriated predominantly from Commonwealth or Australian State or Territory funding sources for the purposes of research?

No

D2. Type of Partner Organisation

(Is this Partner Organisation an Exempt Archive and Public Record Office, an Exempt Charity, an Exempt Herbarium, an Exempt Museum and Collecting Organisation, an Exempt Non-Profit Organisation, an Exempt Small Business or an Exempt Start-up? Please refer to Sections D3 and D8.2.6 of the Funding Rules and the Instructions to Applicants for further information.)

No

Type of Exempt Organisation

D3. Evidence of collaboration with the Administering Organisation/Other Eligible Organisation and the alignment of the Project with the Partner Organisation's overall strategic plan

(In no more than one A4 page, provide evidence of new or on-going collaboration between the Partner Organisation either directly with the Administering Organisation, and/or with an Other Eligible Organisation on the Proposal, including details of how the Project fits into the Partner Organisation's overall strategic plan and how the Project is of value to each of the Partner Organisation(s) involved.)

Uploaded PDF file follows on next page.

NH Architecture (NHA) is an architecture and urban design firm engaged large scale architecture and urban design projects in Australia. They have completed several major urban projects and master planned numerous educational and retail developments. This project aligns with NHA's strategic plan and commitment to design excellence, by providing them with additional knowledge and technology to integrate sophisticated urban analysis tools that would not normally be within a design practice's repertoire.

NHA has expressed that they feel the project is of significant value for them in terms of improving their use of modelling and analysis technology in their design process to make better design decisions. They also noted the potential for both urban renewal projects, as well as green field projects.

The project builds on a prior professional practice relationship and academic teaching partnerships thought the Melbourne School of Design between NHA and CI White.

NHA has committed $10,000 in cash and $30,000 of in-kind equivalents. The in-kind contributions will include providing urban design and architecture design expertise and case study project design and data. They will also contribute time and resources including planning knowledge, hardware and software expertise, and to help design the factor's methodologies and test the decision support system tool as it is developed.

D4. Attach a letter of support for this Proposal including Partner Organisation certification

(Please attach a PDF of no more than two A4 pages of the Partner Organisation letter of support, signed by the CEO or delegate. Please refer to Section A6.2.4 of the Funding Rules for details of the required content for this letter.)

Uploaded PDF file follows on next page.

Level 7
Cannons House
12-20 Flinders Lane
Melbourne
Australia 3000

Telephone
+613 9654 4955
Facsimile
+613 9654 4938
nharchitecture.net

Architecture
Urban Design
Master Planning
Interior Design
Graphic Design

NHArchitecture

03 November 2017

Executive Director
Linkage Projects, Australian Research Council
Level 2, 11 Lancaster Place
Majura Park
Canberra ACT 2609

Dear Sir/Madam,

Re: ARC Linkage Application LP170100315
A multi-criteria design platform to facilitate active school journeys - Dr Marcus White

It is with great pleasure we respond to the invitation to support the proposed ARC Linkage project. NHA has had an ongoing professional relationship with Chief Investigator Dr White through his time working in our studio in the early 2000s and through our continuing involvement in studio reviews and teaching with the University of Melbourne.

NH Architecture is a leading Australian design studio founded on the principles of collaboration and open debate, where architects and urban designers are united by a commitment to creating outstanding contemporary architecture and urban design.

Our studio has a strong track record of engaging and contributing to the quality and permeability of the city with master planning and large scale urban developments such as Margaret Court Arena, Hilton South Warf, Melbourne Exhibition and Convention Centre, Monash University Caulfield Campus, Myer Bourke Street and QV. We see pedestrian permeability and walkability as key drivers to our design thinking and the success of our projects.

Our practice currently uses advanced design software for architectural modelling and documentation utilising both CAD and BIM (building information modelling), but we have found a lack of suitable, available technology for precinct scaled urban analysis and design, particularly aimed at walkability. We therefore see many clear benefits of this research project for our practice, such as having the ability to integrate pedestrian access modelling with the advanced micro-climate modelling and topography into our design process. We see great potential in application in both master planning in both greenfield development projects and retrofitting brownfield re-development sites. We are also interested in the potential of integration of pedestrian safety and air quality analysis into our design processes.

The contribution from NHA will be to commit $10,000 over three years financial support. This financial contribution will be drawn primarily from our practice's Research and Development fund. A small portion will also be allocated from consulting fees for specific project that we will use as studies in the research project. We have a variety of projects within the studio that we believe would be suitable for testing the research and technology and will work with the research team to choose the ideal case-studies during the commencement of the project in 2018.

NH Architecture Pty Ltd
ACN 107 591 293
ABN 95 107 591 293

Level 7
Cannons House
12-20 Flinders Lane
Melbourne
Australia 3000

Telephone
+613 9654 4955
Facsimile
+613 9654 4938
nharchitecture.net

Architecture
Urban Design
Master Planning
Interior Design
Graphic Design

NHArchitecture

We will also contribute approximately $30,000 worth of in-kind support over the three year period. This in-kind support will include provision of studio staff labour and computer resources in producing project data for case-studies, testing the research and technology developed in the project and supplying feedback to the research team, mid-level and director level staff attending meetings and workshops, and access to meeting rooms.

Total In-kind Contribution ($)	Total Cash Contribution ($)	Source of Cash Contribution
$30,000	$10,000	NHA R&D fund

I certify that no part of the NH Architecture's Cash Contribution is drawn from funds previously appropriated or awarded from Commonwealth or Australian State or Territory sources for the purposes of research.

I further certify that NH Architecture will meet the requirements outlined in the standard Funding Agreement, including the requirement to enter into arrangements regarding Intellectual Property which do not unreasonably prevent or delay academic outputs.

We look forward to the opportunity to work with the research team on this exciting project.

Yours sincerely,

Hamish Lyon
Director

NH Architecture Pty Ltd
ACN 107 591 293
ABN 95 107 591 293

D5. Partner Investigator participating on this Proposal for this Partner Organisation, where applicable

Part D - Partner Organisation Details (PCA ARCHITECTS)

D1. Is this a Partner Organisation whose funds are appropriated predominantly from Commonwealth or Australian State or Territory funding sources for the purposes of research?

No

D2. Type of Partner Organisation

(Is this Partner Organisation an Exempt Archive and Public Record Office, an Exempt Charity, an Exempt Herbarium, an Exempt Museum and Collecting Organisation, an Exempt Non-Profit Organisation, an Exempt Small Business or an Exempt Start-up? Please refer to Sections D3 and D8.2.6 of the Funding Rules and the Instructions to Applicants for further information.)

No

Type of Exempt Organisation

D3. Evidence of collaboration with the Administering Organisation/Other Eligible Organisation and the alignment of the Project with the Partner Organisation's overall strategic plan

(In no more than one A4 page, provide evidence of new or on-going collaboration between the Partner Organisation either directly with the Administering Organisation, and/or with an Other Eligible Organisation on the Proposal, including details of how the Project fits into the Partner Organisation's overall strategic plan and how the Project is of value to each of the Partner Organisation(s) involved.)

Uploaded PDF file follows on next page.

Paul Coffey Architects is an architecture and urban design firm engaged a variety of educational projects primarily working with the Catholic Education Office and local Catholic primary schools.

Paul Coffey Architects have had a continuing role as a master planning and architectural consultant for catholic schools in Victoria and have significant expertise in this area. They have expressed support for the project and the practice's belief that the project can contribute communities of children and parents by facilitating better environments for walking to and from schools, but also for has the potential to forge stronger (walkable) links between the schools and their surrounding communities through better integration with community facilities such as nearby sports and cultural buildings.

The project builds on a prior professional practice collaborations between director Paul Coffey and CI White on architectural practice projects.

Paul Coffey Architects have committed a contribution $4,000 per year for three years – at total of $12,000; and $10,000 per year over three years of in-kind support – a total of $30,000.

The in-kind contributions will include providing urban design and architecture design expertise and case study project design iterations and data. They will also contribute time and resources including educational planning knowledge, hardware and software expertise, and to help test the decision support system tool as it is developed.

D4. Attach a letter of support for this Proposal including Partner Organisation certification

(Please attach a PDF of no more than two A4 pages of the Partner Organisation letter of support, signed by the CEO or delegate. Please refer to Section A6.2.4 of the Funding Rules for details of the required content for this letter.)

Uploaded PDF file follows on next page.

Paul Coffey Architects

336 Nicholson Street Yarraville 3013 Australia
0413426837 pc@paulcoffey.com.au www.paulcoffey.com.au

3 November 2017

Paul Coffey Architects Pty Ltd

Executive Director
Linkage Projects, Australian Research Council
Level 2, 11 Lancaster Place
Majura Park
Canberra ACT 2609

Dear Sir/Madam,

Re: ARC Linkage Application LP170100315
A multi-criteria design platform to facilitate active school journeys - Dr Marcus White

Thank you for your invitation to be a part of this exciting ARC Linkage project. Here at PCA, we have a strong interest in designing for heathy, liveable communities and a particularly strong interest in designing for better accessibility to education.

I have worked with Dr Marcus White professionally through my role as Catholic Education Melbourne Architect, and our collaboration with his architecture and urban practice on numerous Catholic Education master planning and building design projects in Victoria including the St Bernard's Year 5&6 Hub in Coburg.

At Paul Coffey Architects we are serious about design. We are respected within the profession as a result of our manifold engagement with architecture and design – particularly for education. We are principally interested in working to make architecture that responds to local and regional issues particular to each project. We offer complete architectural services for all building types with a provision of specialist master planning services to the education and workplace sectors.

We see this proposed project as being highly valuable to our work with the education sector, for master planning within and beyond educational facilities. There is a strong potential for the proposed technology to be integrated into our practice's workflow to provide many additional layers of information and design intelligence. We also foresee the proposed technology as having great potential in helping for our educational sector clients to not only improve walking access for families to and from schools, but also leverage nearby community facilities such as swimming pools, sports fields and libraries. This is an important aspect of providing greater use and integration of education and community assets.

We see significant benefit for our practice and would like to contribute $4,000 per year for three years – at total of $12,000; and $10,000 per year over three years of in-kind support – a total of $30,000.

We will have projects within the office over the next three years that we can use for testing the research and technology. The in-kind support will include provision of office staff labour and computer resources in producing project data for case-studies, testing the research and technology developed in the project and supplying feedback to the research team.

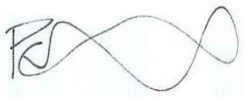
Total In-kind Contribution ($)	Total Cash Contribution ($)	Source of Cash Contribution
30,000	12,000	Practice R&D budget

I certify that no part of the Paul Coffey Architecture's Cash Contribution is drawn from funds previously appropriated or awarded from Commonwealth or Australian State or Territory sources for the purposes of research.

I further certify that PCA will meet the requirements outlined in the standard Funding Agreement, including the requirement to enter into arrangements regarding Intellectual Property which do not unreasonably prevent or delay academic outputs.

We look forward to the opportunity to work with the research team on this exciting project.

Yours sincerely,



Paul Coffey - Director
B.Arch (RMIT), RAIA, ARBV 16761.
Heritage Council of Victoria - Engineering/Building member

D5. Partner Investigator participating on this Proposal for this Partner Organisation, where applicable

Part D - Partner Organisation Details (City of Maribyrnong)

D1. Is this a Partner Organisation whose funds are appropriated predominantly from Commonwealth or Australian State or Territory funding sources for the purposes of research?

No

D2. Type of Partner Organisation

(Is this Partner Organisation an Exempt Archive and Public Record Office, an Exempt Charity, an Exempt Herbarium, an Exempt Museum and Collecting Organisation, an Exempt Non-Profit Organisation, an Exempt Small Business or an Exempt Start-up? Please refer to Sections D3 and D8.2.6 of the Funding Rules and the Instructions to Applicants for further information.)

No

Type of Exempt Organisation

D3. Evidence of collaboration with the Administering Organisation/Other Eligible Organisation and the alignment of the Project with the Partner Organisation's overall strategic plan

(In no more than one A4 page, provide evidence of new or on-going collaboration between the Partner Organisation either directly with the Administering Organisation, and/or with an Other Eligible Organisation on the Proposal, including details of how the Project fits into the Partner Organisation's overall strategic plan and how the Project is of value to each of the Partner Organisation(s) involved.)

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The City of Maribyrnong has previously been engaged with CI White through a number of modelling studies. The first study analysed the potential for an urban canopy renewal in Maribyrnong that accounts for and resolves potential conflicts with high-voltage power lines which led to a revision of their internal working methods. The second study piloted the Ped-Catch tool in examining the accessibility of two schools in Maribyrnong. Other studies have involved examining the role that urban vegetation shading can play in active school journeys in the area.

The City of Maribyrnong have stated the overwhelming overlap of the Linkage Project's objectives and those of the council, with specific reference to: innovation, transparent decision making and well-planned, effective collaboration; Healthy and inclusive communities with healthy and safe living and connection to community, Quality places and spaces with integrated built and natural environments that are accessible; well-planned neighbourhoods; Mobile and connected city with a safe, sustainable and effective transport healthy city for people to access open spaces, cleaner air and water and respond to climate change challenges.

As an early adopter of the first generation of the Ped-Catch tool, Maribyrnong has committed $105,570 in in-kind equivalents to this project. This commitment shows that the first generation tool has been of value to them and they desire to see richer set of factors available to analyse their local council area (as well as be available to other councils all across Australia) to facilitate active school journeys.

The substantial in-kind contributions to the project will include the provision of case studies within the municipality, provision of data, participation in workshops and steering committees, and testing and providing feedback during the development stages of the enhanced decision support system tool to be delivered by this project.

D4. Attach a letter of support for this Proposal including Partner Organisation certification

(Please attach a PDF of no more than two A4 pages of the Partner Organisation letter of support, signed by the CEO or delegate. Please refer to Section A6.2.4 of the Funding Rules for details of the required content for this letter.)

Uploaded PDF file follows on next page.

17 November 2017

Maribyrnong
CITY COUNCIL

Executive Director
Linkage Projects, Australian Research Council
Level 2, 11 Lancaster Place
Majura Park
Canberra ACT 2609

COUNCIL OFFICES
Corner Napier and
Hyde Streets, Footscray
POSTAL ADDRESS
PO Box 58
Footscray Victoria 3011
DX
DX81112 Footscray
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(03) 9688 0200
FACSIMILE
(03) 9687 7793
NATIONAL RELAY SERVICE
(HEARING IMPAIRED)
133 677
WEBSITE
www.maribyrnong.vic.gov.au
EMAIL
email@maribyrnong.vic.gov.au
ABN
86 517 839 961

Dear Sir/Madam,

Re: ARC Linkage Application LP170100315
A multicriteria design platform to facilitate active school journeys - Dr Marcus White

It is with great pleasure we respond to the invitation to support the proposed ARC Linkage project and continue our ongoing relationship with the research team at the University of Melbourne.

The stated aims of the project are strongly aligned with each of our council's key urban objectives:
Strong leadership - Council will proactively lead our changing city using strategic foresight, innovation, transparent decision making and well-planned, effective collaboration.
Healthy and inclusive communities - Council will provide and advocate for services and facilities that support people's wellbeing, healthy and safe living, connection to community, cultural engagement and whole of life learning.
Quality places and spaces - Council will lead the development of integrated built and natural environments that are well maintained, accessible and respectful of the community and neighbourhoods.
Growth and prosperity - Council will support diverse, well-planned neighbourhoods and a strong local economy.
Mobile and connected city - Council will plan and advocate for a safe, sustainable and effective transport network and a smart innovative city.
Clean and green - Council will strive for a clean, healthy city for people to access open spaces, cleaner air and water and respond to climate change challenges.

In late 2016, we began working with CI White and Nano Langenheim on small pilot studies within the City of Maribyrnong. We have been impressed with the quality of the research team, and their understanding and engagement with critical issues relating to our council's key objectives. In the first pilot, the team modelled key streets due for tree renewal bringing our high-voltage powerline data together with their 3D modelling of tree data sets drawing attention to potential spatial conflicts over time. We now overlay these two datasets before any tree planting proceeds. The second study involved investigating accessibility of two schools using their PedCatch tool in addition to their 3D urban forest modelling tools to calculate likely shade in summer at

school pick-up time. This analysis has identified important barriers to access that we need to prioritise, and draws attention to the strong need for better integration of pedestrian access modelling with urban forestry design.

Based on our prior engagement with the research group, we have no doubt that the project will be of great benefit to our organisation and the broader community within the City of Maribyrnong. We also see the tools being beneficial for other councils throughout Australia who are dealing with issues of urban health, sustainable transport, urban forestry, climate change and childhood safety.

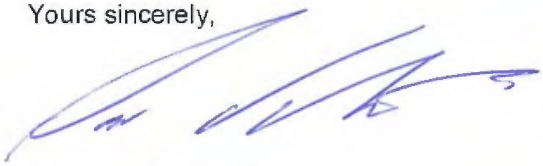
In support of the project, we will contribute an amount equivalent to $35,190 per year for three years of in-kind contributions. We envisage the contribution to include the following: provision of case studies within the municipality, provision of data including climate change and emissions data, GIS tree data, street network and street casement data, provision of town hall meeting rooms, regular participation of two expert staff in workshops and steering committees, testing and providing feedback during the development stages of the enhanced PedCatch tool.

Total In-Kind Contribution Per Year ($ equivalent)	Total Cash Contribution Per Year ($)
$ 35,190	$ 0

I certify that Maribyrnong City Council will meet the requirements outlined in the standard Funding Agreement, including the requirement to enter into arrangements regarding Intellectual Property which do not unreasonably prevent or delay academic outputs.

We look forward to the opportunity to work with the research team on this exciting project.

Yours sincerely,



Sam Ortisi
Manager - Strategic Asset Management - Maribyrnong City Council

D5. Partner Investigator participating on this Proposal for this Partner Organisation, where applicable

Part D - Partner Organisation Details (stella maris catholic primary school)

D1. Is this a Partner Organisation whose funds are appropriated predominantly from Commonwealth or Australian State or Territory funding sources for the purposes of research?

No

D2. Type of Partner Organisation

(Is this Partner Organisation an Exempt Archive and Public Record Office, an Exempt Charity, an Exempt Herbarium, an Exempt Museum and Collecting Organisation, an Exempt Non-Profit Organisation, an Exempt Small Business or an Exempt Start-up? Please refer to Sections D3 and D8.2.6 of the Funding Rules and the Instructions to Applicants for further information.)

No

Type of Exempt Organisation

D3. Evidence of collaboration with the Administering Organisation/Other Eligible Organisation and the alignment of the Project with the Partner Organisation's overall strategic plan

(In no more than one A4 page, provide evidence of new or on-going collaboration between the Partner Organisation either directly with the Administering Organisation, and/or with an Other Eligible Organisation on the Proposal, including details of how the Project fits into the Partner Organisation's overall strategic plan and how the Project is of value to each of the Partner Organisation(s) involved.)

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Stella Maris Primary School, a Catholic school located twenty kilometres from the centre of Melbourne, is a recently opened new school (2010) built in one of the fastest-growing corridors in Melbourne, Victoria. It serves its vibrant and rapidly growing outer urban neighbourhood. The school holds environmental sustainability as a core value, with understanding and teaching of environmental issues taking a high priority for highly motivated teachers and parents. Students' health, safety and wellbeing are crucial to learning and development and encouraging an active lifestyle are critical to the educational environment.

The research will aligns to the school's desire to facilitate active travel to potential benefits for children's health, concentration levels at school, and awareness of the built environment. The project also overlaps with the Active Travel School Program with Wyndham project which the school is aiming to be a participant using the DDSS technology to map where can walk or cycle to school, the routes, and analysing how walkable they are, the barriers, safety, shade and pollution. These aspects will be considered in developing a the school's School Travel Plan, which is an outcome of the Wyndham Program.

The school also sees strong potential pedagogical benefits through integration into the school's curriculum.

Stella Maris Primary School has previously worked with members of the Transport Health and Urban Design Hub (THUD) led by CI Stevenson and this project will build the collaboration to include other key members of the THUD team including CI White.

During the research phase of the project, the parents, students, and staff of the school will contribute the in-kind equivalent of $20,000.

D4. Attach a letter of support for this Proposal including Partner Organisation certification

(Please attach a PDF of no more than two A4 pages of the Partner Organisation letter of support, signed by the CEO or delegate. Please refer to Section A6.2.4 of the Funding Rules for details of the required content for this letter.)

Uploaded PDF file follows on next page.

Stella Catholic Primary School

Imagine the Future. Now.

31 October 2017
Stella Maris Primary School
64 Innisfail Drive, Point Cook VIC 3030

Executive Director
Linkage Projects, Australian Research Council
Level 2, 11 Lancaster Place, Majura Park
Canberra ACT 2609

Re: ARC Linkage Application LP170100315
A multicriteria design platform to enhance active school trips - Dr Marcus White

Dear Sir/Madam,

We are pleased to respond to the invitation to support the ARC Linkage. In support of our submission, we provide the following:

Stella Maris Primary School, a Catholic school located twenty kilometres from the centre of Melbourne, is recently opened new school (2010) built in one of the fastest-growing corridors in Melbourne, Victoria. It serves its vibrant and rapidly growing outer urban neighbourhood. The school community believes that a diversity of cultures and values brings a richness to the school, developing tolerance and understanding and exposing students to other ways of thinking. We also hold environmental sustainability as a core value, with understanding and teaching of environmental issues taking a high priority for highly motivated teachers and parents.

Students' health, safety and wellbeing are crucial to learning and development and encouraging an active lifestyle is an essential ingredient for a first-class educational environment. We firmly believe that this research will be of great value to our school through the facilitation of active travel and the potential benefits for children's health, concentration levels, and awareness of the built environment.

We are currently working with Dr Pat Love on the future planning of the school. One aspect of this is the active travel to school program being discussed with Wyndham City Council. He is a member of the Transport, Health and Urban Design research hub at University of Melbourne.

The proposed research has tremendous potential for integration into our school's curriculum lending itself well to our learning units, developed by our teaching team. We can see potential for exploring issues of environmental impact, distance and time, safety, orientation and direction, and cartography.

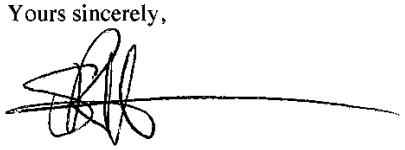
The main contribution from Stella Maris Primary School will be to in the form of in-kind contributions by our teaching staff, as well as from the parents and children of our school.

Total In-Kind Contribution ($ equivalent)	Total Cash Contribution ($)
$20,000	N/A

I further certify that we Stella Maris Primary School will meet the requirements outlined in the standard Funding Agreement, including the requirement to enter into arrangements regarding Intellectual Property which do not unreasonably prevent or delay academic outputs.

We look forward to the opportunity to work with the research team on this exciting project.

Yours sincerely,



Stephen Harrison
Principal

Stella Maris Catholic Primary
54-70 Innisfail Drive
Point Cook West 3030

Postal Address
PO Box 6405
Point Cook 3030

Telephone: 03 9395 8411
Facsimile: 03 9395 9640
Email: info@smpointcookwest.catholic.edu.au

D5. Partner Investigator participating on this Proposal for this Partner Organisation, where applicable

Part D - Partner Organisation Details (SOUTH MELBOURNE PRIMARY SCHOOL - FERRARS STREET)

D1. Is this a Partner Organisation whose funds are appropriated predominantly from Commonwealth or Australian State or Territory funding sources for the purposes of research?

No

D2. Type of Partner Organisation

(Is this Partner Organisation an Exempt Archive and Public Record Office, an Exempt Charity, an Exempt Herbarium, an Exempt Museum and Collecting Organisation, an Exempt Non-Profit Organisation, an Exempt Small Business or an Exempt Start-up? Please refer to Sections D3 and D8.2.6 of the Funding Rules and the Instructions to Applicants for further information.)

No

Type of Exempt Organisation

D3. Evidence of collaboration with the Administering Organisation/Other Eligible Organisation and the alignment of the Project with the Partner Organisation's overall strategic plan

(In no more than one A4 page, provide evidence of new or on-going collaboration between the Partner Organisation either directly with the Administering Organisation, and/or with an Other Eligible Organisation on the Proposal, including details of how the Project fits into the Partner Organisation's overall strategic plan and how the Project is of value to each of the Partner Organisation(s) involved.)

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South Melbourne Primary School is a newly built school opening in the Ferrars Street Education and Community Precinct (FSECP), just south of the Melbourne CBD. A major design goal for the precinct was to act as a community hub and major activity centre, integrating the school with community facilities, open space, and public and active transport. The design of the streetscapes surrounding the school were carefully considered, converting a former industrial area into a well-connected mixed-use precinct that is supportive of the local residents and businesses.

Enabling active transport is seen by the school as an important outcome of this project. This will have benefits for the health of the school children, improve concentration levels, and enable the high integration of the school into its catchment. As the area has been highly redeveloped, converted from an industrial area, the insights of the project and the platform developed will allow the school to better understand its local area and determine how successful the urban design effort has been in encouraging active transport by its students.

South Melbourne Primary School has previously worked with CI Imms on other education related projects. This gives the school confidence that the outcomes and tools created by the project will be successfully integrated into its curriculum and help explore topics of sustainability, geography, and urban design.

During the research phase of the project, the parents, students, and staff of the school will contribute the in-kind equivalent of $20,000.

D4. Attach a letter of support for this Proposal including Partner Organisation certification

(Please attach a PDF of no more than two A4 pages of the Partner Organisation letter of support, signed by the CEO or delegate. Please refer to Section A6.2.4 of the Funding Rules for details of the required content for this letter.)

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SOUTH MELBOURNE
Primary School

16 November 2017
South Melbourne Primary School
129 Ferrars Street, South Melbourne 3205

Executive Director
Linkage Projects, Australian Research Council
Level 2, 11 Lancaster Place, Majura Park
Canberra ACT 2609

Re: ARC Linkage Application LP170100315
A multicriteria design platform to enhance active school trips - Dr Marcus White

Dear Sir/Madam,

We are pleased to respond to the invitation to support the ARC Linkage. In support of our submission, we provide the following:

South Melbourne Primary School is a newly built school opening in the Ferrars Street Education and Community Precinct (FSECP), just south of the Melbourne CBD. A major design goal for the precinct was to act as a community hub and major activity centre, integrating the school with community facilities, open space, and public and active transport. The design of the streetscapes surrounding the school were carefully considered, converting a former industrial area into a well-connected mixed-use precinct that is supportive of the local residents and businesses.

The proposed research project is of great interest to the South Melbourne Primary School. Enabling active transport for our students, with all the benefits that brings to their health and concentration levels, is a key priority. In addition, the project will allow us to explore the community in great detail, using many different methods that would not be possible otherwise. These insights will be valuable as the school evolves and integrates with its newly redesigned catchment area.

We have worked with members of Wesley Imms's research team in the past. We look forward to utilising his expertise in bringing the research into our school's curriculum. This will help us explore topics such as sustainability, travel, and geography through our participation in the project and through the tools created by the research team.

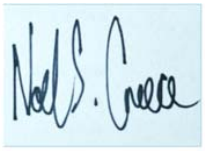
The main contribution from South Melbourne Primary School over the three year project will be to in the form of in-kind contributions by our teaching staff, as well as from the parents and children of our school.

Total In-Kind Contribution ($ equivalent)	Total Cash Contribution ($)
$20,000	N/A

I certify that we South Melbourne Primary School will meet the requirements outlined in the standard Funding Agreement, including the requirement to enter into arrangements regarding Intellectual Property which do not unreasonably prevent or delay academic outputs.

We look forward to the opportunity to work with the research team on this exciting project.

Yours sincerely,



Noel Creece
Principal

D5. Partner Investigator participating on this Proposal for this Partner Organisation, where applicable

Part D - Partner Organisation Details (VicRoads)

D1. Is this a Partner Organisation whose funds are appropriated predominantly from Commonwealth or Australian State or Territory funding sources for the purposes of research?

No

D2. Type of Partner Organisation

(Is this Partner Organisation an Exempt Archive and Public Record Office, an Exempt Charity, an Exempt Herbarium, an Exempt Museum and Collecting Organisation, an Exempt Non-Profit Organisation, an Exempt Small Business or an Exempt Start-up? Please refer to Sections D3 and D8.2.6 of the Funding Rules and the Instructions to Applicants for further information.)

No

Type of Exempt Organisation

D3. Evidence of collaboration with the Administering Organisation/Other Eligible Organisation and the alignment of the Project with the Partner Organisation's overall strategic plan

(In no more than one A4 page, provide evidence of new or on-going collaboration between the Partner Organisation either directly with the Administering Organisation, and/or with an Other Eligible Organisation on the Proposal, including details of how the Project fits into the Partner Organisation's overall strategic plan and how the Project is of value to each of the Partner Organisation(s) involved.)

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VicRoads' purpose is to deliver social, economic, and environmental benefits to communities throughout Victoria by managing the Victorian arterial road network and its use as an integral part of the overall transport system. Our aims relate to continued road crash reductions, managing, and improving the effectiveness and efficiency of the road transport system, an integrated and sustainable road transport system, minimising the impact of roads and traffic on the community, and effective, equitable, and efficient customer relationships.

This project aligns in a number of ways with VicRoads' strategic plans and policy linkages including: the National Early Childhood Development Strategy - Investment in the Early Years; National Quality Framework for Early Childhood Education and Care; The National Practices for Early Childhood Road Safety Education; AusVELS; The Principles for Road Safety Education. The project also aligns with the objectives of our Active Transport Programs, particularly Walk Safely to School, Ride2school and SafetoSchool, and the Victorian Prevention and Health Promotion Achievement programs.

VicRoads has participated in the Transport Health and Urban Design workshops at the University of Melbourne and has previously partnered with CI Stevenson on the 2015 VicRoads Safety Leadership Program. This track record gives them confidence in the successful outcome of this project.

To support the project, the VicRoads is providing in-kind support of $120,000 over the three year project. The in-kind support will include provision of data (road and traffic data) and analysis, feedback on the methodology process and testing the different components of the DDSS, attending meetings, and providing workshops.

D4. Attach a letter of support for this Proposal including Partner Organisation certification

(Please attach a PDF of no more than two A4 pages of the Partner Organisation letter of support, signed by the CEO or delegate. Please refer to Section A6.2.4 of the Funding Rules for details of the required content for this letter.)

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TOWARDS ZERO Safe System Road Infrastructure Program

SSRIP
1 McNab Avenue
Footscray Victoria 3011
t: 03 8572 7992
e: ssrip@roads.vic.gov.au

Dr Marcus White
Faculty of Architecture, Building and Planning
Room 428, Melbourne School of Design, Building 133
The University of Melbourne VIC 3010
AUSTRALIA

Dear Dr White,

Re: ARC Linkage Application LP170100315

It is with great pleasure we respond to the invitation to support the proposed ARC Linkage project and continue our ongoing relationship with the Transport, Health and Urban Design Research Hub (THUD) research team.

VicRoads' purpose is to deliver social, economic, and environmental benefits to communities throughout Victoria by managing the Victorian arterial road network and its use as an integral part of the overall transport system. Our aims relate to continued road crash reductions, managing, and improving the effectiveness and efficiency of the road transport system, an integrated and sustainable road transport system, minimising the impact of roads and traffic on the community, and effective, equitable, and efficient customer relationships.

This proposed ARC Linkage project on active school journeys will provide significant benefits to VicRoads through a deeper understanding of how active school journeys can be promoted and how road infrastructure design decision making can impact those journey choices. Based on our prior engagement with the research group on other ARC linkage projects, we have no doubt that the project will be of great benefit to our organisation and the broader community within Victoria. We see the research as beneficial in helping VicRoads understand how the management of our road system contributes to the health and safety of Victorians, especially of school children. We can clearly see the benefit of the proposed analysis and decision support system in our assessment, intervention and planning processes. This new toolset will help us plan for the future, creating a sustainable and resilient road transport system that accounts for active transport options and what makes those options more desirable.

The contribution from VicRoads will be to commit in-kind valued at $30,000 per year with a total of $90,000 total over the three-year period. VicRoads in-kind support includes attendance at project working group meetings, assistance in reviewing documents, providing advice, provision of data and also travel time to and from meetings.

Total In-kind Contribution ($)	Total Cash Contribution ($)	Source of Cash Contribution
90,000	0	0

I further certify that VicRoads will meet the requirements outlined in the standard Funding Agreement, including the requirement to enter into arrangements regarding Intellectual Property which do not unreasonably prevent or delay academic outputs.

I have read and understood the requirements in the standard Linkage Project Funding Agreement about Partner Organisation written agreements, including the requirements to enter into arrangements regarding intellectual property.

Yours sincerely,

BRYAN SHERRITT
DIRECTOR

28 / 11 / 2017

D5. Partner Investigator participating on this Proposal for this Partner Organisation, where applicable

Part D - Partner Organisation Details (WYNDHAM CITY COUNCIL)

D1. Is this a Partner Organisation whose funds are appropriated predominantly from Commonwealth or Australian State or Territory funding sources for the purposes of research?

No

D2. Type of Partner Organisation

(Is this Partner Organisation an Exempt Archive and Public Record Office, an Exempt Charity, an Exempt Herbarium, an Exempt Museum and Collecting Organisation, an Exempt Non-Profit Organisation, an Exempt Small Business or an Exempt Start-up? Please refer to Sections D3 and D8.2.6 of the Funding Rules and the Instructions to Applicants for further information.)

No

Type of Exempt Organisation

D3. Evidence of collaboration with the Administering Organisation/Other Eligible Organisation and the alignment of the Project with the Partner Organisation's overall strategic plan

(In no more than one A4 page, provide evidence of new or on-going collaboration between the Partner Organisation either directly with the Administering Organisation, and/or with an Other Eligible Organisation on the Proposal, including details of how the Project fits into the Partner Organisation's overall strategic plan and how the Project is of value to each of the Partner Organisation(s) involved.)

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The City of Wyndham has adopted a transport strategy which in part seeks to create a pedestrian and cycling friendly central city. As such, they are highly supportive of research that aims to understand what urban design elements best facilitate these types of active transport.

This project aligns with a number of the City of Wyndham's strategic plans. Understanding the factors that make an active journey desirable is a necessary step to design infrastructure that supports these journeys. The resulting design decision support tool will provide them with a method to systematically analyse activity centre catchments to foster active journeys to them.

The City of Wyndham is part of the Greening the West initiative, and also has in place a comprehensive City Forest & Habitat Strategy. This ARC Linkage's focus on human thermal comfort (HTC) due to urban vegetation and its impact on active journeys will allow the city to optimise their urban greenery efforts for a healthy and resilient urban forest that also provides HTC benefits to active journeys.

Initial discussions between the research team, Partner organisations City of Wyndham and Stella Maris Primary School (school within City of Wyndham) have occurred resulting in strong support for using Stella Maris as one of the case studies.

The City of Wyndham has committed $90,000 in in-kind equivalents to this project. The in-kind contributions to the project will include the provision of case studies within the municipality, provision of data, participation in workshops and steering committees, and testing and providing feedback during the development stages of the enhanced decision support system tool to be delivered by this project.

D4. Attach a letter of support for this Proposal including Partner Organisation certification

(Please attach a PDF of no more than two A4 pages of the Partner Organisation letter of support, signed by the CEO or delegate. Please refer to Section A6.2.4 of the Funding Rules for details of the required content for this letter.)

Uploaded PDF file follows on next page.

wyndham city
city. coast. country

Civic Centre | 45 Princes Highway, Werribee, Victoria 3030, Australia
Postal | PO Box 197, Werribee, Victoria 3030, Australia

Telephone | (03) 9742 0777
Facsimile | (03) 9741 6237
Email | mail@wyndham.vic.gov.au
www.wyndham.vic.gov.au

DX 30258 Werribee Vic
ABN: 38 393 903 860

Your Ref: WyndhamLetterDraft

Our Ref: A1891682

24 November 2017

Executive Director
Linkage Projects, Australian Research Council
Level 2, 11 Lancaster Place
Majura Park
CANBERRA ACT 2609

Dear Sir/Madam

Re: ARC Linkage Application LP170100315
A multicriteria design platform to facilitate active school journeys - Dr Marcus White

We are delighted to support the proposed ARC Linkage project to produce a new urban design decision support system to aid us in making our suburbs more walkable and suitable for active transport for children.

Wyndham is estimated to have the largest population growth of all Local Government Areas in Victoria in the coming decades. By 2040, it is estimated that an additional 225,000 people will be living in Wyndham, bringing the total population to over 425,000 (Victoria in the Future 2014).

One of our key policy objectives is to reduce car dependency – to reduce the significant increasing demands across the entire transport system locally and regionally, but also to contribute to the health of our residents. Family life is integral to people in Wyndham, it is a place for people to bring up their children. Residents place value on having a range of locally available facilities and services that cater to their needs. Safe and comfortable pedestrian and cycling connectivity across the municipality, but particularly active near schools is a critical component of our objective to reduce car dependency.

The proposed ARC Linkage Project aligns with several of our policies, programs and broader objectives including:

- The Wyndham Active Travel Schools Program
- Wyndham Integrated Transport Strategy
- City Forest & Habitat Strategy
- Wynlens - Visual, Analysis & Modelling of a Holographic City
- Wyndham's Leisure Strategy 2013-2017 (which is currently being updated and will be re-named "Active Wyndham 2040 Strategy")

We would like to offer $30,000 worth of in-kind contribution per year for the three-year project duration.

Total In-kind Contribution ($)	Total Cash Contribution ($)	Source of Cash Contribution
$90,000	0	NA

This contribution to be made up of GIS data provision, time and travel to meetings, key staff participation at expert review panel and steering committee meetings, case study data and design's project team work, and provision of feedback on each of the different decision support system factors as they develop throughout the project duration. The total contribution of in-kind contribution is summarised in the table below:

Role/Task/Support	**No. Staff x Hr Rate**	**Mtg Duration (hrs)**	**No. Meetings**	**Total**
GIS Data Provision (no travel)	2 x $60	3	12	$4,320
Time & Travel to Meetings – Calculate 1.5 hrs	2 x $60	3.5	12	$5,040
Key staff participation • Expert review panel • Steering Committee	4 x $60	3.5	12	$10,080
Case Study Data (hours)	1 x $60	1.5	6	$540
			No hrs per staff member	
Structured feedback provision	2 x $60		24	$5,760
			Sub-Total:	**$25,740**
Overheads (ie: computers, utilities, desk space etc).				$4,260
			Total:	**$30,000**

I certify that City of Wyndham will meet the requirements outlined in the standard Funding Agreement, including the requirement to enter into arrangements regarding Intellectual Property which do not unreasonably prevent or delay academic outputs.

We look forward to the opportunity to work with the research team on this exciting project.

Yours faithfully

GRIFF DAVIS
MANAGER – CITY TRANSPORT

D5. Partner Investigator participating on this Proposal for this Partner Organisation, where applicable

Part E - Project Cost (LP170100315)

E1. What is the proposed budget for your Project?

(Please refer to the Instructions to Applicants for detailed instructions.)

Total requested budget: $559,937

Year 1

Description	ARC	Admin Org		Partner Org	
	Cash	Cash	In-kind	Cash	In-kind
Total	185,169		159,684	46,668	171,192
Personnel	137,663		156,484	46,668	
CI Stevenson, Lev E (0.2 FTE)			48,790		
CI White, Lev C3 (0.2 FTE)			33,384		
CI Livesley, Lev D4 (0.1 FTE)			20,865		
CI Schofield, Lev C1 (0.1 FTE)			15,729		
RA[1], Lev A6 (0.6 FTE)	21,517			46,668	
RF[1], Lev B1 (0.5 FTE)	64,204				
PM[1], Lev 6.1 (0.5 FTE)	51,942				
CI Hes, Lev C6 (0.1 FTE)			18,136		
CI Imms, Lev D2 (0.1 FTE)			19,580		
Equipment	4,000				
Pollution monitors (16 x Shinyei PPD60PV)	4,000				
Travel	3,122				
RF[1] Conferences Accm (4 nights, 250 per night)	1,000				
RF[1] Conferences per diem (60% of ATO rate)	522				
Return Airfare-Melbourne to Barcelona return RF[1]	1,600				
Fieldwork Expenses	1,040				
Local travel, (33-Year1&3), (26-Yea 2) 60km round trip, at $0.52/km	1,040				
Other	39,344		3,200		171,192
Consultant (software development) (0.2, 0.4, 0.15 FTE yrs 1,2,3) $100/hr	36,000				
Conference Registration	1,000				
Workshops room hire (hosted at UoM)			3,200		
Workshop catering ($12/person) x 8	384				
Web site hosting	1,000				
Data and data processing					28,000
Project Advisory Committee catering ($12/person) x 8	960				
Project Advisory Committee room hire (hosted at PO)					6,192
PO Project staff time					75,000
PO Expert staff time					40,000

PO Overheads (Computers, desk space etc.)					22,000

Year 2

Description	ARC	Admin Org		Partner Org	
	Cash	Cash	In-kind	Cash	In-kind
Total	223,109		175,262	46,666	171,191
Personnel	143,611		175,262	46,666	
CI Stevenson, Lev E (0.2 FTE)			48,790		
CI Livesley, Lev D4 (0.1 FTE)			20,865		
CI Schofield, Lev C1 (0.1 FTE)			16,692		
RA[1], Lev A7 (0.6 FTE)	24,019			46,666	
RF[1], Lev B2 (0.5 FTE)	66,610				
PM[1], Lev 6.2 (0.5 FTE)	52,982				
CI Hes, Lev C6 (0.1 FTE)			18,136		
CI White, Lev C4 (0.2 FTE)			34,346		
CI Schofield, Lev C2 (0.1 FTE)			16,211		
CI Imms, Lev D3 (0.1 FTE)			20,222		
Travel	3,322				
RF[1] Conferences Accm (4 nights, 250 per night)	1,000				
RF[1] Conferences per diem (60% of ATO rate)	522				
Return Airfare-Melbourne to USA return RF[1]	1,800				
Fieldwork Expenses	832				
Local travel, (33-Year1&3), (26-Yea 2) 60km round trip, at $0.52/km	832				
Other	75,344				171,191
Consultant (software development) (0.2, 0.4, 0.15 FTE yrs 1,2,3) $100/hr	72,000				
Conference Registration	1,000				
Workshop catering ($12/person) x 8	384				
Web site hosting	1,000				
Data and data processing					28,000
Project Advisory Committee catering ($12/person) x 8	960				
Project Advisory Committee room hire (hosted at PO)					6,191
PO Project staff time					75,000
PO Expert staff time					40,000
PO Overheads (Computers, desk space etc.)					22,000

Year 3

Description	ARC	Admin Org		Partner Org	
	Cash	Cash	In-kind	Cash	In-kind

Total	151,659		160,656	46,666	171,187
Personnel	117,153		160,656	46,666	
CI Stevenson, Lev E (0.2 FTE)			48,790		
CI Livesley, Lev D4 (0.1 FTE)			20,865		
RA[1], Lev A8 (0.6 FTE)	26,521			46,666	
RF[1], Lev B3 (0.5 FTE)	69,017				
PM[1], Lev 6.3 (0.2 FTE)	21,615				
CI Hes, Lev C6 (0.1 FTE)			18,136		
CI White, Lev C5 (0.2 FTE)			35,308		
CI Schofield, Lev C3 (0.1 FTE)			16,692		
CI Imms, Lev D4 (0.1 FTE)			20,865		
Travel	3,122				
RF[1] Conferences Accm (4 nights, 250 per night)	1,000				
RF[1] Conferences per diem (60% of ATO rate)	522				
Return Airfare-Melbourne to Europe return RF[1]	1,600				
Fieldwork Expenses	1,040				
Local travel, (33-Year1&3), (26-Yea 2) 60km round trip, at $0.52/km	1,040				
Other	30,344				171,187
Consultant (software development) (0.2, 0.4, 0.15 FTE yrs 1,2,3) $100/hr	27,000				
Conference Registration	1,000				
Workshop catering ($12/person) x 8	384				
Web site hosting	1,000				
Data and data processing					28,000
Project Advisory Committee catering ($12/person) x 8	960				
Project Advisory Committee room hire (hosted at PO)					6,187
PO Project staff time					75,000
PO Expert staff time					40,000
PO Overheads (Computers, desk space etc.)					22,000

Partner Organisation

Organisation	Year 1		Year 2		Year 3	
	Cash	In-kind	Cash	In-kind	Cash	In-kind
TRANSPORT ACCIDENT COMMISSION	30,000	16,667	30,000	16,667	30,000	16,666
KENSINGTON PRIMARY SCHOOL		6,667		6,667		6,666
ASPECT STUDIOS PTY LTD	4,000	8,000	4,000	8,000	4,000	8,000

MOVENDO PTY. LTD.	5,334	11,334	5,333	11,333	5,333	11,333
NH ARCHITECTURE PTY LTD	3,334	10,000	3,333	10,000	3,333	10,000
PCA ARCHITECTS	4,000	10,000	4,000	10,000	4,000	10,000
City of Maribyrnong		35,190		35,190		35,190
stella maris catholic primary school		6,667		6,667		6,666
SOUTH MELBOURNE PRIMARY SCHOOL - FERRARS STREET		6,667		6,667		6,666
VicRoads		30,000		30,000		30,000
WYNDHAM CITY COUNCIL		30,000		30,000		30,000
Total	46,668	171,192	46,666	171,191	46,666	171,187
Committed Total	46,668	171,192	46,666	171,191	46,666	171,187

Part F - Budget Justification (LP170100315)

F1. Justification of funding requested from the ARC

(In no more than two A4 pages and within the required format fully justify, in terms of need and cost, each budget item requested from the ARC. Use the same headings as in the Description column in the budget at Part E of this Proposal.)

Uploaded PDF file follows on next page.

F1 Justification of funding requested from the ARC

Personnel

As this project involves a number of multidisciplinary areas, each with large research gaps, the majority of the project funding is concentrated on the provision of personnel to conduct the research in these areas. Due to the iterative, cyclical development approach to the project, the components of research and development of the different factors will partially overlap but the four main components of the project will be urban topography, human thermal comfort, pedestrian risk, and air pollution. The project will be conducted over a three year period with staging broadly conforming to the diagram shown in Figure 2 in Section C1.

The first factor, urban topography, is the shortest component. It has already undergone two full development cycles and been partially refined providing proof of concept/feasibility for an additional add-on factor to the PedCatch base tool using seed funding awarded by Melbourne Social Equity Institute. The urban topography factor will be completed with a single additional development cycle and disseminated to partners and academic community early in Year 1.

The second environmental factor, human thermal comfort, has had initial work on the framing stage of the development cycle through pilot work with City of Maribyrnong. The majority of development for the technology and case study testing in practice with partner organisations for this factor will be conducted within Year 1 and requires considerably more development support. Resulting knowledge and technology will be disseminated to partners and academic community early in Year 2.

The third urban factor, pedestrian risk, will be developed primarily within Year 2 with dissemination occurring towards the end of the year.

The final environmental factor, air pollution, will occur late in Year 2 and through the first half of Year 3. This will be followed by dissemination of the research and technology responding to this environmental factor, as well as synthesis and testing of the combined factors (DDSS) and further testing using practice partner led project studies. The second part of Year 3 will also include exploration of the pedagogical potential of the technology in educational curriculum development.

The funding from the ARC will support the following personnel:

Research Assistant RA[1]: RA[1] will be required (0.6 FTE) in Years 1, 2, and 3 as a data collection and conversion assistant. The position will require experience in data collection and conversion from a wide variety of sources. These data sets will include pollution data, traffic counts, urban layouts, and climate data sets required for modelling the four different desirability factors. This position will require modelling experience to model climate and pollution scenarios and perform modelling for case studies. This position will support field research, assessing the impact of human thermal comfort, pollution, risk, and topography on the desirability of active journeys. In Year 3, RA[1] will take on most of the administrative responsibilities of PM[1]. The cost will be $21,517, $24,091, and $26,521 in Years 1, 2, and 3 (remainder costs of $46,668, $46,666, and $46,666 to be covered by partner cash contributions).

Research Fellow RF[1]: RF[1] has primary responsibility for conducting research related to the four factors impacting active school journeys (topography, pedestrian risk, human thermal comfort, and pollution) (largely in Years 1 and 2). RF[1] will also lead activities around data collection (in Years 2 and 3) and conversion and translation of the research into publications and reports for research industry partners (in years 2 and 3). In addition, RF[1] will lead RA personnel in research activities. Position is 0.5 FTE in Years 1, 2, and 3. Costs will be $64,204, $66,610, and $69,017 in Years 1, 2, and 3.

Project Manager PM[1]: PM[1] is needed to manage this project which will involve coordination of regular interdisciplinary stakeholder group meetings, communication between the management committee, coordination of communication with research industry partners, meeting scheduling, and other organisational tasks. An experienced project manager will oversee operational administrative tasks in the project and provide administrative support for CI White and CI Stevenson. The project manager will also arrange all requirements for face to face meetings, video conferencing, and develop and action any translation materials required to meet the needs of the project and our objective of creating mechanisms that maintain excellent communication between our investigator group, our expert group, as well as our translation of the research to academic and broader community members. This person will set up the processes and procedures that will ensure each year's' work plans are met. A higher time fraction in the first year is requested to support project setup (Position is 0.5 FTE in Years 1 and 2) and a reduced fraction in the third year (0.2 FTE in Year 3). Costs will be $51,942, $52,982, and $21,615 in Years 1, 2, and 3.

Equipment
Much of the monitoring equipment will draw from existing university equipment, with the exception of pollution monitors, where we are requesting $4,000 for 16 AirBeam_Particle Sensors (Shinyei PPD60PV) ($250 each). Monitors will be used for air pollution validation, assessing the accuracy of using_satellite derived LUR maps and modelling for air pollution for walks to school journeys.

Travel
Travel - Conferences
The dissemination of the research at both national and international conferences is of the utmost importance for the success of the project. Though CIs will fund their own travel and registrations, a modest allowance for ECR research fellow (RF[1]) is requested. RF[1] travel and conference fees for conferences in Years 1, 2, and 3. This includes $1000/year for accommodation, $522/year conference per diem (60% of ATO rate), $1000/year for conference registrations, and Economy Flights to Europe $1600 (Year 1), USA $1800 (Year 2) and Europe $1600 (year 3). We see this as an important aspect of research staff training and career building for the RF[1]. We intend on submitting for peer reviewed international conferences such as Urban Transitions 2018 Integrating Urban and Transport Planning, Environment and Health for Healthier Urban Living, and ICSUIIP 2018: 20th International Conference on Smart Urban Infrastructures and Infrastructure Planning in Year 1. The destination for the conferences in Years 2 and Year 3 is currently unknown, but will likely include CUPUM - International Conference on Computers in Urban Planning, Urban Transitions - Integrating Urban and Transport Planning, Environment and Health for Healthier Urban Living conference, and ICHSC: International Conference on Healthy and Sustainable Cities conference.

Travel - Fieldwork/collaboration/project meetings.
Local travel for fieldwork (case study) research sites will be required for this project with sites located across the Melbourne Metropolitan area. Exact site locations will be determined based on partner projects, but will include multiple suburban sites per urban design partner, and per local government group. The Human Thermal Comfort (Year 1) and Air Pollution module (Year 3) will involve onsite monitoring (thermal and air quality respectively) requiring several visits to each site.

The project requires transport to collaboration meetings with partners as well as Project Advisory Group meetings. We have made an allowance of $1040 in Year 1, $832 in Year 2, and $1040 in Year 3 has been made costed at $0.52/km.

Other
Consultant (software development) C[1]: C[1] will be required as a web developer (costed at $100/hr or $180,000/year for 1.0 FTE) at 0.2, 0.4 and 0.15 FTE in Years 1, 2, and 3 with costs of $36,000, $72,000, and $27,000 in those years. The position will require experience in Java J2EE and web technologies. C[1] will be responsible for extending the PedCatch software to allow additional analysis layers, creating functionality to import and export scenarios, and implement additional analysis layers.

Web site hosting
As the key project output will be web-based application, high quality commercial grade hosting is required. This is costed at $1000/year for Years 1, 2, and 3.

Project Advisory Committee (PAC) meetings
PAC meetings will be essential for each environmental factor research component, particularly during Frame stage and Refine stages of development. The PAC will include 30 participants made up of CIs, partner personnel, and key stakeholders, will be held twice for each project component (topography (2), human thermal comfort (2), pollution (2), and pedestrian risk (2)) making 8 in total. Meetings will be hosted at the University or partner organisations through in-kind contributions, however, a modest allowance for catering ($12/person) is requested for the workshops (cost of 8x30x12=$2880 in total).

Workshops
Two collaborative workshops per environmental factor research component (8 workshops in total) will also be held with smaller group of 12 participants made up of relevant CIs and partners. An allowance for catering ($12/person) is requested for the workshops (cost of 8x12x12=$1152 in total).

F2. Details of Partner Organisation and other non-ARC contributions

(In no more than two A4 pages and within the required format, provide an explanation of how non-ARC contributions will support the proposed Project. Use the same headings as in the Description column in the budget at Part E of this Proposal. Contributions by Partner Organisations should be highlighted and attributed to specific Partner Organisations.)

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F2 Justification of Partner Organisation and other non-ARC contributions

Personnel

The University of Melbourne is strongly supporting involvement of CI White (0.2 FTE), CI Stevenson (0.2 FTE), CI Livesley (0.1 FTE), CI Schofield (0.1 FTE), CI Hes (0.1 FTE), and CI Imms (0.1 FTE).

CI White will provide project management and intellectual input throughout the project. CI White will lead and manage the project and take primary responsibility for the direction of the research and communication of results. He will take a leading role in ensuring the project meets its stated aims and objectives, will mentor research staff, and will provide sufficient intellectual input and guidance. CI White will supervise C[1], RA[1], and RF[1]. CI White will manage elements related to the Ped-Catch tool as well as its extension with additional analysis layers from this project. CI White University of Melbourne (Academic scale Level C, Step 3, 0.2 FTE) salaries $33,384 in year 1, $34,346 in year 2, and $35,309 in year 3.

CI Stevenson will be responsible for the coordination and management of the project. He will manage elements related to the creation of the methodology around pedestrian risk and its application in the project. He will play a role in the translation of the results, its dissemination to research industry partners, and will contribute to publications. CI Stevenson University of Melbourne (Academic scale Level E, Step 1, 0.2 FTE) salaries $48,790 year 1, year 2, and year 3 for a total of $146,370. Professor Stevenson holds a 2018 NHMRC Research Fellowship. The salary for this Fellowship is co-funded by the UoM. The in-kind salary contributions for this proposal will be sourced from UoM funds.

CI Livesley will be responsible for supervising the research creating the methodology around human thermal comfort and its application in this project. He will play a role in the translation of the results, its dissemination to research industry partners, and will contribute to publications. CI Livesley University of Melbourne (Academic scale Level D, Step 4, 0.1 FTE) salaries $20,865 year 1, year 2, and year 3 for a total of $62,595.

CI Schofield will be responsible for supervising the research creating the methodology around pollution exposure and its application in this project. She will play a role in the translation of the results, its dissemination to research industry partners, and will contribute to publications. CI Schofield University of Melbourne (Academic scale Level C, Step 1-3, 0.1 FTE) salaries $15,729 year 1, $16,212 year 2, $16,692 year 3.

CI Hes will be responsible for the social research aspects and sustainability implications of the factor's methodologies and the adoption of the decision design system tool. CI Hes University of Melbourne (Academic scale Level C, Step 6, 0.1 FTE) salaries $18,136 year 1, $18,770 year 2, and $19,427 year 3 for a total of $56,333.

CI Imms will be responsible for the collaboration with educational institutions and pedagogical opportunities. It is anticipated that this research can be integrated into the pilot studies (such as Kensington Primary School) curriculum starting in year 2 and 3 of the project. CI Imms University of Melbourne (Academic scale Level D2, Step 1-3, 0.1 FTE) salary $19,580 year 1, $20,222 year 2, and $20,865 year 3.

(Partner Organisation) contributions:

Traffic Accident Commission *(TAC) partner organisation contributions*: The TAC will contribute $30,000 cash per annum over the life of the project. In addition, they will contribute $50,000 in total in in-kind equivalents ($16,667 years 1 and 2 and $16,666 year 3).

Personnel: The cash contribution will be allocated to cover, in part ($30,000 annually), the cost of the RA[1] per annum for three years ($56,820 in year 1, $58,905 in year 2, and $60,990 in year 3).

In-kind: The in-kind support will include data processing of road trauma data, feedback on the methodology process and resulting tool, attending meetings, and providing workshops at a value of $50,000.

Aspect Design *partner organisation contributions*: Aspect Design will contribute $4000 cash per annum over the life of the project. In addition, they will contribute $8,000 per annum in in-kind equivalents.

Personnel: The cash contribution will be allocated to cover, in part ($4,000 annually), the cost of the RA[1] per annum for three years ($56,820 in year 1, $58,905 in year 2, and $60,990 in year 3).

In-kind: The in-kind contributions, at a value of $8,000 per annum, will include providing landscape architecture design expertise. They will also contribute time and resources to landscape planning knowledge and hardware and software expertise to help design the factor's methodologies and build and integrate the final decision support system tool.

Kensington Primary School & Stella Maris Primary School & South Melbourne Primary School *partner organisation contributions*: The Kensington Primary School, Stella Maris Primary School, and South Melbourne Primary School will contribute $20,000 in total ($6,667 years 1 and 2, $6,666 year 3) in in-kind equivalents.

In-kind: The in-kind contributions will include the time and effort of the parents, children, and staff of this school contributing to this research and testing the resulting methodologies.

Movendo *partner organisation contributions*: Movendo will contribute $16,000 in total cash over the life of the project ($5,334 year 1 and $5,333 years 2 and 3). In addition, they will contribute $34,000 total in in-kind equivalents ($11,334 year 1 and $11,333 years 2 and 3).

Personnel: The cash contribution will be allocated to cover, in part ($5,333 annually), the cost of the RA[1] per annum for three years ($56,820 in year 1, $58,905 in year 2, and $60,990 in year 3).

In-kind: The in-kind contributions, at a value of $34,000, will include providing practice based transport engineering expertise. They will also contribute time and resources to traffic engineering, pedestrian access knowledge along with hardware and software expertise to help design the factor's methodologies and build and test the final decision support system tool.

NHA *partner organisation contributions***:** NHA will contribute $10,000 in cash over the life of the project ($3,334 year 1 and $3,333 years 2 and 3). In addition, they will contribute $30,000 in in-kind equivalents ($10,000 in years 1, 2, and 3).

Personnel: The cash contribution will be allocated to cover, in part ($3,333 annually), the cost of RA[1] per annum for three years ($56,820 in year 1, $58,905 in year 2, and $60,990 in year 3).

In-kind: The in-kind contributions, at a value of $30,000, will include providing urban design expertise. They will also contribute time and resources to urban planning knowledge and hardware and software expertise to help design the factor's methodologies and build and test the final decision support system tool.

Paul Coffey Architects *partner organisation contributions*: Paul Coffey Architects will contribute $4,000 cash per annum over the life of the project. In addition, they will contribute $10,000 per annum in in-kind equivalents over the life of the project.

Personnel: The cash contribution will be allocated to cover, in part ($4,000 annually), the cost of RA[1] per annum for three years ($56,820 in year 1, $58,905 in year 2, and $60,990 in year 3).

In-kind: The in-kind contributions will contribute to the provision of school master planning case studies, and substantial consulting time testing and providing feedback during the development stages of the tools.

City of Maribyrnong *partner organisation contributions*: The City of Maribyrnong will contribute $35,190 per annum in in-kind equivalents over the life of the project.

In-kind: The in-kind contributions will contribute provision of case studies within the municipality, provision of data including climate change and emissions data, GIS tree data, street network and street casement data, provision of town hall meeting rooms, regular participation of two expert staff in workshops and steering committees, testing and providing feedback during the development stages of the tools.

City of Wyndham *partner organisation contributions*: The City of Wyndham will contribute $30,000 per annum in in-kind equivalents over the life of the project.

In-kind: The in-kind contributions will include GIS data provision, staff time and travel time, case study data, structured project feedback, and staff overheads (i.e. computers, utilities, deskspace, etc.).

VicRoads *partner organisation contributions*: VicRoads will contribute $30,000 per annum in in-kind equivalents over the life of the project.

In-kind: The in-kind contributions includes attendance at project working group meetings, assistance in reviewing documents, providing advice, provision of data, preparing materials for workshops, project management and reporting, and also travel time to and from meetings.

Equipment

This project does not require substantial support for software or equipment as the technology will be primarily developed in-house or using existing university licences. The University of Melbourne will supply suitable IT infrastructure such as computers/laptops as well as remote thermal sensing devices. Access to existing air pollution monitoring equipment and data will be provided by the the City of Maribyrnong.

Other

Project Advisory Committee (PAC) meetings

Meetings will be hosted at the University or partner organisations through in-kind contributions

Workshops

Meetings will be hosted at the University or partner organisations through in-kind contributions

Part G - Personnel and ROPE (Dr Marcus White)

G1. Personal Details

(To update personal details, click the 'Manage Personal Details' link below. Note this will open a new browser tab. When returning to the form ensure you 'Refresh' the page to capture the changes made to your profile.)

Participation Type

Chief Investigator

Title

Dr

First Name

Marcus

Second Name

Family Name

White

G2. Role of Partner Investigator

(Please indicate which of the Partner Investigator role options from A7.3.3 of the Funding Rules apply to your role on this Project. Select all options that apply.)

G3. Will you be residing predominantly in Australia for the duration of the Project?

(This is a 'Yes' or 'No' question. Indicate whether you will be residing predominantly in Australia for the duration of the Project, taking into account any international travel. If you are applying as a CI and you answer 'No' to this question you will be prompted to contact your Research Office to check your eligibility.)

Yes

G4. Qualifications

(To update any qualifications, click on the 'Manage Qualifications' link below. Note this will open a new browser tab. When returning to the form ensure you 'Refresh' the page to capture the changes made to your profile.)

Conferral Date	AQF Level	Degree/Award Title	Discipline/Field	Awarding Organisation	Country of Award
29/10/2010	Doctoral Degree	PhD	Urban Design / Architecture	RMIT University Melbourne	Australia
14/02/2000	Bachelor Honours Degree,Graduate Certificate, Graduate Diploma	BArch	Architecture	RMIT University Melbourne	Australia

G5. Are you currently undertaking a Higher Degree by Research which will be conferred after 1 July 2017?

(This is a 'Yes' or 'No' question. If you are applying as a CI and your answer is 'Yes' to this question you will be prompted to contact your Research Office.)

No

G6. Research Opportunity and Performance Evidence (ROPE) - Current and previous appointment(s) / position(s) - from 2007 onwards

(To update any details in this table, click on the 'Manage Employment Details' link below. Note this will open a new browser tab. When returning to the form ensure you 'Refresh' the page to capture the changes made to your profile. Click on the information icon above and refer to the Instructions to Applicants for more information.)

Description	Department	Contract Type	Employment Type	Start Date	End Date	Organisation
Lecturer	Architecture and urban design	Permanent	Full Time	01/02/2011		The University of Melbourne
Director	Architecture and urban design	Permanent	Part Time	01/01/2006	01/02/2012	Harrison and White Pty Ltd
Lecturer	Architecture and design	Contract	Part Time	01/02/2009	01/02/2010	RMIT University
Senior Project Architect	Archtecture & urban design	Permanent	Full Time	01/03/2005	01/03/2009	MGS Architects

G7. Employment Details as at Commencement date of Project

(This question will be used to determine your eligibility. Confirm your employment status at all organisations that you will be associated with as at the Commencement Date for the Project (1 July 2017). Enter the relevant appointment type and Full-Time Equivalent (FTE) for each organisation. Click on the information icon for further information.)

Org name	Is this an Eligible Organisation?	Please choose your appointment type for this organisation.	Please enter your FTE for this Organisation
The University of Melbourne	Yes	Employee	1

G8. Further Details Regarding Partner Investigator Status - Do you hold a remunerated appointment at an Eligible Organisation?

(NOTE: this question is mandatory ONLY FOR PIs WHO:
• at G3 confirmed that they will reside predominantly in Australia for the duration of the proposed Project; AND
• at G5 confirmed that they are not currently undertaking a Higher Degree by Research which will be conferred after 1 July 2017; AND
• at G7 indicated that they would hold either:
- an appointment at an Eligible Organisation equal or greater than 0.2FTE; OR
- Emeritus Appointment at an Eligible Organisation

This is a 'Yes' or 'No' question. If you select 'Yes', you will be further prompted to justify your participation on this Proposal as a PI with reference to sections A7.2 and A7.3 of the Funding Rules. Click on the information icon for further information.)
Do you hold a remunerated appointment at an Eligible Organisation?

Justification of PI status

G9. Relevant organisation for this Proposal

(Enter the Organisation that is relevant to your participation on this Proposal, and that you will be associated with as at the Commencement Date for the Project (1 July 2017). The 'relevant organisation' is the primary organisation that

will be supporting your involvement in this Project if it is funded. Note that the Organisation must be listed in G7 for this question to validate.)

Relevant Organisation

The University of Melbourne

G10. What is your time commitment to this Project?

(Enter your time commitment to this Project as a Full-Time Equivalent (FTE). Note that an FTE of 1.0 represents a full-time commitment (i.e. 5 days per week).)

0.2

G11. Research Opportunity and Performance Evidence (ROPE) - Details of your career and opportunities for research from 2007 onwards.

(Write a maximum of 5250 characters (approximately 750 words). Please detail your career and opportunities.)

i) Dr. White completed his design research PhD at the RMIT University 7 years ago at the Spatial Information Architecture Laboratory (SIAL) with MGS Architects and his own practice Harrison and White.

ii)He has worked in architecture and urban design practice since the completing his undergraduate degree in 2000. In 2005, Dr. White began a practice-based PhD at RMIT SIAL and MGS Architects as part of an ARC Linkage project: 'Technology Transfer through Embedded Research within Architectural Practice'.

In 2009, he was employed in a 0.5FTE teaching position at RMIT for 1 year whilst continuing to focus on practice. Since January 2011, he has been employed in a 1.0FTE Teaching and Research role in the Faculty of Architecture Building and Planning at the University of Melbourne, whilst continuing his design practice-based research with Harrison and White. Since this appointment, he has been awarded grants from internal ABP and the University of Melbourne as an Early Career Researcher and externally grants through the Australian National Data Service.

iii) After submitting his PhD, he returned to private practice until 2011 when he started a 1.0FTE position at the University of Melbourne. This has been an opportunity to pursue an academic career. In 2011 his time was split between teaching (40%), administration (20%), research (40%).

In 2012, Dr. White was recognised by his faculty as a leader in design technology and was given the role of Assistant Dean (IT), to drive the direction of the faculty's IT needs for teaching and research. The two-year role was extended to five years to ensure the complex and diverse needs of the faculty could be delivered through the University-wide IT restructuring, and construction of and relocation to the new Melbourne School of Design building. His role as Assistant Dean (IT), (0.2FTE), has reduced his research capacity over the last five years as the duties of his position have been split into teaching (40%), administration (40%) and research (20%).

In addition to this administrative role, at the beginning of 2015 he was appointed the Master of Urban Design Program Coordinator role (0.3FTE), and has made major improvements to the program increasing the digital innovation content (digital modelling and urban-informatics) whilst gaining planning institute accreditation for the next 5 years. Though these roles have reduced his research capacity, they have provided the opportunity to develop strong leadership, collaboration and organisational skills, and further develop his command of design and e-infrastructure which feed directly into his research.

iv) N/A

v) Dr. White has been awarded internal grants from the faculty such as the Graham Treloar Fellowship for research into algorithmic tree modelling for urban design. The initial findings of this research have led to two invited presentations to City of Melbourne and three peer international reviewed papers. The work formed the basis for his Early Career Research Grant for 2014 as sole CI – to further explore tree modelling along with urban heat island and real-time urban canyon modelling, which has led to international collaboration with Chinese universities Tongji and Nanjing University.

Many of these projects have led to ongoing collaborations and mentorship with a wide community of academic

researchers both within the faculty such as CI Stevenson and Prof. Chris Ryan of the Victorian Eco-Innovation Lab, and beyond the Faculty such as Associate Prof. Chris Pettit (UNSW), Tim Horton from the Australian Centre for Workplace Innovation and Social Research, Prof. Robin Drogemuller (QUT) and Prof. Ding Wowo (Nanjing University).

The University of Melbourne supports a wide range of cross-disciplinary support groups and forums. UoM is home to ICA-OSGeo laboratory, Australia's first Open Source Geospatial Laboratory of which he is on the steering committee. The international open source geospatial laboratory is a joint initiative of the International Cartographic Association (ICA) and the Open Source Geospatial Foundation (OSGeo).

He is a member of two Research Hubs – the "Transport, Health and Urban Design" led by CI Stevenson and the "Future Factory". He also belongs to a cross-disciplinary UoM Virtual Reality group which meets fortnightly to share Virtual Reality knowledge as well as research and teaching experiences.

vi) Though he has had engagement with academia through part-time teaching and practice-based PhD, his appointment in 2011 at the University of Melbourne is his first full-time academic appointment with a designated research component. His opportunity to build a research program within the context of academia has been limited before this point. He has, however, placed emphasis on design research through his practice, Harrison and White throughout his career. His research has been principally through and by design; the outputs of such are predominantly not traditional publications but exhibited or built works.

G12. Research Opportunity and Performance Evidence (ROPE) - Significant research outputs and ARC grants from 2007 onwards

(Upload a PDF of no more than ten A4 pages with a list of all research outputs, such as journal articles and refereed conference papers, book and book chapters. Use asterisks to identify research outputs relevant to this Proposal. Click on the information icon or refer to the Instructions to Applicants for the required content and formatting.)

Uploaded PDF file follows on next page.

G12. Research Opportunity and Performance Evidence (ROPE) - Significant research outputs and ARC grants

i) Scholarly Books
NA

ii) Scholarly Book Chapters
1. **White, M.** & Kimm, G. (2017) "PedCatch – inclusive pedestrian accessibility modelling using animated service area simulation with crowd sourced network data", in Hun S. (eds.) *Healthy Future Cities*, Tsinghua University Press, Beijing (in press as of 30/05/17).
2. Langenheim, N., **White, M.**, Barton, J. and Eagleson, S. (2017) "Designing with Data for Urban Resilience" *Planning Support Science for Smarter Urban Futures*, in Geertman, S., Allan, A., Stillwell, J. and Pettit, C. (eds.) Springer.
3. ***White, M.** (2015) "Exploring Urban Environment Dynamics with a Hybrid Design Studio Model", in *Future Studio – Future Practice*, Ward, M ed., URO Media, Melbourne, Australia, pp. 15-24.
4. ***White, M.** & Langenheim, N. (2014) "Urban street tree modelling using high polygon 3D models with photometric daylight systems". In: Oliveira V, Pinho P, Batista L, Patatas T and Monteiro C (eds.) *Our common future in Urban Morphology*. Porto, Portugal: FEUP, pp. 256-267.
5. ***White, M.** & Langenheim, N. (2014) "Measuring urban canyons with real-time light-based sky view factor modelling". In: Oliveira V, Pinho P, Batista L, Patatas T and Monteiro C (eds.) *Our common future in Urban Morphology*. Porto, Portugal: FEUP, pp. 239-304.
6. Badland, H. **White, M.** & Macaulay, G. (2013) "Using Agent-Based Modelling to Inform Neighbourhood Walkability". In *Spatial Data Access and Interrogation to Support Liveability: A Case Study in North and West Melbourne*. Centre for Spatial Data Infrastructures and Land Administration, pp. 23-38.
7. ***White, M.** (2010) "The Subtracto - Sun: 4D Solar Envelope," in. *Homo Faber: Modelling identity and the post digital*, eds Burry, M, Ostwald, M, Downton, P & Mina, A, Archadia Press: Sydney, pp. 111-124.

iii) Refereed journal articles
8. ***White, M.** & Langenheim, N. (2017), "A Spatio-temporal Decision Support System for Designing with Street Trees", International Journal of E-Planning Research (IJEPR) 7 (4), (in press as of 13/11/17).
9. Ian D. Bishop, I., Eagleson, S., Pettit, C., Rajabifard, A., Badland, H., Day, J., Furler, J., Kalantari, M., Sturup, S., **White, M.** (2017) "Using an Online Data Portal and Prototype Analysis Tools in an Investigation of Spatial Livability Planning" International Journal of E-Planning Research (IJEPR) 6 (2).
10. ***White, M.** & Langenheim, N. (2016), "Quantitative assessment of view from within high density development using a perverted light modelling approach", Journal of Urban and Regional Planning, 8(2), 21. Tsinghua University Press, Beijing, China pp.175-195.
11. ***White, M.,** Hu, Y., Langenheim, N., Ding, W., & Burry, M. (2016). Cool City Design: Integrating Real-Time Urban Canyon Assessment into the Design Process for Chinese and Australian Cities. Urban Planning, 1(3).
12. ***White, M.** (2014) "Preserving open space amenity using subtractive volumetric modelling". *Aachener Geographische Arbeiten*, Geographisches Institut der RWTH Aachen im Selbstverlag Druck: Digitaldruck AixPress GmbH: Germany, pp.179-198.
13. Badland, H., **White, M.,** Macaulay, G., Eagleson, S., Mavoa, S., Pettit, C., & Giles-Corti, B (2013). Using simple agent-based modeling to inform and enhance neighbourhood walkability. *International journal of health geographics*, 12(1), 58.

iv) Refereed conference papers
14. ***White, M.**, Kimm, G., Langenheim, N. (2017) "Pedestrian access modelling with tree shade – won't someone think of the children…", in proceedings of the Urban Transitions Global Summit 2016 Shanghai, China.
15. *Huang, X., **White, M.**, Burry, M. (2017) "Urban Multitude Microclimate Singularities – An agent-based biomimetic strategy for urban morphogenesis", in proceedings of 3rd International Conference of Biodigital Architecture and Genetics, Universitat Internacional de Catalunya, Barcelona.
16. *Escobar, F., Mavoa, S., Eagleson, S., **White, M.,** Giles-Corti, B., Badland, H. (2017) "School catchment modelling with cellular automata-a case study in Melbourne", in proceedings of the Conference: 14th International Conference on Urban Health, Coimbra, Portugal.
17. Huang, X., **White, M.**. Burry, M. (2017) "A Pedestrian-centric Design Strategy: Melding Reactive Scripting with Multi-agent Simulation", in Proceedings of the Symposium on Simulation for Architecture and Urban Design, Toronto, pp.309-316.

18. *Hu, Y., **White, M.**, Ding, W. (2016) "An Urban Form Experiment on Sky View Factor to mitigate Urban Heat Island in High Density Area", in proceedings of The Fourth International Conference on Countermeasure to Urban Heat Islands (4th IC2UHI), Elsevier, Singapore, pp.166–174.
19. ***White, M.**, and Kimm, G. (2015) "Measuring sky view factor of urban canyons using hacked Gopro hemispheric video processing" in R.H. Crawford and A. Stephan (eds.), Living and Learning: Research for a Better Built Environment: 49th International Conference of the Architectural Science Association 2015, The Architectural Science Association, pp.525–535.
20. ***White, M.** (2015) "Steamed in the Southern Capital –emergent technology and social media in interdisciplinary travelling studios for total immersive learning". In proceedings of the 8th International Conference and Exhibition of the Association of Architecture Schools of Australasia, CPIT - Christchurch Polytechnic Institute of Technology, Christchurch, NZ.
21. *Burry, M., Holzer, D., **White, M.**, Aschwanden, G., Karakiewicz, J. & Kvan, T. 2015 "Building information modelling; precinct information modelling; city information modelling: the challenges of modelling urban design behaviours and city scales", in proceedings of the Design Modelling Symposium Copenhagen 2015, Springer, Copenhagen, DK.
22. Sabri, S., Pettit, J. C., Kalantari, M., Rajabifard, A., **White, M.**, Lade, O. & Ngo, T., 2015 "What are essential requirements in planning for future cities using open data Infrastructures and 3D data models?". In the proceedings of the Computers in Urban Planning and Urban Management (CUPUM) conference, MIT in Cambridge, Massachusetts US.
23. ***White, M.** & Langenheim, N. (2014) "Impact assessment of street trees in the City of Melbourne using temporal high polygon 3D canopy modelling". In the proceedings of the 7th International Urban Design Conference Designing Productive Cities, Adelaide, Australia.
24. **White, M.** (2014) "Methodology and tactics for design research - the Cross-pollinating Three-way". In the proceedings of the Architectural Design Research Symposium (Venice Biennale NZ pavilion), Victoria University of Wellington, Wellington, New Zealand.
25. ***White, M.** (2013) "Urbanism Up to 11 - A Design Studio of Extremes". In proceedings of the 7th International Conference of the Association of Architecture Schools of Australasia, http://www.artdes.monash.edu.au/docs/aasa2013-proceedings.pdf 3-5th October, Melbourne, Australia, pp. 86-107.
26. ***White, M.** (2013) "Using the 'Subtracto-Silhouette' parametric view-shed method in structure planning and architectural design". In proceedings of the 20th International Seminar on Urban Form, 17-20th July, Brisbane, Australia, pp. 165-178.
27. ***White, M.** (2010) "The Future Australian City: Implementing The Rhetoric Using 3D Spatial Scanning and 'Defragmented' Digital Design Techniques", In proceedings of the Healthy Cities – International Urban Design Conference, retrieved from http://liveablecities.org.au/archives/lc_archives.php 12 -13th July, Brisbane, Australia.
28. **White, M.** (2007) "The plan is an inadequate tool for planning". In proceedings of the International Conference on Sustainable Urbanism - Squaring Off: A New Paradigm for Urban Change, 1-3rd April, Texas A&M University, [CD-ROM] College Station, Texas, U.S.A.
29. **White, M.** (2007) "Enhancing the urban design process through the use of 3D+ digital tools directed towards sustainability". In proceedings of the Forum on the Application of Sustainable Theory to Urban Development Practice, 10-11th August, [CD-ROM] College of Design, Art, Architecture and Planning, University of Cincinnati, Cincinnati OH, U.S.A.
30. **White, M.** (2007) "Densification, pedestrian catchments and the battle for Middle Earth – Can agent based pedestrian modelling be used to inform urban morphology?" Future of Cities, Impacts: Indicators: Implementations, 51st IFHP World Congress, retrieved from http://www.ifhp2007copenhagen.dk/proceedings/ Copenhagen, Denmark.

v) Other research outputs, including non-traditional research outputs

In architectural and urban design research, the research output may vary from major exhibitions/installations and competition entries to completed built projects. Such outputs are considered equivalent to traditional research publications as per the ERA definition of research outputs and have been included here.

Architecture and Urban Design Projects:

31. *2017 Architects: Harrison and White (**White, M.**) with Lyons Architects, NMBW, Minifie van Schaik Architects Melbourne, and Maddison Architects, design project: "RMIT University 'New Academic Street' renovation project for buildings 8, 10, 12, 14", Melbourne, [under construction].

32. 2017 Architects: Harrison and White (**White, M.**), Good Samaritan Primary School - Nazareth (Year 1 and 2) Learning Village (Commendation for AIA Educational Architecture).
33. 2016 Architects: Harrison and White (**White, M.**), built project: "Heald House", Kilsyth-Montrose, Victoria, (finalist for AIA Victoria award for housing).
34. *2016 Architects: Harrison and White (**White, M.**), built project: St Bernard's Year 5&6 Hub, Coburg, Victoria, (finalist for AIA Victoria award for educational buildings and the Colorbond™ Steel Award).
35. *2015 Architects: Harrison and White St Margaret Mary's Primary Masterplan, Spotswood, Victoria.
36. 2015 Architects: Harrison and White (**White, M.**), Good Samaritan Primary School Administration Works, Roxburgh Park, Victoria.
37. 2013 Architects: Harrison and White (**White, M.**), design project: Western Gateway for City of Wyndham, (one of five finalists in open design competition).
38. 2012 Architects: Harrison and White (**White, M.**), built project: Preston Oval Redevelopment, (finalist for AIA Victoria award for public alterations and additions)
39. *2011 Architects: Harrison and White (**White, M.**), built project: Foyn-Johanson House, (AIA Victoria award for alterations and additions).
40. 2010 Architects: Harrison and White (**White, M.**) 509 Spencer Street Units
41. *2010 Architects: MGS Monash, Clayton Masterplan
42. *2010 Architects: MGS Monash, Gippsland Campus Masterplan
43. 2008 Architects: Harrison and White (**White, M.**), built project: Joy Radio Studios, (Melbourne) (finalist for AIA Victoria award for public alterations and additions).
44. 2007 Architects: Harrison and White (**White, M.**), & White C, competition project: 'Real Walking City' (awarded a commendation for the inaugural AA Unbuilt Awards).
45. 2009 Architects: Harrison and White (**White, M.**), open design competition: 'smarter stay smarter go', Design Research Institute Bushfire Design Challenge; (finalist) Design Research Institute, RMIT, Melbourne.
46. 2006 Architects: Harrison and White (**White, M.**), design project: St Luke's Anglican Church, office building, JA Early Learning Centre and Eagle Terrace town houses Sydenham, Victoria.

Exhibited Works and Exhibitions:

47. *2017 (Jan) **White, M.**, Lipson-Smith, R., Bernhardt, J., French, J., Elliot-Jones, R., Shannon, M. M., "Vital (De)signs – Sensing Space through VR" at *MPavilion*, Queen Victoria Gardens, Melbourne.
48. *2016 (Jun) Architects: Harrison and White (**White, M.**), "Heald House", Kilsyth-Montrose, Victoria, Exhibited at No Vacancy Gallery, QV, Jane Bell Lane, Melbourne.
49. *2016 (Jun) Architects: Harrison and White (**White, M.**) St Bernard's Year 5&6 Hub, Coburg, Victoria, Exhibited at No Vacancy Gallery, QV, Jane Bell Lane, Melbourne.
50. *2016 (May-Nov) Huang, X., **White, M.**, Burry, M., Kimm, G., "Connectivity and morphology refining urban density by taking X-Ray the City! as a historical review" in *X-Ray the City*, Venice Biennale, Venice.
51. 2016 (May-Nov) **White, M.**, Langenheim, N., M., Kimm, G., "'Spatial Nearness' - Proximity and Accessibility", in *X-Ray the City*, Venice Biennale, Venice.
52. *2016 (May-Nov) **White, M.**, Langenheim, N., M., Kimm, G., Huang, X., Burry, M., "Cities… they're so hot right now, Hot in the city, hot in the city tonight…", in *X-Ray the City*, Venice Biennale, Venice.
53. *2016 (Dec) Architects: Harrison and White (**White, M.**), "Parametric Picturesque, Fabulous Metal and Snake Skin Pants" in *Sino-Australian Dialogue on Design Practice Research*, Lee King Fun Gallery, Melbourne.
54. 2016 (Dec) Architects: Harrison and White (**White, M.**), "RMIT New Academic Street", in *Sino-Australian Dialogue on Design Practice Research*, Lee King Fun Gallery, Melbourne.
55. *2016 (Dec) Architects: Harrison and White (**White, M.**), "Flinders Street Station", in *Sino-Australian Dialogue on Design Practice Research*, Lee King Fun Gallery, Melbourne.
56. 2013 (Jan) Architects: Harrison and White (**White, M.**), Vibrant Gujarat Gandhi Nagar, India.
57. 2013 (Jan) Architects: Harrison and White (**White, M.**), India International Centre Annexe #40, New Delhi, India.
58. 2013 (Dec 2012 – Jan 2013) Architects: Harrison and White (**White, M.**), 'Now and When' (Implementing the Rhetoric), Studio X, Kitab Mahal Mumbai, India.
59. 2012 (Dec) Architects: Harrison and White (**White, M.**), 'Now and When' (Implementing the Rhetoric), Coimbatore Centre for Contemporary Arts 'Now and When' (Implementing the Rhetoric), Coimbatore, India.
60. 2012 (Sep-Dec) Architects: Harrison and White (**White, M.**), 'Now and When' (Implementing the Rhetoric), Srishti School of Art, Design and Technology Bengaluru, India.
61. 2012 (Jun - Sep) Architects: Harrison and White (**White, M.**), 'Now and When' (Implementing the Rhetoric), Kaohsiung Museum of Fine Arts (KMoFA), Kaohsiung, Taiwan.

62. 2012 (Feb-Mar) Architects: Harrison and White (**White, M.**), 'Now and When' (Implementing the Rhetoric), Gallery of Australian Design, Canberra, Australia.
63. 2012 (Oct) Architects: Harrison and White (**White, M.**), 'Now and When' (Implementing the Rhetoric), Hong Kong Central Library, Hong Kong.
64. 2011 (Mar) Architects: Harrison and White (**White, M.**), 'The First Show' 'Dog model' at Pin-Up Project Space at The Compound Interest, Collingwood, Australia.
65. *2011 (Apr - Jun) Architects: Harrison and White (**White, M.**), 'Now and When' (Implementing the Rhetoric), Museum of Art, Seoul, Korea.
66. *2011 (Sep) Architects: Harrison and White (**White, M.**), 'Now and When' (Implementing the Rhetoric), Object: Australian Centre for Craft and Design Sydney, Sydney, Australia.
67. *2011 Architects: Harrison and White (**White, M.**), exhibited project: Now and When' (Implementing the Rhetoric), Ballarat International Foto Biennale, Art Gallery of Ballarat, Australia.
68. *2011 Architects: Harrison and White (**White, M.**), exhibited project: 'Now and When' (Implementing the Rhetoric), Object: Australian Centre for Craft and Design Sydney, Sydney, Australia.
69. 2010 (**White, M.**), exhibited project: Advertisements for Architecture exhibition, Surry Hills Library, Sydney.
70. *2010 Architects: Harrison and White (**White, M.**), exhibited project: 'Now and When' Australian Pavilion (Implementing the Rhetoric) Venice Biennale, Venice, Italy.
71. 2009 (**White, M.**), exhibited project: Advertisements for Architecture exhibition – Federation Square Atrium, (people's choice award winner), Melbourne, Australia.
72. *2009 Architects: Harrison and White (**White, M.**), exhibited project: 'Baking Architecture', State of Design Festival, AIA Victoria.
73. 2009 Architects: Harrison and White (**White, M.**), AIA 'Baking Architecture' AIA Victorian Chapter Foyer, 41 Exhibition St. Melbourne
74. 2009 (Nov) Architects: Harrison and White (**White, M.**), Bushfire Design Challenge 'Smarter Stay, Smarter Go' – Museum of Victoria, Melbourne, Australia.
75. 2009 Architects: **White, M.**, Advertisements for Architecture exhibition – Federation Square Atrium, Melbourne, Australia.
76. 2008 (Sep), Architects: Harrison and White (**White, M.**), Homo-Faber exhibition – Museum of Victoria, Melbourne, Australia.
77. 2008 (Sep) Architects: Harrison and White (**White, M.**), 'Abundance' Australian Pavilion (Pants House) – Venice Biennale, Venice, Italy.
78. 2007 (Mar) Architects: Harrison and White (**White, M.**), IFHP Ranko Radovic exhibition, School of Architecture, Copenhagen, Denmark.
79. 2007 (Nov) Architects: Harrison and White (**White, M.**), AA Unbuilt Awards exhibition – The Prince Hotel, St Kilda, Australia.

My architectural and urban design work has also been published in:

80. Johnson, A. & Black, R. 2016 "Heald House", in *Living in the Landscape*, Thames and Hudson, Australia.
81. Office of the Victorian Government, 2012 *Momentum, New Victorian Architecture,* Meigunya Press, Melbourne.
82. 'Shape Steps out of the Shadows' – Domain (The Age) (April 2010)
83. 'Foyn-Johanson House' – Monument (August 2010)
84. 'Implementing the Rhetoric' – 'Now and When' Australian Pavilion Catalogue, Venice Biennale (Aug 2010)
85. 'The Penguin House', – The Sential Times, (May 2009)
86. 'Baking Architecture' – Domain (The Age) (August 2009)
87. 'A Real Walking City', Unbuilt, Architecture Australia (Jan 2008)
88. 'Pants House' – The Australian Newspaper (4th Oct 2008)
89. 'Pants House' – 'Abundance' Australian Pavilion Catalogue for the Venice Biennale (Nov 2008)
90. 'The Architects themes song lyrics and annotation' – Architect Victoria (Autumn 2008)
91. 'Foyn-Johanson House' – australiandesignreview.com, & www.uapmarker.com.au & www.whitezine.com/en/design/foyn-johanson-house.html & mocoloco.com http://www.archdaily.com/77852/foyn-johanson-house-harrison-and-white/
92. 'Watergate Place', – FuturArc: New Architecture, (Australia), Vol. 7, (2007)
93. 'The Big Penguin' – Architect Victoria - The Grotesque Edition (Winter 2007)

2) I have not been on an ARC grant as a CI or a Fellow in the last 10 years

G13. Research Opportunity and Performance Evidence (ROPE) - Ten career-best research outputs

(Upload a PDF of no more than four A4 pages with a list of your ten career-best research outputs, with a brief paragraph for each research output explaining its significance.)

Uploaded PDF file follows on next page.

G13. Research Opportunity and Performance Evidence (ROPE) - Ten career-best research outputs

1. ***White, M.** & Kimm, G. (2017) "PedCatch – inclusive pedestrian accessibility modelling using animated service area simulation with crowd sourced network data", in Hun S. (eds.) Healthy Future Cities, Tsinghua University Press, Beijing (in press as of 30/05/17).

> This methodology chapter details the most recent incarnation of the PedCatch tool describing the access modelling platform with now over 3500 uses globally and its recent footpath offset estimation capability.

2. **White**, M. (2015) "Steamed in the Southern Capital –emergent technology and social media in interdisciplinary travelling studios for total immersive learning". In proceedings of the 8th International Conference and Exhibition of the Association of Architecture Schools of Australasia, CPIT - Christchurch Polytechnic Institute of Technology, Christchurch, NZ.

> This paper details award winning exploration of innovative immersive digital technologies (virtual reality/ cloud) in collaborative design-studios held in China focused on designing in an international context of hyper-dense urbanisation.

3. **White, M.** & Langenheim, N. (2014) "Urban street tree modelling using high polygon 3D models with photometric daylight systems". In: Oliveira V, Pinho P, Batista L, Patatas T and Monteiro C (eds.) *Our common future in Urban Morphology*. Porto, Portugal: FEUP, pp. 256-267.

> This chapter for the prestigious ISUF, outlines our novel 'urban-forest modelling' algorithmic-botany with animation technology to rapidly and iteratively test design options for microclimate and comfort impact at precinct scale.

4. ***White, M**, (2014) "Preserving open space amenity using subtractive volumetric modelling". Aachener Geographische Arbeiten, Geographisches Institut der RWTH Aachen im Selbstverlag Druck: Digitaldruck AixPress GmbH: Germany, pp.179-198.

> This paper details case studies applying my innovative digital modelling tool for solar amenity preservation and impact on liveability and sustainability with respect to access to daylight and vitamin D.

5. ***White, M**., Langenheim, N (2014), "Quantitative assessment of view from within high density development using a perverted light modelling approach". In the proceedings of the 7th Making Cities Liveable Conference, 10-11th July, Kingscliff, NSW, Australia.

> Peer reviewed conference paper outlining my innovative 3D modelling method for assessing the quality of view from within apartments and hospitals measuring the amount of sky, vegetation and water visible.

6. *Badland, H., **White, M.**, Macaulay, G., Eagleson, S., Mavoa, S., Pettit, C., & Giles-Corti, B (2013), "Using simple agent-based modeling to inform and enhance neighborhood walkability". International journal of health geographics, 12(1), 58.

> Paper outlining novel open source pedestrian modelling software based developed in collaboration with the McCaughey VicHealth Centre for Community Wellbeing, Australian National Data Service and Australian Urban Research Infrastructure Network.

7. ***White, M** (2010), "The Future Australian City: Implementing The Rhetoric Using 3D Spatial Scanning and 'Defragmented' Digital Design Techniques", Healthy Cities – International Urban Design Conference, Brisbane, Australia.

Presentation of Venice Biennale Project: regarded by AIA as the highest research output – internationally significanct because of the reputation of the Venice Biennale and peer esteem of Australian selection panel.

8. ***White, M.** (2010) "The Subtracto - Sun: 4D Solar Envelope," in. *Homo Faber: Modelling identity and the post digital*, eds Burry, M, Ostwald, M, Downton, P & Mina, A, Archadia Press: Sydney, pp. 111-124.

A chapter examining the role of digital models in preserving amenity of public open space. The chapter discusses use of mysolar subtraction tool for maximising light in public open space.

9. ***White, M** (2007), "The plan is an inadequate tool for planning", International Conference on Sustainable Urbanism, Texas A&M University, US.

Paper published from PhD and presented at a peer reviewed international conference on sustainable urbanism. A discussion of new 4-Dimensional (3D plus time) digital design tools for urban modelling.

10. ***White, M** (2007), "Densification, pedestrian catchments and the battle for Middle Earth – Can agent based pedestrian modelling be used to inform urban morphology?" Future of Cities, Impacts: Indicators: Implementations, 51st International Federation for Housing and Planning (IFHP) World Congress, Copenhagen, Denmark.

Published at the IFHP world congress 'Futures of Cities.' First example of agent-based modelling applied to pedestrian catchments and walkability directly linked directly to housing density distribution.

G14. Research Opportunity and Performance Evidence (ROPE) - Further evidence in relation to research impact and contributions to the field from 2007 onwards, including those most relevant to this Proposal.

(Write a maximum of 7500 characters (approximately 1000 words). Detail further evidence in relation to research impact and contributions to the field. Click on the information icon and refer to the Instructions to Applicants for the required content and formatting.)

Dr. White is an award winning-architect and urban designer; lecturer in digital design in architecture and urban design, Assistant Dean (IT); and leads the Masters of Urban Design program at the University of Melbourne.

After graduating his B.Arch (Hons 1) at RMIT in 2000, Dr. White worked in private practice as design and project architect on complex mixed-use tower developments spawning a deep interest in impacts of dense urban living and related planning policy.

Dr. White completed his practice based PhD at RMIT Spatial Information Architecture Laboratory in collaboration with MGS (Urban Design) and his own practice Harrison and White Pty Ltd in 2010. His PhD focused on sustainable urban design solutions using custom digital design techniques within practice. His work has been used to inform Transit Oriented Development policies of councils including City of Whitehorse and City of Stonnington, and the Monash University Clayton and Gippsland Campus Masterplans.

'Implementing the Rhetoric', his urban design proposition based on these techniques, was one of only 16 projects from Australia to be selected for inclusion in the prestigious 2010 Venice Biennale and has subsequently been exhibited throughout China, Australia, Taiwan, India and Korea.

His contribution to the field of urban design and his performance and capacity to deliver high-quality innovative research is evidenced in acknowledgements from peak professional bodies in the form of state and federal level awards, internal and federally funded research grants, university teaching awards both locally and internationally, and his contribution to committees and panels. A selection of awards, grants and memberships relevant to the project are listed below:

Research and teaching awards and grants:
2015 Citations for Outstanding Contributions to Student Learning (National)
2015 Disability Research Initiative and the Melbourne Network Society Institute awarded for "Topographical accessibility modelling for people with mobility impairments" project investigating advanced topography modelling to aid community with mobility impairments
2014 Honorary Credential award National Board of Architectural Accreditation, China and the Institute of Architectural Education and Accreditation, Architectural Society of China
2014 Early Career Research Grant University grant for "Rapid sky view factor modelling tools for urban heat island assessment"
2013 Teaching and Learning Initiative "Utilising AURIN to support e-learning"
2013 Lens 10 Innovative Urban Design Project with University of Adelaide, QUT, RMIT, City of Logan
2013 Carlton Connect Initiative grant with IBM, Samsung and University of Sao Paulo
2012 Walkability Project (AURIN and ANDS) with McCaughey Centre and VicHealth Centre
2012 Graham Treloar Fellowship for "High polygon digital modelling of urban street trees"
2012 Dean's Honours MSD Teaching Excellence Award for Innovative Teaching (Flexible Urban Modelling, subject)

Design awards including:
2017 Educational Architecture award AIA (Vic) (commendation)
2016 AIA (Vic) Educational award (honorable mention)
2016 Colorbond Steel award (finalist)
2016 AIA (Vic) Housing (new) (finalist)
2013 Western Gateway for Wyndham City Council competition (finalist)
2013 AIA (Vic) Institutional Alterations & Extensions award (finalist)
2012 AIA Residential Architecture Award
2011 The inaugural AIA National Emerging Architect Award
2010 The AIA Victorian Emerging Architect Award
2009 Design Research Institute Bushfire Design Challenge (finalist)
2009 Advertisements for Architecture people's choice award winner
2007 National Architecture Australia Prize for Unbuilt Work for the 'Real Walking City' (commendation).

Memberships, committees, expert panels:
Australian Institute of Architects Urban Design Committee for three years, co-authoring position papers for

Melbourne Let's Talk and the East-West Link project.
The steering committee for the ICA-OSGeo lab at the University of Melbourne, a group promoting access and use of geospatial data for evidence-based research and decision-making.
UoM Masters of Urban Design - Advisory Committee for the last four three years, making a major contribution to the accreditation of the course (Planning Institute of Australia).
Panel of experts for the AURIN 'Lens 10 – Innovative Urban Design'
Making Cities Liveable Conference (Safe Cities) scientific committee
North West Metropolitan Region Integrated Data Working Group
Safe City Conference (Making Cities Liveable) 2015 Advisory Committee and leader scientific review panel
7th International Urban Design Conference (Adelaide) Chair of Whole City Thinking stream.
Chair of keynote session for Safe City Conference 2015
AIA (Victoria) Emerging Architect Award jury
National Emerging Architect Award for the Australian Architects Achievement Awards jury.

Integration of his innovative analysis and design tools into practice has also been acknowledged with an AIA award for the Foyn-Johanson House which uses his 'Subtracto-Sun', a subtractive solar amenity preservation tool used to maintain direct sunlight into private and public open spaces during specified times.
This research has recently been applied at whole municipality scale through his consulting work for the City of Melbourne – "Sunlight to Public Spaces Policy Review - 3D Sunlight Study of Public Open Space" project. The project involves the production of aggregate shadows (9am-4pm) for all suburbs with City of Melbourne and producing solar protection maximum envelopes to protect key public open spaces.

Dr. White's research impact and contribution to the field of architectural and urban design is evidenced by the inaugural Australian Institute of Architects' National Emerging Architect Award. This award acknowledges his "contribution to architectural practice, education, design excellence and community involvement, which advances the profession's role within the public arena" and is one of the highest honours bestowed by the Australian Institute of Architects (AIA).

G15. Currently held ARC Projects

(This information is auto-populated from your RMS profile and will include any 'active' Project which has not yet had a Final Report approved and the Project file closed by the ARC. If you have any concerns with the information recorded here, contact your Administering Organisation's Research Office. NOTE: If you hold a CI or a PI role on the Project/s listed in the table below you must ensure a progress statement is provided in H2. This requirement applies to the following schemes: Discovery Projects, Discovery Indigenous Researchers Development, Discovery Indigenous, Discovery Early Career Researcher Award, Linkage Projects, Industrial Transformation Research Hubs, Industrial Transformation Training Centres or any ARC Fellowship scheme. Please click on the information icon and refer to the Instructions to Applicants for further information.)

Part G - Personnel and ROPE (Prof Mark Stevenson)

G1. Personal Details

(To update personal details, click the 'Manage Personal Details' link below. Note this will open a new browser tab. When returning to the form ensure you 'Refresh' the page to capture the changes made to your profile.)

Participation Type

Chief Investigator

Title

Prof

First Name

Mark

Second Name

Robert

Family Name

Stevenson

G2. Role of Partner Investigator

(Please indicate which of the Partner Investigator role options from A7.3.3 of the Funding Rules apply to your role on this Project. Select all options that apply.)

G3. Will you be residing predominantly in Australia for the duration of the Project?

(This is a 'Yes' or 'No' question. Indicate whether you will be residing predominantly in Australia for the duration of the Project, taking into account any international travel. If you are applying as a CI and you answer 'No' to this question you will be prompted to contact your Research Office to check your eligibility.)

Yes

G4. Qualifications

(To update any qualifications, click on the 'Manage Qualifications' link below. Note this will open a new browser tab. When returning to the form ensure you 'Refresh' the page to capture the changes made to your profile.)

Conferral Date	AQF Level	Degree/Award Title	Discipline/Field	Awarding Organisation	Country of Award
08/03/1995	Doctoral Degree	Doctor of Philosophy (with distinction)	Epidemiology	University of Western Australia	Australia
06/03/1990	Masters Degree	Master of Public Health	Epidemiology and Biostatistics	Curtin University	Australia

G5. Are you currently undertaking a Higher Degree by Research which will be conferred after 1 July 2017?

(This is a 'Yes' or 'No' question. If you are applying as a CI and your answer is 'Yes' to this question you will be prompted to contact your Research Office.)

No

G6. Research Opportunity and Performance Evidence (ROPE) - Current and previous appointment(s) / position(s) - from 2007 onwards

(To update any details in this table, click on the 'Manage Employment Details' link below. Note this will open a new browser tab. When returning to the form ensure you 'Refresh' the page to capture the changes made to your profile. Click on the information icon above and refer to the Instructions to Applicants for more information.)

Description	Department	Contract Type	Employment Type	Start Date	End Date	Organisation
Professor of Urban Transport and Public Health	Melbourne School of Design, Melbourne School of Population and Global Health, Melbourne School of Engineering	Contract	Full Time	23/03/2015	23/03/2020	The University of Melbourne
Director, Monash University Accident Research Centre	Monash Injury Research Institute	Contract	Full Time	01/10/2010	20/03/2015	Monash University
Professor	School of Public Health and Preventive Medicine	Contract	Full Time	01/10/2010	20/03/2015	Monash University
Honorary Professor	Sydney Medical School	Contract	Full Time	01/06/2010	01/06/2013	The University of Sydney
Guest Professor	Health Science Centre	Contract	Full Time	01/01/2008	31/12/2010	Peking University, Beijing
Senior Director	Research and Development	Permanent	Full Time	01/06/2006	01/06/2010	The George Institute for Global Health
Professor of Injury Prevention	The Sydney Medical School	Permanent	Full Time	01/06/2003	01/06/2010	The University of Sydney

G7. Employment Details as at Commencement date of Project

(This question will be used to determine your eligibility. Confirm your employment status at all organisations that you will be associated with as at the Commencement Date for the Project (1 July 2017). Enter the relevant appointment type and Full-Time Equivalent (FTE) for each organisation. Click on the information icon for further information.)

Org name	Is this an Eligible Organisation?	Please choose your appointment type for this organisation.	Please enter your FTE for this Organisation
The University of Melbourne	Yes	Employee	1

G8. Further Details Regarding Partner Investigator Status - Do you hold a remunerated appointment at an Eligible Organisation?

(NOTE: this question is mandatory ONLY FOR PIs WHO:
• at G3 confirmed that they will reside predominantly in Australia for the duration of the proposed Project; AND
• at G5 confirmed that they are not currently undertaking a Higher Degree by Research which will be conferred after 1 July 2017; AND
• at G7 indicated that they would hold either:
- an appointment at an Eligible Organisation equal or greater than 0.2FTE; OR
- Emeritus Appointment at an Eligible Organisation

This is a 'Yes' or 'No' question. If you select 'Yes', you will be further prompted to justify your participation on this Proposal as a PI with reference to sections A7.2 and A7.3 of the Funding Rules. Click on the information icon for further information.)

Do you hold a remunerated appointment at an Eligible Organisation?

Justification of PI status

G9. Relevant organisation for this Proposal

(Enter the Organisation that is relevant to your participation on this Proposal, and that you will be associated with as at the Commencement Date for the Project (1 July 2017). The 'relevant organisation' is the primary organisation that will be supporting your involvement in this Project if it is funded. Note that the Organisation must be listed in G7 for this question to validate.)

Relevant Organisation

The University of Melbourne

G10. What is your time commitment to this Project?

(Enter your time commitment to this Project as a Full-Time Equivalent (FTE). Note that an FTE of 1.0 represents a full-time commitment (i.e. 5 days per week).)

0.2

G11. Research Opportunity and Performance Evidence (ROPE) - Details of your career and opportunities for research from 2007 onwards.

(Write a maximum of 5250 characters (approximately 750 words). Please detail your career and opportunities.)

i) Prof Stevenson was awarded his PhD in Epidemiology from the University of Western Australia 22 years ago.

ii) Prof Stevenson is the most esteemed researcher in transport safety in Australia and globally, having achieved significant academic milestones in road injury research over the past 15 years. He has led the landmark road injury prevention studies and was recently invited by the Editor of The Lancet medical journal to lead a Lancet series on Urban Design, Transport and Health reflecting Prof Stevenson's innovative, cross-disciplinary research capability. Prof Stevenson has procured more than $32 million in research funding (including funding from the ARC, NHMRC and the US National Institutes of Health) and published in the leading international medical journals such as the Lancet and the British Medical Journal and discipline-specific journals (Am J of Epidemiology).

iii) Prof Stevenson is the Director of the Transport, Health and Urban Design research group at the University of Melbourne. Prior to this appointment, he led the prestigious Monash University Accident Research Centre for almost 5 years. He holds senior leadership roles including an expert adviser for injury to the Director General of the WHO, an appointed member of the Coronial Council of Victoria and a board member of the International Council on Road Safety based in India. He is an Associate Editor on the leading journals in his respective field namely, Injury Prevention and Traffic Injury Prevention and on the editorial board of 3 other leading discipline-related journals.

iv) N/A

v) Prof Stevenson has supervised to completion, 13 doctoral students and 16 masters' (by research) students and currently supervises 4 doctoral students. The success of his supervision can be measured, in part, by the positions currently held by his doctoral graduates including appointments at the University of Oxford and the University of London. He attracts excellent postgraduate students through not only his international reputation in the field of epidemiology and road injury prevention but for his unique ability to integrate his science across

disciplines.

In addition to supervising students, Prof Stevenson's role as a Director of research centres over the past 15 years, has meant mentoring staff is an important role in his career. Aside from mentoring several postdoctoral fellows in his current role as Director of the Transport, Health and Urban Design Research Hub, he is actively involved in mentoring leading scientists from low- and middle-income countries.

Prof Stevenson's approach to research supervision and mentoring is underpinned by over twenty years of teaching experience, including the development of new units (he received a Public Health Education and Research Program grant in 2002 to develop the first national course in injury epidemiology, prevention and control). He also established the first global road injury prevention leadership course whilst Director of the Monash University Accident Research Centre. He also leads the epidemiology course with Prof Salmi at the Association for the Advancement of Automotive Medicine annual conference.

vi) Prof Stevenson's recognition, internationally, has been acknowledged by 17 invitations to give keynote addresses at international meetings in the last 5 years. Many of these invitations are to highly prestigious meetings including the recent invitation to present at the 71st Meeting of the United Nations in New York and the global meeting of City Mayors hosted in Bogota. Prof Stevenson continues to hold the appointment (since 2008) as the Expert Adviser for injury to the Director General of the World Health Organisation. He has also been appointed (and funded) under the Chinese government's 111 Program (2017-2021) as a scholar of international eminence to collaborate with Tongji University on transport safety innovation.

Prof Stevenson is a regular peer-reviewer (>4 papers per annum) for 8 international journals and reviews papers for a further 10 journals including the Lancet and Lancet Public Health. He has been invited to review international research grants in the United States (NIH-Fogarty awards) and New Zealand (Health Research Council Grants) and has been appointed to the NHRMC Academy for expertise in injury prevention, epidemiology and public health and is an active reviewer of NHMRC and ARC grants. He contributes significantly as Associate Editor on two international journals and is on the editorial board for a further 3 journals.

Prof Stevenson has contributed to national and international research review committees including the U.S. National Institutes of Health, the Health Research Council of New Zealand, the ARC and the NHMRC. Prof Stevenson plays significant advocacy (expert commentaries in the Age and Sydney Morning Herald) and international and government advisory roles including to the WHO, UNICEF and advice to the NSW government on integrated transport policies to reduce road trauma by 30% to 2021. In recognition of his contribution to road injury prevention in Australia, he has been elected a lifetime fellow of the Australasian College of Road Safety.

G12. Research Opportunity and Performance Evidence (ROPE) - Significant research outputs and ARC grants from 2007 onwards

(Upload a PDF of no more than ten A4 pages with a list of all research outputs, such as journal articles and refereed conference papers, book and book chapters. Use asterisks to identify research outputs relevant to this Proposal. Click on the information icon or refer to the Instructions to Applicants for the required content and formatting.)

Uploaded PDF file follows on next page.

Scholarly Book Chapters

1. * Ivers, R.Q., **Stevenson, M.**, Brown, K. and Yu, J. (2015), Road Traffic Injuries. In: *International Encyclopedia of Public Health* (eds. K. Heggenhougen and S. Quah), Academic Press, San Diego, vol 5, pp. 615-623. 2015, 2nd Edition. (ISBN 978-0-12- 373960-5).

2. Clapham, K., Khavarpour, F., Bolt, R., **Stevenson, M.** and Su, S. (2012), Researching the safety of indigenous children and youth: an urban perspective. In: *Urban Health: Strengthening of voice, culture and partnerships*, Chapter 4, pp. 47-57. (ISBN: 9781922102034).

3. Petridou, E., Germeni, E. and **Stevenson, M**. (2010), Epidemiology of Injuries. In: *Teaching Epidemiology: A Guide for Teachers in Epidemiology, Public Health and Clinical Medicine* (eds. J. Olsen, R Saracci and D. Trichopoulos), Oxford University Press, Oxford, 3rd Edition. (ISBN 13 978-0-19-923947-4).

4. * McEvoy, S. and **Stevenson, M**. (2009), Measuring exposure to driver distraction. In: *Driver distraction: theory, effects and mitigation* (eds. M.L. Regan, J.D. Lee and K.L. Young), CRC Press, Florida, USA, pp. 73-85. (ISBN 13:978-0-8493-7426-5).

5. * McEvoy, S. and **Stevenson, M**. (2009), Epidemiological Research on driver distraction. In: *Driver distraction: theory, effects and mitigation* (eds. M.L. Regan, J.D. Lee and K.L. Young), CRC Press, Florida, USA, pp305-319. (ISBN 13:978-0-8493-7426- 5).

6. MacMahon, K., Guruaj, G. and **Stevenson, M**. (2008), Chapter 2 Road traffic injuries. In: *World Report on Child Injury Prevention* (eds. M. Peden, K. Oyebgite, J. Ozanne-Smith et al.), World Health Organization and UNICEF, Geneva, Switzerland. (ISBN 978 92 4 156357 4).

7. Petridou, E., Germeni, E. and **Stevenson, M**. (2008), Epidemiology of Injuries. In: *Teaching Epidemiology: A Guide for Teachers in Epidemiology, Public Health and Clinical Medicine* (eds. J. Olsen, R Saracci and D. Trichopoulos), Oxford University Press, Oxford, 2nd Edition. (ISBN 13 978-0-19-923947-4).

8. Poulos, R. and **Stevenson, M.** (2008), Burns & Scalds. In: *International Encyclopedia of Public Health* (eds. K. Heggenhougen and S. Quah), Academic Press, San Diego, vol 5, pp. 370-376. (ISBN 978-0-12-373960-5).

9. * Ivers, R.Q., **Stevenson, M.**, Norton, R. and Yu, J (2008), Road Traffic Injuries. In: *International Encyclopedia of Public Health* (eds. K. Heggenhougen and S. Quah), Academic Press, San Diego, vol 5, pp. 615-623. (ISBN 978-0-12-373960-5).

Refereed Journal Articles

10. Fraser, M., Meuleners, L., Chow, K. and **Stevenson, M**. (2017) Distracting and risky behaviours while cycling: a comparison of group and non-group riders in Western Australia. *Injury Prevention*, (accepted 29 July).

11. Beck, B., Ekegren, C.L., Cameron, P., Edwards, E.R., Bucknill, A., Judson, R., Page, R., Hau, R., **Stevenson, M**. and Gabbe, B.J. (2017), Predictors of recovery in cyclists hospitalised for orthopaedic trauma following an on-road crash, *Accident Analysis & Prevention*, 106: pp.341-347.

12. Thompson, J., Wijnands, J., Savino, G., Lawrence, B. and **Stevenson, M.** (2017), Estimating the safety benefit of separated cycling infrastructure adjusted for behavioural adaptation among drivers; an application of agent-based modelling. *Transportation Research Part F: Traffic Psychology and Behaviour*, 49: pp.18-28.

13. Warmerdam, A., Griffin, M., Sheppard, D., **Stevenson, M**. and Newman, S. (2017), A new approach to managing work-related road traffic injury: the development of a health investment framework. *Journal of Safety Research*, published online 7 Feb. http://dx.doi.org/10.1080/15389588.2017.1288289

14. Newnam, S., Warmerdam, A., Sheppard, D.M., Griffin, M. and **Stevenson, M**. (2017), Do management practices support or constrain safe driving behaviour? A multilevel systems protocol. *Accident Analysis and Prevention*, 102: pp.101-109.

15. Newnam, S., Goode, N., Salmon, P. and **Stevenson, M**. (2017), Reforming the road freight transportation system using systems thinking: An investigation of coronial inquests in Australia. *Accident Analysis and Prevention*, 101: pp.28-36.

16. Beck, B., Ekegren, C., Cameron, P., **Stevenson, M.**, Judson, R., Bucknill, A., Edwards, E. and Gabbe, B (2017), Comparing ICD-10 external cause codes for pedal cyclists using self-reported crash details. *Injury Prevention*, published online February 16. doi:10.1136/injuryprev-2016-042206.

17. O'Hern, S., Oxley, J. and **Stevenson, M**. (2017) Validation of a bicycle simulator for road safety research. *Accident Analysis and Prevention*, 100: pp.53-58.

18. Warmerdam, A., Sheppard, D., Griffin, M. and **Stevenson, M**. (2017), Workplace road safety risk management: An investigation into Australian practices. *Accident Analysis and Prevention*, 98 pp.:64-73.

19. **Stevenson, M.**, Harris, A., Mortimer, D., Wijnands, J., Tapp, A., Peppard, F. and Buckis, S (2016). The effects of feedback and incentive- based insurance on driving behaviours: study approach and protocols. *Injury Prevention*, published online Jan 10. http://dx.doi.org.ezp.lib.unimelb.edu.au/10.1136/injuryprev-2016-042280

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23. Giles-Corti, B., Moudon, A., Reis, R., Turrell, G., Dannenberg, A.L., Badland, H., Foster, S., Lowe, M., Sallis, J., **Stevenson, M.** and Owen, N. (2016), City planning and population health: a global challenge. *Lancet*, published online Sept 23. http://dx.doi.org/10.1016/S0140-6736(16)30066-X.

24. Sallis, J., Bull, F., Burdett, R., Frank, L., Griffiths, P., Giles-Corti, B. and **Stevenson M.** (2016), Using science to guide city planning policy and practice: achieving healthy and sustainable future cities. *Lancet*, published online Sept 23. http://dx.doi.org/10.1016/S0140-6736(16)30068-X.

25. **Stevenson, M.**, Faruque, S., Almajil, A., Farhan, M., Fildes, B. and Lawrence, B. (2016), An evaluation of the red-light camera programme in the city of Dammam, the Kingdom of Saudi Arabia. *International Journal of Injury Control and Safety Promotion*, Epub. doi: /10.1080/17457300.2015.1132732. =

26. Thompson, J., Savino, G. and **Stevenson, M.** (2016), A model of behavioural adaptation as a contributor to the safety-in-numbers effect for cyclists. *Transportation Research Part A: Policy and Practice*, 85: pp.65-75.

27. Fildes, B., Stevenson, M., Hoque, S. and Hammid, A (2016), Restraint use in the Eastern Province of the Kingdom of Saudi Arabia. *Traffic Injury Prevention*, Epub. doi: 10.1080/15389588.2015.1103849.

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35. Howard, M.E., Jackson, M.L. and **Stevenson, M.** (2015), Who needs sleep apnea treatment for safety critical tasks--are we there yet? *Sleep*, 38(3): pp.331-2.

35.* Hunter, K., Keay, L., Simpson, J.M., Brown, J., Bilston, L.E., Fegan, M., Cosgrove, L., **Stevenson, M.** and Ivers, R.Q. (2015), Program fidelity measures associated with an effective child restraint program: Buckle-Up Safely. A*merican Journal of Public Health*, 105(3): pp.584-90.

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37. **Stevenson, M.**, Sleet, D. and Ferguson, R. (2015), Preventing child pedestrian injury: a guide for practitioners. *American Journal of Lifestyle Medicine*, 9(6): pp.442-50.

38. Lawrence, B., **Stevenson, M.**, Oxley, J. and Logan, D. (2015), Geospatial analysis of cycling injury trends: An investigation in Melbourne, Australia. *Traffic Injury Prevention*, 16(5): pp.513-18.

39. Hunter, K., Keay, L., Simpson, J., Brown, J., Bilston, L., Fegan, M., Cosgrove, L., **Stevenson, M.** and Ivers, R. (2015), Program fidelity measures of a successful child car restraint program: Buckle-Up Safely. *American Journal of Public Health*, 105(3): pp.584-590.

40. McClure, R., Adriazola-Steil, C., Mulvihill, C., Fitzharris, M., Bonnington, P., Salmon, P. and **Stevenson, M**. (2015), Simulating the dynamic effect of land-use and transport policies on the development and health of populations. *American Journal of Public Health*, 105(S2): S223-S229.

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42. **Stevenson, M.**, Johnson, M., Oxley, J., Meuleners, L., Gabbe, B. and Rose, G. (2015), Safer cycling in the urban road environment: study approach and protocol guiding an Australian study. *Injury Prevention*, 21(1): e3.

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48. **Stevenson, M.** and Thompson, J. (2014), On the road to prevention: road injury and health promotion. *Health Promotion Journal of Australia*, 25(1): pp.4-7.

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ARC grants awarded in the last 10 years on which you have been a CI, PI, or Fellow

Project ID	CI/PI/Fellow Name/s	Amount Funded	Number of Years	Project Title	Research Outputs
LP160100701	Mueleners L, **Stevenson M**	$260,000	2017-2020	Driving performance and self-regulation practice in drivers with dementia	
LP150100680	**Stevenson M,** Mortimer D, Harris A, Tapp A, Peppard F, Collins S	$530,000	2015-2019	Effects of feedback and incentive-based insurance on driving behaviours	
LP130100380	**Stevenson M**, Johnson M, Oxley H, Meuleners L**,** Gabbe B, Rose G, Dill J, Katz R, Bourke P, Bartel J, Moyses D, Nieuwesteeg M	$705,770	2013-2015	Safer cycling in the urban road environment	23,28
LE130100050	Grzebieta R, Williamson A, Charlton J, Watson B, **Stevenson M**, Rakotonirainy A, Haworth H, Woolley J	$570,000	2013-2016	Integrated facility for recording driver and road user behaviour	
LP0776308	**Stevenson M**, Sharwood LN, Wong K, Elkington J, Meuleners L, Ivers R, Grunstein R, Williamson A, Haworth N, Norton R.	$432,000	2007-2009	Safety in the Heavy Vehicle Industry: A Collaborative Response	12, 21, 35, 36, 40, 43, 47, 55

G13. Research Opportunity and Performance Evidence (ROPE) - Ten career-best research outputs

(Upload a PDF of no more than four A4 pages with a list of your ten career-best research outputs, with a brief paragraph for each research output explaining its significance.)

Uploaded PDF file follows on next page.

G13. Research Opportunity and Performance Evidence (ROPE) - Ten career-best research outputs

1.Wang, S.Y., Li, Y.H. Chi, G.B., Xiao, S.Y., Ozanne-Smith, J., **Stevenson, M.** and Phillips, M.R. (2008), Injury-related fatalities in China: an under-recognized public health problem. *The Lancet*, 372(9651): pp.1765-73.

Impact Factor: 45; citations = 256. This invited paper, the first to describe the epidemiology of injury in China, highlights opportunities to adopt efficacious and easily implemented interventions particularly in relation to suicide.

2. **Stevenson, M.,** Thompson, J., de Sa, T.H., Ewing, R., Mohan, D., McClure, R., Roberts, I., Tiwari, G., Giles-Corti, B., Xiaoduan, S., Wallace, M. and Woodcock, J (2016), Land use, transport and population health; estimating the health benefits of compact cities. *Lancet*, published online Sept 23. http://dx.doi.org/10.1016/S0140-6736(16)30067-X.

Impact factor: 45; citations = 8. This paper forms part of an invited series of three papers and highlights the public health gains from transport modal shift to active transport.

3.McEvoy, S., **Stevenson, M.**, McCartt, A., Woodward, M., Haworth, C., Palamara, P., and Cercarelli, L. (2005), The role of mobile phones in motor vehicle crashes resulting in hospital attendance: a case-crossover study. *British Medical Journal.* 331: pp.428-433.

Impact factor: 19.97; citations = 516. This study demonstrated the risk of hands free mobile phone use and motor vehicle crashes was similar to that of hand-held mobile phone use and led to world-wide legislative changes.

4. *MacKay, M., Elsenaar, P., Ghaffar, A., Hijar, M., Kallberg, V.-P., Linnan, M., Odero, W., **Stevenson, M.**,Wodzin, E. (2004), Chapter 3: Risk factors. In: *World report on road traffic injury prevention* (eds. M. Peden, R. Scurfield, D. Sleetet al.), World Health Organization, Geneva, Switzerland.

Citations = 3,288. This report highlighted the magnitude of the traffic injury problem and the expected number of deaths due to road traffic injury, globally. Published in 8 languages, thousands of copies sold.

5.*Sharwood, L., Elkington, J., Meuleners, L., Ivers, R., Boufous, S. and **Stevenson, M.** (2013), Use of caffeinated substances and risk of crashes in long distance drivers of commercial vehicles: case control study. *British Medical Journal*, 346: f1140. doi: 10.1136.

Impact factor: 19.97; citations = 31. This paper, also taken from the case-control study of heavy vehicle crashes provides a dose-response relationship between the use of caffeine and the risk of crashing. It provides some impetus to pursue the current proposal.

6.***Stevenson, M.**, Elkington, J., Sharwood, L.N., Meuleners, L., Ivers, R., Boufous, S., Williamson, A.M., Haworth, N.L., Quinlan, M., Grunstein, R.R., Norton, R. and Wong, K. (2014), The role of sleepiness, sleep disorders, and the work environment on heavy-vehicle crashes in 2 Australian states. *American Journal of Epidemiology*, 179(5): pp.594-601.

Impact factor: 5.23; citations = 24. The findings from the paper highlighted unique elements associated with the largest observational study, to date, of heavy vehicle crashes. The findings investigated important elements related to driver schedules and payment with respect to crash risk.

7. Ivers, R., Senserrick, T., Boufous, S., **Stevenson, M.** and Chen, T. (2009), Novice drivers risky driving behaviours, risk perception and crash risk: Findings from the DRIVE Study. *American Journal of Public Health*, 99(9): pp.1638- 44.

Impact factor: 4.55; citations = 130. This study (the largest cohort study of young novice drivers to date, n=22,000) has contributed to enhancements in driver licensing systems throughout Australia and likely to contribute to changes, internationally.

8. McEvoy, S., **Stevenson, M.** and Woodward, M. (2006), Phone use and crashes while driving: a representative survey of drivers in two Australian states. *Medical Journal of Australia*, 185: pp.630-634.

Impact factor: 4.089; citations = 73. This paper highlighted for the first time in Australia, the prevalence of mobile phone use whilst driving, in two Australian states. The findings highlighted the magnitude of this driving risk.

9. MacMahon, K., Guruaj, G., **Stevenson, M.** Chapter 2 Road traffic injuries. World Report on Child Injury Prevention. M. Peden, K. Oyegbite, J. Ozanne-Smith et al. 2008, Geneva, World Health Organization and UNICEF.

Citations: 966. Thousands of copies of this report have been sold to date. The road traffic injury chapter provides a league table of known and efficacious interventions supported by evidence.

10. *Sharwood LN, Elkington J, **Stevenson M,** Grunstein RR, Meuleners L, Ivers RQ, Haworth N, Norton R, Wong KK. (2012). Assessing sleepiness and sleep disorders in Australian long distance commercial vehicle drivers: Self-report versus an 'at home' monitoring device. *Sleep*, 35, 469-475.

Impact factor: 5.49; citations= 37. ARC funded study. Sleep apnoea remains a significant and unrecognised problem in heavy vehicle drivers. This study revealed that self-identification is insufficient to accurately identify those at risk.

G14. Research Opportunity and Performance Evidence (ROPE) - Further evidence in relation to research impact and contributions to the field from 2007 onwards, including those most relevant to this Proposal.

(Write a maximum of 7500 characters (approximately 1000 words). Detail further evidence in relation to research impact and contributions to the field. Click on the information icon and refer to the Instructions to Applicants for the required content and formatting.)

Prof Stevenson is a NHMRC (Australia) Fellow, an Honorary Professor in the Peking University Health Science Centre, China and an advisor for injury to the Director General of the World Health Organisation. He has been recognised internationally by appointments to editorial boards (as Associate Editor) of international injury prevention journals, with keynote or invited speeches at more than 30 international meetings in the last 8 years, the chairing of sessions at international injury and transport conferences and a recent invitation to lead a number of seminal papers in a Lancet series on urban design, transport and population health in 2016. This series was launched in September at the United Nations with the Editor of the Lancet, Dr Richard Horton, chairing the launch and Prof. Jeff Sachs from the Earth Institute, Columbia University, discussing the implications of the Series.

His extensive work in low- and middle-income countries has also been recognised by numerous invitations from United National organisations to lead consultancies on road and child injury prevention, by an international appointment to the US-National Institutes of Health research review committees, along with obtaining highly competitive research awards from AusAID. Beyond this, Prof Stevenson has been invited to contribute as an author to the WHO's World Report on Road Traffic Injuries (2004), World Report on Child Injury Prevention (2008) and the Global Status Report on Road Injury(2012).

Prof Stevenson initiated the Western Australia Young Driver Cohort Study (n=3,000) which highlighted that newly licensed or novice drivers were (and continue to be) at increased risk of crashing in the first year of licensing with his research highlighting that 14% of young drivers crash within the first 12 months of driving. From this background, he developed DRIVE – the largest cohort study of novice drivers involving over 22,000 young drivers from urban and rural regions of New South Wales (NSW). These drivers were recruited at the time they obtained their probationary license. These data have subsequently been linked to the Roads and Traffic Authority of NSW (now Transport for NSW – Roads and Maritime Services) data for crashes, hospital discharge and coronial data. This leading study has elucidated key risk and protective factors including the increased risk of crash associated with carrying peer passengers and risky driving behaviours. The information gleaned from these studies provided the necessary evidence to advocate for significant changes to the licensing system for novice drivers in Australia, particularly the inclusion of strategies such as night and passenger restrictions during the early stages of probationary licensing. Over a 2-year period 2005-2006 he advocated strongly for the introduction of a graduated licensing system for novice drivers. Utilising the evidence from the cohort studies Professor Stevenson proposed significant policy implications in relation to the Australian licensing system namely, that late night and peer passenger restrictions needed to be introduced. During the height of the public debate (2005/06) his advocacy for such changes warranted almost weekly media or government meetings in NSW. The translation of the research findings into policy is still ongoing, however at the time of submitting this grant, all states in Australia have introduced graduated licensing schemes – the majority including peer-passenger restrictions and one state is likely to introduce night driving restrictions in the early stages of the probationary licensing process.

The most significant impact both nationally and internationally emanates from his research on the role of mobile phones and road traffic injury, particularly hands-free mobile phone use and road traffic injury. This research not only changed driving behaviour globally, it also refined the case-crossover research approach which had been used in the initial stages for understanding the relationship between mobile phones and the risk of road traffic injury. Professor Stevenson was funded by the US-based Insurance Institute for Highway Safety to determine the role mobile (cell) phones play in the propensity to crash. Until then, only one study had investigated the issue and although it utilised a case-crossover study design it had a number of limitations. The most significant was the fact that the hazard and control intervals were not comparable; the control interval did not determine whether the participants were driving (and using their mobile phones) during the control interval. Taking account of this and a number of other limitations, particularly the fact that we used mobile phone billing records from the telecommunication companies to obtain the exposure data for each driver who presented to hospital following a motor vehicle crash, has placed this research as the seminal piece related to this significant public health problem. The study, which was published in the British Medical Journal, involved 1,800 drivers as they presented at emergency departments in the Perth metropolitan area over a 28 month period. As alluded to above, mobile phone use was obtained from telecommunication companies in order to assess the temporality of mobile phone use and motor vehicle crash. The research highlighted that the risk of motor vehicle crash whilst using a hands-free mobile phone was similar to that associated with hand-held devices and the increased risk was irrespective of the sex or age of the driver. The research has been cited in at least 2 jurisdictions in Australia as the evidence for the current legislation which now prohibits the use of hand-held (and in some states prohibits hands-free devices for novice drivers) whilst driving. As well, this research has been cited as the key evidence for similar legislative

changes internationally including 6 states in the United States and New Zealand.

G15. Currently held ARC Projects

(This information is auto-populated from your RMS profile and will include any 'active' Project which has not yet had a Final Report approved and the Project file closed by the ARC. If you have any concerns with the information recorded here, contact your Administering Organisation's Research Office. NOTE: If you hold a CI or a PI role on the Project/s listed in the table below you must ensure a progress statement is provided in H2. This requirement applies to the following schemes: Discovery Projects, Discovery Indigenous Researchers Development, Discovery Indigenous, Discovery Early Career Researcher Award, Linkage Projects, Industrial Transformation Research Hubs, Industrial Transformation Training Centres or any ARC Fellowship scheme. Please click on the information icon and refer to the Instructions to Applicants for further information.)

Identifier	Scheme Name	Investigators	Admin Organisation	Project Title	Funding	End Date
LE130100050	LE 2013 R1	Prof Raphael Grzebieta ; Prof Ann Williamson ; A/Prof Judith Charlton ; Adj/Prof Barry Watson ; Prof Mark Stevenson ; Prof Andry Rakotonirainy ; Prof Narelle Haworth ; A/Prof Jeremy Woolley	The University of New South Wales	Integrated facility for recording driver and road user behaviour	$570,000	31/12/2015
LP130100380	LP 2013 R1	Prof Mark Stevenson ; Dr Marilyn Johnson ; A/Prof Jennifer Oxley ; Prof Lynn Meuleners ; Prof Belinda Gabbe ; Prof Geoffrey Rose ; Prof Jennifer Dill ; Dr Roderick Katz ; Mr David Moyses ; Mrs Juliet Bartels ; Mr Michael Nieuwesteeg ; Mr Peter Bourke	The University of Melbourne	Safer cycling and the urban road environment	$705,770	26/06/2018
LP150100680	LP 2015 R1	Prof Mark Stevenson ; A/Prof Duncan Mortimer ; Prof Anthony Harris ; Prof Alan Tapp ; Mr Frank Peppard ; Miss Samantha Collins	The University of Melbourne	Effects of feedback and incentive-based insurance on driving behaviours	$530,000	22/03/2020
LP160101446	LP 2016 R1	Prof Lynn Meuleners ; Prof Mark Stevenson ; Dr Andrew Stafford	Curtin University	Driving performance and self-regulation practices in drivers with dementia	$195,645	31/12/2019

Part G - Personnel and ROPE (Dr Dominique Hes)

G1. Personal Details

(To update personal details, click the 'Manage Personal Details' link below. Note this will open a new browser tab. When returning to the form ensure you 'Refresh' the page to capture the changes made to your profile.)

Participation Type

Chief Investigator

Title

Dr

First Name

Dominique

Second Name

Family Name

Hes

G2. Role of Partner Investigator

(Please indicate which of the Partner Investigator role options from A7.3.3 of the Funding Rules apply to your role on this Project. Select all options that apply.)

G3. Will you be residing predominantly in Australia for the duration of the Project?

(This is a 'Yes' or 'No' question. Indicate whether you will be residing predominantly in Australia for the duration of the Project, taking into account any international travel. If you are applying as a CI and you answer 'No' to this question you will be prompted to contact your Research Office to check your eligibility.)

Yes

G4. Qualifications

(To update any qualifications, click on the 'Manage Qualifications' link below. Note this will open a new browser tab. When returning to the form ensure you 'Refresh' the page to capture the changes made to your profile.)

Conferral Date	AQF Level	Degree/Award Title	Discipline/Field	Awarding Organisation	Country of Award
19/11/2005	Doctoral Degree	PhD	Architecture	RMIT	Australia
25/11/1998	Bachelor Honours Degree,Graduate Certificate, Graduate Diploma	Graduate Diploma Cleaner Production	Engineering	RMIT	Australia
12/11/1995	Bachelor Degree	Science	Botany	The University of Melbourne	Australia

G5. Are you currently undertaking a Higher Degree by Research which will be conferred after 1 July 2017?

(This is a 'Yes' or 'No' question. If you are applying as a CI and your answer is 'Yes' to this question you will be prompted to contact your Research Office.)

No

G6. Research Opportunity and Performance Evidence (ROPE) - Current and previous appointment(s) / position(s) - from 2007 onwards

(To update any details in this table, click on the 'Manage Employment Details' link below. Note this will open a new browser tab. When returning to the form ensure you 'Refresh' the page to capture the changes made to your profile. Click on the information icon above and refer to the Instructions to Applicants for more information.)

Description	Department	Contract Type	Employment Type	Start Date	End Date	Organisation
Director Thrive Research Hub	Faculty of Architecture, Building and Planning	Permanent	Full Time	01/07/2016		The University of Melbourne
Senior Lecturer	Architecture	Permanent	Full Time	12/03/2016	06/12/2017	The University of Melbourne
Lecturer	Architecture	Permanent	Full Time	03/04/2006	11/03/2011	The University of Melbourne

G7. Employment Details as at Commencement date of Project

(This question will be used to determine your eligibility. Confirm your employment status at all organisations that you will be associated with as at the Commencement Date for the Project (1 July 2017). Enter the relevant appointment type and Full-Time Equivalent (FTE) for each organisation. Click on the information icon for further information.)

Org name	Is this an Eligible Organisation?	Please choose your appointment type for this organisation.	Please enter your FTE for this Organisation
The University of Melbourne	Yes	Employee	1

G8. Further Details Regarding Partner Investigator Status - Do you hold a remunerated appointment at an Eligible Organisation?

(NOTE: this question is mandatory ONLY FOR PIs WHO:
• at G3 confirmed that they will reside predominantly in Australia for the duration of the proposed Project; AND
• at G5 confirmed that they are not currently undertaking a Higher Degree by Research which will be conferred after 1 July 2017; AND
• at G7 indicated that they would hold either:
- an appointment at an Eligible Organisation equal or greater than 0.2FTE; OR
- Emeritus Appointment at an Eligible Organisation

This is a 'Yes' or 'No' question. If you select 'Yes', you will be further prompted to justify your participation on this Proposal as a PI with reference to sections A7.2 and A7.3 of the Funding Rules. Click on the information icon for further information.)
Do you hold a remunerated appointment at an Eligible Organisation?

Justification of PI status

G9. Relevant organisation for this Proposal

(Enter the Organisation that is relevant to your participation on this Proposal, and that you will be associated with as

at the Commencement Date for the Project (1 July 2017). The 'relevant organisation' is the primary organisation that will be supporting your involvement in this Project if it is funded. Note that the Organisation must be listed in G7 for this question to validate.)

Relevant Organisation

The University of Melbourne

G10. What is your time commitment to this Project?

(Enter your time commitment to this Project as a Full-Time Equivalent (FTE). Note that an FTE of 1.0 represents a full-time commitment (i.e. 5 days per week).)

0.1

G11. Research Opportunity and Performance Evidence (ROPE) - Details of your career and opportunities for research from 2007 onwards.

(Write a maximum of 5250 characters (approximately 750 words). Please detail your career and opportunities.)

i) Dr Hes received her PhD in Architecture from RMIT 12 years ago.

ii) Dr. Hes has been part of three successful ARC Linkage Projects (1st CI on one), developed and carried out research for local, state and federal governments, published two books, several government and industry guides and over 50 papers. She is the Director of the Thrive Research Hub within the Faculty of Architecture, Building and Planning, which aims to undertake practical research with industry to support the provision of social and ecological benefit in the built environment. Within Thrive, they aim to bring researchers from construction, property, architecture, planning, landscape architecture, theatre and engineering together to carry out research at the coalface, working with industry and community partners to implement ideas in a holistic, transparent and integrated fashion. Recent projects that demonstrate this are:
(a) Seacombe West where she brought together 40 researchers, engineers, industry, government and community to design a regenerative community on Lake Wellington, funded by Carlton Connect, and;
(b) Horticultural Industry Association Plant Life balance project with RMIT, where CI Hes used a Delphi methodology to develop metrics through which the mental wellbeing and physical health benefits of plants could be easily communicated to the general public; and
(c) the Myer Foundation Placemaking grant which is bringing together 5 universities, 18 practitioners and over 30 local governments and developers to look at increasing citizen agency in the development of place.
Ci Hes's key interest is multidisciplinary research leading to transdisciplinary outcomes that are practical and greater than the sum of their parts – specifically how this can help solve the complex, multi-faceted issue of sustainability for modern societies.

iii) Ci Hes works at FTE 0.8:
-Teaching (FTE 0.3, 40%): CI Hes coordinates and delivers three subjects, one undergraduate run twice a year with 200+ students and two post graduate, each running once a year (120 and 70 students). CI Hes has developed four new subjects at the University of Melbourne, as part of the Melbourne Model (ABPL20036, ABPL90120, ABPL90153 and ABPL90272).
-Research (FTE 0.3, 40%): CI Hes has written two books, one is in progress, brought in funding from government and industry and driven the development and establishment of the Thrive Research Hub, which now spans 15 researchers, with over $3M in funding and, in 2016, produced over 40 papers.
-Administration (FTE 0.2, 20%) CI Hes manage the finances, administration and coordination of the Thrive Research Hub, as well as day-to-day teaching and research aspects. Between 2012 and 2014, she was the Assistant Dean Equal Opportunity.

iv) Between 2008 and 2009, CI Hes took maternity leave for nine months and have worked on an FTE 0.8/0.9 since to care for her daughter. In 2014 and 2015 she reduced her workload to FTE 0.2 for 12 months, due to her daughter having a medical condition. During this time she only maintained PhD supervisory roles. This period of reduced capacity limited research output for that period.

v) The University of Melbourne and the Faculty of Architecture, Building and Planning provides a supportive collegiate environment with mentoring and support for research. Full facilities have been provided for her research including space for research assistants, conference travel and access to internal research funding support.

vi) One of her greatest achievements is the publication of Designing for Hope: Pathways to Regenerative Sustainability (Hes and du Plessis 2015). This book and associated research project compiled over 35 projects from around the world, demonstrating not just the theory but also the practice of socially, ecologically and economically sustainable design.

G12. Research Opportunity and Performance Evidence (ROPE) - Significant research outputs and ARC grants from 2007 onwards

(Upload a PDF of no more than ten A4 pages with a list of all research outputs, such as journal articles and refereed conference papers, book and book chapters. Use asterisks to identify research outputs relevant to this Proposal. Click on the information icon or refer to the Instructions to Applicants for the required content and formatting.)

Uploaded PDF file follows on next page.

G12. Research Opportunity and Performance Evidence (ROPE) - Significant research outputs and ARC grants

Scholarly Books

1. *__Hes, D.,__ and du Plessis, C. (2015, *Designing for Hope: Pathways to Regenerative Sustainability*, Earthscan from Routledge, London, United Kingdom.

2. *__Hes, D__., Bush, J. ed (2018), *Enabling Eco-Cities: defining, planning, and creating a more thriving future*, Palgrave Macmillan, London.

Scholarly Book Chapters

3. *Bush, J., Aye, L., **Hes, D.,** and Murfitt, P. (2017), How could sustainability transition theories support practice-based strategic planning? In: *Urban Sustainability Transitions: Australian Cases – International Perspectives* (eds. Moore, de Haan, Horne and Gleeson), Springer, Japan.

4. *Ong, B.L., Fryd, O., **Hes, D.,** Lu Aye and Ngo, T.D. (2017), Green Plot Ratio and Mutopia. In: *Growing Compact. Urban Form, Density and Sustainability*, Routledge.

5. ***Hes, D.,** Jensen, C., & Aye, L. (2016), Cool roofs versus green roofs. In: *Building Resilience in Urban Settlements: green roof retrofit* (eds. S.J. Wilkinson and T. Dixon), John Wiley & Sons, pp.116- 134.

6. *__Hes, D.__ (2014), Biophilic design: connection to nature is central to wellbeing and good design. In: *RETH¿NK MATERIALS* (ed. D Clarke), CI Creations, Sydney, Australia, pp. 40-44.

7. *__Hes, D.__ (2011), The EGLE has landed: Architecture reshaping schools for sustainable and effective learning. In: *Reshaping Environments – An interdisciplinary approach to sustainability in a complex world* (ed. H. Bender), Cambridge University Press, New York, U.S.A., pp.139-166.

8. *__Hes, D.__ (2009), Sustainability for learning environments. In:*Take 8-Learning spaces* (eds. K. Kisher and C.Newton), RAIA, Melbourne, Australia, pp. 122-129.

9. **Hes, D.** (2007), CH2, Melbourne City Council, Australia. In: *Environmental Brief* (Eds. W. Cheshire, R. Hyde, M. Thompson & S. Watson, Taylor and Francis, New York, U.S.A.,.pp. 239-254.

Refereed Journal Articles

10. Beer, T. and **Hes, D.** (2017), Sustainability in Production: Exploring Eco-creativity within the Parameters of Conventional Theatre, Behind the Scenes. *Journal of Theatre Production Practice*, 1(1).

11. *Plaut, J., Dunbar, B., Gotthelf, H. and **Hes, D.** (2016), Regenerative Development through LENSES with a case study of Seacombe West, *EDG*, 88: pp.1-16. ISSN 1442-5017.

12. *Lowe, M., Whitzman, C., Badland, H., Davern, M., Aye, L., **Hes, D.,** Butterworth, I., and Giles-Corti B. (2015), Planning Healthy, Liveable and Sustainable Cities: How Can Indicators Inform Policy? *Urban Policy and Research*, 33(2): pp.131-144.

13. *Badland, H., Whitzman, C., Lowe, M., Davern, M., Aye, L., Butterworth, I., **Hes, D.** and Giles-Corti, B. (2014), Urban liveability: Emerging lessons from Australia for exploring the potential for indicators to measure the social determinants of health. *Social Science & Medicine*, 111: pp.64-73.

14. *Hunter Block, A., Williams, N., Ryaner, J., Aye L. and **Hes D.** (2014), Quantifying the thermal performance of green façades: A critical review. *Ecological Engineering*, 63: pp.102- 113.

15. *Aye, L., and **Hes, D.** (2012), Green building rating system scores for building reuse. *Journal of Green Building*, 7(2): pp.105-112.

16. *Newton, C., Wilks, S., **Hes, D.,** Aibinu, A., Crawford, R., Goodwin, K., Jensen, C., Chambers, D., Chan, T. and Aye, L. (2012), More than a survey: an interdisciplinary post- occupancy tracking of BER schools. *Architectural Science Review*, 55(3): pp.196-205.

17. **Hes, D.** (2012), A Practical Guide to Life Cycle Assessment of Buildings. *EDG* 72: pp.1-10.

18. *Crabtree, L., and **Hes, D.** (2009), Sustainability uptake in housing in metropolitan Australia: an institutional problem, not a technological one. *Housing Studies*, 24(2): pp.203 – 224.

19. *Wilks, S., Newton, C. and **Hes D.** (2009), Educational buildings as 3D text books: - linking ecological sustainability, pedagogy and space. *Open House International*, 24(1): pp.17-25.

20. ***Hes, D.** (2009), 'Once they have been there and have sat in it, they get it', *Critical and Creative Thinking*, 17(2): pp.77-92.

21. *Wilks, S. and **Hes, D.** (2008), Immersion in school design – Educational outcomes of an innovative design studio. *Journal of Analytical Teaching*, 27(2): pp.3-13. http://www.viterbo.edu/analytic/Vol.27%20no.2/Immersion%20in%20school%20Design.p df

22. *Verghese, K. and **Hes, D**. (2007), Qualitative and quantitative tool development to support design decisions. *Journal of Cleaner Production*, 15(8-9): pp.814-818.

23. Hurlimann, A.C., **Hes, D.,** Othman, M. and Grant, T. (2007), Charting a new course for water

– is black water reuse sustainable? *Water Science and Technology: Water Supply*, 7(5-6): pp.109–118.

24. ***Hes, D.** (2007), Perspectives on the Effectiveness of Rating Tools and their Ability to Support the Development of a More Sustainable City. *The International Journal of Environmental, Cultural, Economic and Social Sustainability*, 3(4): pp.143-152.

Refereed Conference Papers

25. **Hes, D.,** Stephan, A. and Moosavi, S. (2017), Putting Regenerative Development into action. In: *World Sustainable Building Conference*, Hong Kong, June.

26. ***Hes, D**., Stephan, A. and Moosavi, S. (2016), Net regenerative regional development: implementation in the master planning stage of a 680 hectares case study. In: *Fifty years later: Revisiting the role of architectural science in design and practice: 50th International Conference of the Architectural Science Association* (eds. J. Zuo, L. Daniel and V. Soebarto), Adelaide, Australia, December 7-9.

27. *Doyon, A. and **Hes, D.** (2014), Positive Buildings, an Opportunity to Increase Resilience. In: *7th Making Cities Liveable Conference*, Kingscliff, NSW, Australia, July 10-11.

28. ***Hes, D**. and du Plessis, C. (2014), W's six hat does built environment practice look like in the ecological worldview. In: *World Green Building conference*, Barcelona, October 27- 30.

29. Hamidi, N. and **Hes, D**., (2014) Non-uniform environments – Evaluation of personal ventilation performance in an open plan office building in warm and humid climate, Abstract accepted. In: *Indoor Air 2014*, Hong Kong, July 7-12.

30. ***Hes, D.** (2013), Current sustainability: are we trying to just be less bad? In: *People and the Planet 2013*, RMIT, Melbourne Australia, July 2-4. Published by Urban Futures; Routledge.

31. *__Hes, D.__, Livesley, S., Jensen, C., Lu Aye, Williams, N.S. and Cadorel, X. (2012), Healthy cities, climate change and the role of high albedo surfaces and green infrastructure. In: *The 5th Healthy Cities: Working Together to Achieve Liveable Cities Conference*, Geelong, Victoria, Australia, June 6-8.

32. *__Hes, D.,__ and Soccio, P. (2012), Developing the "knowing eye" in students – a visual literacy of architecture and sustainable building using school infrastructure. In: *AAEE National Conference*, Melbourne Australia, October 1-4 2012.

33. Howard, P., Gan, L. and __Hes, D.__ (2011), How can we provide robust sustainable solutions for all climate zones that function well as learning spaces using prefabricated classrooms. In: *SB11*, peer reviewed conference, Helsinki, Finland, October 17-19.

34. __Hes, D.,__ Padovani, R. and Raj, A. (2011), Building satisfaction - using thermal modelling to identify areas of building use focus for post occupancy evaluation: using POE not to assess use satisfaction but user impact on performance. In: *Building Simulation 2011*, peer reviewed Australasian conference, Sydney, Australia, November 14-16.

35. Dawkins, A., __Hes, D.__ and Aye, L. (2011), Linking field data of tree shade on walls to develop an effective predictive model in IES for the energy benefits of trees. In: *Building Simulation 2011*, peer reviewed Australasian conference, Sydney, Australia, November 14-16.

36. Livesley, S., Caffin, M., Dawkins, A., Lu, A. and __Hes, D.__ (2011), Effect of vegetation around buildings on space conditioning energy and water consumption. In: *SB11*, peer reviewed conference, Helsinki, Finland, October 17-19.

37. *__Hes, D.__ (2011), Beyond sustainability – the importance of thinking beyond efficiency based initiatives in buildings. In: *SB11*, peer reviewed conference, Helsinki, Finland, October 17-19.

38. *__Hes, D.__ and Howard, P. (2010), Using construction of schools buildings as a novel approach to teach about sustainability. In: *2010 conference of the Australasian Universities Building Education Association*, Melbourne, Australia, July 14-16. A080, 1-17.

39. Padovani, R., Jensen, C. and __Hes, D.__ (2010), Approach to thermal modelling innovative green building elements: Green roof and phase change plasterboard. In: *2010 conference of the Australasian Universities Building Education Association*, Melbourne, Australia, July 14-16. A080, 1-13.

40. *Wilks, S. and __Hes, D.__ (2009), The Educational Green: Researching Ways of Combining Professions. Art and Design Research Centre Undisciplined! In: *Design Research Society Conference 2008*, Sheffield Hallam University.

41. *Owen, C.M. and __Hes, D.__ (2009), Regenerative Design: negotiating the culture-nature divide. In: *AASA 2009 Sustainable Theory - theorizing sustainability* [Refereed Conference], Wellington, New Zealand, September 4-5. ISBN 978-0-475-12346-6.

42. O'Brien, D., Iftekhar, A. and __Hes, D__. (2008), Housing Reconstruction in Aceh: Relationships Between House Type and Environmental Sustainability. In: *Building abroad - procurement of construction and reconstruction projects in the international context*, Montreal, Canada, October, pp. 361-370.

43. *Howard, P., __Hes, D.__ and Owen, C. (2008), Exploring regenerative design opportunities in ecotourism project on Torres Straight Islands. In: *SB08, International Sustainable Building Conference*, Melbourne, Australia, September 21-25, pp. 145-153.

44. __Hes, D.__ (2008) EcoTourism certification tools what is their role now and in the future. In: *SB08, International Sustainable Building Conference*, Melbourne, Australia, September 21-25, pp. 298-306.

45. __Hes, D.__ (2008), Water and energy opportunities for semi-decentralised water reuse and power production in high density areas. In: *SB08, International Sustainable Building Conference*, Melbourne, Australia, September 21-25, pp. 471-479.

46. O'Brien, D.J. and __Hes, D.__ (2007), The third way: developing low environmental impact housing prototypes for hot/humid climates. In: *XXXV IAHS World Congress on Housing Science*, Melbourne, Australia.

47. *Owen, C. and **Hes, D.** (2007), Ecotourism in the architectural imagination.In*: Gazing, Glancing, Glimpsing: Tourists and tourism in a visual world*, University of Brighton, Eastbourne, UK, June 13-15.

48. Hurlimann, A.C., **Hes, D.,** Othman, M. and Grant, T. (2007), Charting a new course for water

- is black water reuse sustainable? In: *4th IWA Specialist Conference on Efficient Use and Management of Urban Water Supply*, Jeju Island, Korea, International Water Association and the Korean Society of Water and Wastewater, May 21-23 2007, pp. 607-617.

(1) **Grants**

Project ID	**CI/PI/Fellow Awardee Nam they appear on the grant)**	**Amount funded**	**Amount of Year**	**Project Title**	**Outputs**
LP0991146	Ms CL Newton; Prof T Kvan; Dr D Hes; Dr K Fisher; Dr MJ Grose; Dr S Wilks	$470,000	4	Future Proofing Schools:Using Smart Green Integrated Design Approaches To Prefabricated Learning Environments	5, 6, 13,16,17
LP0776850	Ms CL Newton; Dr D Hes; Dr S Wilks; Prof K G Dovey; Dr K Fisher	$340,000	3	Smart Green Schools Education and Enviornmental Outcomes of Innovation in School Building	18, 28,29,34,36

G13. Research Opportunity and Performance Evidence (ROPE) - Ten career-best research outputs

(Upload a PDF of no more than four A4 pages with a list of your ten career-best research outputs, with a brief paragraph for each research output explaining its significance.)

Uploaded PDF file follows on next page.

G13 Research Opportunity and Performance Evidence (ROPE) - Ten career-best research outputs

1. ***Hes, D**. and du Plessis, C. (2015), *Designing for Hope: Pathways to Regenerative Sustainability*, Earthscan from Routledge, London, United Kingdom.

   CI Hes's most significant research output has been the book 'Designing for Hope'. This book is central to the project proposed, outlining how regenerative thinking builds on the contribution trajectory beyond efficiency, net-zero, connecting to nature, conservation to regeneration. Further, it argues that central to the moving to a positive, abundant future requires the ability to work systemically not just of addressing the physical aspects of our unsustainability, but the psychological reasons (behaviour, values, aspirations etc.). It presents a new worldview – a way of seeing the world called the living systems worldview. **The aspects of the book that are pertinent to this application is the connection to nature or biophilia section which discusses the physical and psychological benefits of being connected to nature.**

2. ***Hes, D.** (2011), The EGLE has landed: Architecture reshaping schools for sustainable and effective learning. In: *Reshaping Environments – An interdisciplinary approach to sustainability in a complex world* (ed. H. Bender), Cambridge University Press, New York, U.S.A., pp.139-166.

   The outcome from ARC Smart Green Schools (LP0991146), this book chapter speaks directly to the project and working in an interdisciplinary complex and contributive space. This work brought together schools, architecture and sustainability together.

3. *Newton, C., Wilks, S., **Hes, D.,** Aibinu, A., Crawford, R., Goodwin, K., Jensen, C., Chambers, D., Chan, T. and Aye, L. (2012), More than a survey: an interdisciplinary post-occupancy tracking of BER schools. *Architectural Science Review*, 55(3): pp.196-205.

   This publication was the outcome of a collaborative research project spanning educators, engineers, quantity surveyors and architects evaluating the bioclimatic, acoustic and educational quality and attributes of the template schools in Victoria. Again, this is about collaboration across disciplines to look at spaces for children. It was also arguing for a more complex approach to data collection about phenomena, bringing qualitative and quantitative together in effective narratives to explain the new spaces and their impact on the students.

4. *Lowe, M., Whitzman, C., Badland, H., Davern, M., Aye, L., **Hes, D.,** Butterworth, I. and Giles-Corti B. (2015), Planning Healthy, Liveable and Sustainable Cities: How Can Indicators Inform Policy? *Urban Policy and Research,* 33(2): pp.131-144.

   This journal paper again illustrates interdisciplinary work, but specifically it is included because it speaks to physical and mental wellbeing of people in cities linked to sustainability. The wellbeing indicators and models reported on in this publication and created through this collaboration has informed the thinking of this proposal.

5. ***Hes, D**. (2009), 'Once they have been there and have sat in it, they get it'. *Critical and Creative Thinking*, 17(2): pp. 77-92.

   The outcome from ARC Smart Green Schools (LP0991146), this journal paper speaks directly to the need to children to be exposed to the reality of sustainability. In this case understanding the spaces that they sit in, their classrooms, then being able to analyse and critique it.

6. * Ong B.L., Fryd, O., **Hes, D.**, Lu Aye and Ngo, T.D. (2017), Green Plot Ratio And Mutopia. In: *Growing Compact. Urban Form, Density and Sustainability*, Routledge.

   This book chapter in part looks at green infrastructure and its contribution to sustainability and well-being.

7. * **Hes, D.,** Jensen, C. and Aye, L. (2016), Cool roofs versus green roofs. In: *Building Resilience in Urban Settlements: green roof retrofit* (eds. S.J. Wilkinson & T. Dixon), Emerald.

   In this chapter we discuss an alternative to urban greenery for the city, specifically for this ARC proposal the aspects that are interesting are the alternatives to greening, their measurement and comparison.

8. Badland, H., Whitzman, C., Lowe, M., Davern, M., Aye, L., Butterworth, I., **Hes, D**. and Giles-Corti, B. (2014), Urban liveability: Emerging lessons from Australia for exploring the potential for indicators to measure the social determinants of health. *Social Science & Medicine*, 111: pp.64-73.

   This journal paper again illustrates interdisciplinary work, but specifically it is included because it speaks to physical and mental wellbeing of people in cities linked to sustainability. The wellbeing indicators and models reported on in this publication and created through this collaboration has informed the thinking of this proposal.

9. ***Hes, D.** (2010), *Facilitating green building: turning observation into practice*, LAP Lambert Academic Publishing, Saarbrücken, Germany.

   Based on the PhD this book outlines a mixed methods reflective thinking methodology with real world case studies and experiences at its heart. The cross disciplinary work developed from this thesis informs the research approach for the proposal.

10. Sibley, J., **Hes, D.** and Martin, F. (2003), A Triple Helix Approach: An inter-disciplinary approach to research into sustainability in outer-suburban housing estates. In: *Methodologies in Housing Research Conference Stockholm* – The International Association of People-Environment Studies (IAPS), the European Network for Housing Research (ENHR) and The Royal Institute of Technology (KTH), Stockholm, Sweden, September.

    Though beyond the year range specified, this conference paper was written by two PhD students of CI Hes mentored, this was the first time she applied the idea of inter-disciplinarily in a constructive contributive frame: where each person has depth of their field but collaborated through the project on common outcomes.

G14. Research Opportunity and Performance Evidence (ROPE) - Further evidence in relation to research impact and contributions to the field from 2007 onwards, including those most relevant to this Proposal.

(Write a maximum of 7500 characters (approximately 1000 words). Detail further evidence in relation to research impact and contributions to the field. Click on the information icon and refer to the Instructions to Applicants for the required content and formatting.)

Dr. Hes's most significant research output has been the book 'Designing for Hope: Pathways to Regenerative Sustainability'. The book came out near the end of 2014, start of 2015. It was the culmination in 3 years of research, documenting over 35 different case studies around the world which contributed socially and or ecologically to their contexts. While collecting the data for the book the footage was converted into a video as well as five vignettes on different aspects. The Regenerates Documentary https://vimeo.com/120837455.

Beyond publications, the most relevant addition to her research impact is the national award she received last year from Bob Brown: Deni Greene (2015) award 'for a professional who has shown outstanding courage in their work for sustainability'. Specifically for this proposal the award was for her leading work both in research and activities with communities to develop positive social and ecological practices. To this end there are also several videos that she have been involved in to support this:
Castlemaine Living Building Challenge research https://vimeo.com/164217893
Seacombe West Documentary http://seacombewest.com.au/
TED style talk on shift from Liveable to Thriveable cities https://youtu.be/KlscZnOieE
Dutch TV https://www.facebook.com/dutchtv.australia/videos/707509572668213/
Supporting Sustainability Green Infrastructure video https://www.youtube.com/watch?v=YzlBJHgJPMo

This demonstrated the translation of research into the wider community as does the articles written for the conversation and the guardian. Specifically the later speaks directly to this research project Thriving, not just surviving: why business needs to go beyond doing less bad https://www.theguardian.com/sustainable business/2016/aug/09/thrivingnotjustsurvivingwhybusinessneedstogobeyonddoinglessbad

Further to Dr. Hes's impact, and specifically to this research, she is a founding board member of the Living Future Institute of Australia and served on the board for 3 years 20112015.
She is a member of the Executive Committee of the Melbourne Sustainable Society Institute (MSSI) 2016 – ongoing.
Further, she just joined the Breathe Architects Industry Reference Committee 2016 – ongoing.
All of these are examples of esteem in the industry and with fellow researchers and putting into practice many of the ideas that have come out of her research.

Dr. Hes is a judge on many of the leading industry sustainability awards:
Banksia award Sustainable architecture judge 2005 and 2015, 2016, 2017 The Banksia Environmental Awards are regarded as the most prestigious environmental awards in
Australia.
IDEA awards (The (inside) Design Excellence Awards) 2006 and 2007 sustainable project category guest judge IDEA is a celebration of Australian design at its best and is a highly recognised forum for professional designers and design students to present their finest projects visually.
Premiers (Vic) award judge for educational building design 2010 and sustainability award (2017)
HIA (National) awards judge for green smart design 2009
Yarra Sustainability Awards (2011 and 2012)
Facilities Management Association 2016

Further research outputs:
White roofs Video https://www.youtube.com/watch?v=srHNswJY5tw
White roofs research and report (City of Melbourne) http://www.melbourne.vic.gov.au/buildingand development/sustainablebuilding/Pages/Coolroofs.aspx
Green Infrastructure Research (City of Melbourne)
CH2 – 22 design snapshots http://www.melbourne.vic.gov.au/buildinganddevelopment/sustainable building/councilhouse2/designprocess/Pages/designsnapshots.
aspx
Review of Your Building content:
Fact sheets (Vic Gov) – Thermal Mass, Natural Ventilation, Solar Transpired air heater
Case studies (Vic Gov) – 3 case studies on key innovative buildings
Hes, D. (2009). ESD design guide for Commercial buildings. Federal Government, 3rd edition, http://olr.npi.gov.au/sustainability/government/publications/esddesign/pubs/esddesignguidecover.pdf
Hes, D. (2007). ESD Operations guide for owners, managers and tenants. Federal Government,

http://www.gbca.org.au/uploads/244/36084/Dept%20of%20Environment%20esdoperationsguide.pdf

Other Awards received:
National Citations for Outstanding Contributions to Student Learning 2015
University of Melbourne, Teaching Excellence Award 2015
University of Melbourne, Faculty of Architecture, Building and Planning, Teaching Design Excellence Award 2015
University of Melbourne, Faculty of Architecture, Building and Planning, Teaching Design Excellence Award 2009
Essay competition Melbourne 2020: Water – opportunities for semidecentralised water reuse in high density areas
10th Annual Business and Higher Education Roundtable award for Outstanding Achievement in Collaboration in Education and training (2000)
13th Annual Business and Higher Education Round table honorary mention for Outstanding Achievement in Collaboration in Education and training (2003)
Banksia award – Darebin City Council for Leadership in Sustainability in Buildings for the Reservoir Civic Centre (2004)
Award finalist
FMA Australia inaugural 2010 Awards for Excellence for book/guide the 'ESD operations guide for building owners and managers'

Presentations:
Over 40 including 4 invited international presentations and Key notes – including the World Cleaner Production Conference and over 20 national invited presentations.

Supervision:
PhDs – 5 completions
Masters – 15 completions
Current load – PhDs 2, Masters 2.

Media:
Interviews on ABC and RRR radio, Financial Review, MX, the Australian and The Age, EarthBeat, A Current Affair and Catalyst.
TED style talk on shift from Liveable to Thriveable cities https://youtu.be/KlscZnOieE
Supporting Sustainability Green Infrastructure video https://www.youtube.com/watch?v=YzlBJHgJPMo
White roofs Video https://www.youtube.com/watch?v=srHNswJY5tw
Dutch TV https://www.facebook.com/dutchtv.australia/videos/707509572668213/
White roofs research and report (City of Melbourne) http://www.melbourne.vic.gov.au/buildingand development/sustainablebuilding/Pages/Coolroofs.aspx
Green Infrastructure Research (City of Melbourne)
Castlemaine Living Building Challenge research https://vimeo.com/164217893
CH2 – 22 design snapshots http://www.melbourne.vic.gov.au/buildinganddevelopment/sustainable building/councilhouse2/designprocess/Pages/designsnapshots.aspx
Review of Your Building content
Fact sheets (Vic Gov) – Thermal Mass, Natural Ventilation, Solar Transpired air heater
Case studies (Vic Gov) – 3 case studies on key innovative buildings

G15. Currently held ARC Projects

(This information is auto-populated from your RMS profile and will include any 'active' Project which has not yet had a Final Report approved and the Project file closed by the ARC. If you have any concerns with the information recorded here, contact your Administering Organisation's Research Office. NOTE: If you hold a CI or a PI role on the Project/s listed in the table below you must ensure a progress statement is provided in H2. This requirement applies to the following schemes: Discovery Projects, Discovery Indigenous Researchers Development, Discovery Indigenous, Discovery Early Career Researcher Award, Linkage Projects, Industrial Transformation Research Hubs, Industrial Transformation Training Centres or any ARC Fellowship scheme. Please click on the information icon and refer to the Instructions to Applicants for further information.)

Part G - Personnel and ROPE (A/Prof Stephen Livesley)

G1. Personal Details

(To update personal details, click the 'Manage Personal Details' link below. Note this will open a new browser tab. When returning to the form ensure you 'Refresh' the page to capture the changes made to your profile.)

Participation Type

Chief Investigator

Title

A/Prof

First Name

Stephen

Second Name

John

Family Name

Livesley

G2. Role of Partner Investigator

(Please indicate which of the Partner Investigator role options from A7.3.3 of the Funding Rules apply to your role on this Project. Select all options that apply.)

G3. Will you be residing predominantly in Australia for the duration of the Project?

(This is a 'Yes' or 'No' question. Indicate whether you will be residing predominantly in Australia for the duration of the Project, taking into account any international travel. If you are applying as a CI and you answer 'No' to this question you will be prompted to contact your Research Office to check your eligibility.)

Yes

G4. Qualifications

(To update any qualifications, click on the 'Manage Qualifications' link below. Note this will open a new browser tab. When returning to the form ensure you 'Refresh' the page to capture the changes made to your profile.)

Conferral Date	AQF Level	Degree/Award Title	Discipline/Field	Awarding Organisation	Country of Award
01/07/1999	Doctoral Degree	PhD	Soil Science	The University of Reading	England

G5. Are you currently undertaking a Higher Degree by Research which will be conferred after 1 July 2017?

(This is a 'Yes' or 'No' question. If you are applying as a CI and your answer is 'Yes' to this question you will be prompted to contact your Research Office.)

No

G6. Research Opportunity and Performance Evidence (ROPE) - Current and previous appointment(s) / position(s) - from 2007 onwards

(To update any details in this table, click on the 'Manage Employment Details' link below. Note this will open a new browser tab. When returning to the form ensure you 'Refresh' the page to capture the changes made to your profile. Click on the information icon above and refer to the Instructions to Applicants for more information.)

Description	Department	Contract Type	Employment Type	Start Date	End Date	Organisation
Associate Professor	School of Ecosystem and Forest Sciences	Permanent	Full Time	31/01/2011		The University of Melbourne
Senior Research Fellow	School of Geography and Environmental Science	Contract	Full Time	15/07/2010	28/01/2011	Monash University
Research Fellow	School of Forest and Ecosystem Science	Contract	Full Time	01/09/2004	15/07/2010	The University of Melbourne

G7. Employment Details as at Commencement date of Project

(This question will be used to determine your eligibility. Confirm your employment status at all organisations that you will be associated with as at the Commencement Date for the Project (1 July 2017). Enter the relevant appointment type and Full-Time Equivalent (FTE) for each organisation. Click on the information icon for further information.)

Org name	Is this an Eligible Organisation?	Please choose your appointment type for this organisation.	Please enter your FTE for this Organisation
The University of Melbourne	Yes	Employee	1

G8. Further Details Regarding Partner Investigator Status - Do you hold a remunerated appointment at an Eligible Organisation?

(NOTE: this question is mandatory ONLY FOR PIs WHO:
• at G3 confirmed that they will reside predominantly in Australia for the duration of the proposed Project; AND
• at G5 confirmed that they are not currently undertaking a Higher Degree by Research which will be conferred after 1 July 2017; AND
• at G7 indicated that they would hold either:
- an appointment at an Eligible Organisation equal or greater than 0.2FTE; OR
- Emeritus Appointment at an Eligible Organisation

This is a 'Yes' or 'No' question. If you select 'Yes', you will be further prompted to justify your participation on this Proposal as a PI with reference to sections A7.2 and A7.3 of the Funding Rules. Click on the information icon for further information.)
Do you hold a remunerated appointment at an Eligible Organisation?

Justification of PI status

G9. Relevant organisation for this Proposal

(Enter the Organisation that is relevant to your participation on this Proposal, and that you will be associated with as at the Commencement Date for the Project (1 July 2017). The 'relevant organisation' is the primary organisation that will be supporting your involvement in this Project if it is funded. Note that the Organisation must be listed in G7 for this question to validate.)

Relevant Organisation

The University of Melbourne

G10. What is your time commitment to this Project?

(Enter your time commitment to this Project as a Full-Time Equivalent (FTE). Note that an FTE of 1.0 represents a full-time commitment (i.e. 5 days per week).)

0.1

G11. Research Opportunity and Performance Evidence (ROPE) - Details of your career and opportunities for research from 2007 onwards.

(Write a maximum of 5250 characters (approximately 750 words). Please detail your career and opportunities.)

i) Dr Livesley graduated 18 years ago with a PhD from The University of Reading, UK.

ii) In late 2005, Dr Livesley moved from his role as a Research Scientist at the Victorian Department of Sustainability and Environment (DSE) to become a Research Fellow in greenhouse gas flux research in the Forests and Climate Change Group of MSLE. Early ARC research success involved considerable methodology development with international research collaborators (Germany) to successfully meet project objectives and to provide a solid base for ongoing research of the Forests and Climate Change Group. The first three year appointment was research only, but from 2008 onwards included increasing teaching (30%) and administrative (10%) responsibilities. During this time, Dr Livesley, developed a research interest in urban biogeochemistry and the role of vegetation within the urban landscape. This led to the supervision of several RHD student projects investigating urban green infrastructure benefits and the award of >$100k from the Nursery and Garden Industry Australia - an important industry research relationship that continues to develop. From 2009 to 2010 Dr Livesley worked (0.5 FTE) with Victoria's DSE to design, test, develop and provide training in the new 'Forest and Monitoring and Reporting Information System (FM&RIS)' to be rolled out at >800 sites throughout Victoria's State Forests and National Park network.

iii) In July 2010, Dr Livesley accepted a Senior Research Fellow position at the Monash Sustainability Institute to drive the development of forest research within South East Asia with regional collaborators in India and Indonesia. In February 2011, Dr Livesley accepted a tenured position as a Senior Lecturer in Urban Horticulture at The University of Melbourne, where responsibilities include teaching (40%), research (40%) and administration (20%). He has developed and co-ordinates two new subjects: 'Green infrastructure for liveable cities' and 'Urban soils, substrates and water' at the Burnley campus. Dr Livesley contributes considerably to University administration, acting as the Academic Liaison Officer, E-learning working group, Chair of the Postgraduate Conference. He has completed the Graduate Certificate in University Teaching to better function under the higher teaching loads.
Dr Livesley, acted as the Burnley campus Director in 2014 for a period of 6 months, a considerable administrative load, but without negative impact on research and teaching capacity. He has completed a management training program 'Future Academic Leaders' through the University of Melbourne for professional development as a Managers of research, teaching and administration at a whole of School, Faculty and University level. Dr Livesley's recent promotion to Associate Professor has led to additional responsibilities in School and Faculty administration.

iv) Dr Livesley has had no significant career interruptions. Dr Livesley has had no formal research mentoring since completing his PhD.

v) He was instrumental with Dr Stefan Arndt in developing the Forest and Climate Change group, and led the soil trace gas research aspects until 2010. Dr Livesley has had good, and continues to have good, access to research facilities, including the Creswick campus and Burnley campus analytical laboratories with isotope, trace gas chromatography and inductively coupled plasma (ICP). Dr Livesley has rapidly established himself as a lead researcher in urban biogeochemistry and urban ecosystems research. With Drs Livesley, Williams, Rayner, Fletcher and Walsh established at the Burnley campus, this is developing into an internationally recognised urban ecosystem research centre.
Dr Livesley recently mentored and shadowed Professor Ivan Mareels, the Dean of the Faculty of Engineering at the University of Melbourne to learn the skills of leadership, motivation, people and time management from a proven leader in his field.

vi) Despite Dr Livesley's growing administrative and teaching loads since tenure in 2011, he continues a respectable publication output in high impact journals. Dr Livesley has also contributed to the award of >$5M of funding from sources such as the ARC, government agencies, local councils and industry bodies. Dr Livesley is currently the Principal Investigator for a recently awarded ARC Linkage (2015) 'Traits, Substrates and Stormwater grates', and Chief investigator for an ARC Discovery (2015) 'Seeing the good from the trees: Mapping the urban forest canopy' with Marco Amati from RMIT and Cris Brack from ANU.
Dr Livesley has also been instrumental in raising the profile of Urban Forest research in Australia through his organisation of the 2nd International Conference in Urban Tree Diversity, to be held in Melbourne in February 2016, with finding and administrative support from International Society of Arboriculture, Arboriculture Australia and the City of Melbourne.

G12. Research Opportunity and Performance Evidence (ROPE) - Significant research outputs and ARC grants from 2007 onwards

(Upload a PDF of no more than ten A4 pages with a list of all research outputs, such as journal articles and refereed conference papers, book and book chapters. Use asterisks to identify research outputs relevant to this Proposal. Click on the information icon or refer to the Instructions to Applicants for the required content and formatting.)

Uploaded PDF file follows on next page.

G12. Research Opportunity and Performance Evidence (ROPE) Significant research outputs and ARC grants

Scholarly Books

None

Scholarly Book Chapters

1. Ossola, A. and **Livesley, S.J**. (2015), Drivers of urban soil heterogeneity. In: *Urban landscape ecology* (eds. R.A. Francis, J.D.A. Millington and M.A. Chadwick, Routledge, pp.23-41.

Refereed Journal Articles

1. *Kaspar, J., Kendal, D, Sore, R. and **Livesley, S.J.** (2017), Random point sampling to detect gain and loss in tree canopy cover in response to urban densification. *Urban Forestry & Urban Greening,* 24: pp.26-34.
2. Threlfall, C.G., Mata, L., Stork, N., Hahs, A., Williams, N.S.G. and **Livesley, S.J.** (2017), Increasing biodiversity in urban green spaces through simple vegetation interventions. *Journal of Applied Ecology* (In Press).
3. Mata, L., Threlfall, C.G., Williams, N.S.G., Hahs, A.K., Malipatil, M., Stork, N.E. and **Livesley, S.J**. (2017), Conserving herbivorous and predatory insects in urban green spaces. *Scientific Reports* 7: 40970. doi: 10.1038/srep40970.
4. Fest, B. J., Hinko-Najera, N., Wardlaw, T., Griffith, D. W., **Livesley, S. J.** and Arndt, S. K. (2017), Soil methane oxidation in both dry and wet temperate eucalypt forests show near identical relationship with soil air-filled porosity. *Biogeosciences*, 14(2): pp.467-479
5. Ossola, A., Aponte, C., Hahs, A. K., and *Livesley, S. J.* (2017), Contrasting effects of urban habitat complexity on metabolic functional diversity and composition of litter and soil bacterial communities. *Urban Ecosystems 20: pp. 595-607*.
6. *Sanusi, R., Johnstone, D., May, P. and **Livesley, S.J.** (2017), Microclimate beenfits that different street tree species provide to sidewalk pedestrians relate to differences in plant area index. *Landscape and Urban Planning* 157: pp.502-511.
7. Fest, B., Hinko-Najera, N., von Fischer, J., **Livesley, S.J.**, Arndt, S.K. (2017), Soil methane uptake increases under continuous throughfall reduction in a temperate evergreen, broadleaved eucalypt forest. *Ecosystems* 20 (2): pp.368–379.
8. ***Livesley, S.J.**, Escobedo, F.J. and Morgenroth, J. (2016,) The biodiversity of urban and peri-urban forests and diverse ecosystem services they provide as socio-ecological systems. *Forests*, 7(12): 291.
9. *Parmher, E., Amati, M., Taylor, E.J., **Livesley, S.J.** (2016), Estimation of urban tree canopy cover using random point sampling and remote sensing methods. *Urban Forestry and Urban Greening*, 20: pp.160-171.
10. *Coutts, A., Harriss, R.J., Thu Phanna, **Livesley, S.J.**, Williams, N.S.G. and Tapper, N.J. (2016), Thermal infrared remote sensing of urban heat: hotspots, vegetation, and an assessment of techniques for use in urban planning. *Remote Sensing of Environment*, 186: pp.637-651.
11. Bristow et al. (2016), Quantifying the relative importance of greenhouse gas emissions from current and future savanna land use change across northern Australia. *Biogeosciences,* 13(22): pp.6285-6303.
12. Threlfall, C.G., Ossola, A., Hahs, A.K., Williams, N.S.G., Wilson, L. and **Livesley, S.J.** (2016), Quantifying differences in vegetation structure and composition across different types of urban green space- golf courses, remnant patches, residential streetscapes and urban parks. *Frontiers in Ecology and Environmental Science,* 4(66). doi:10.3389/fevo.2016.00066
13. Threlfall, C.G., Williams, N.S.G., Hahs, A.K., and **Livesley, S.J.** (2016), Approaches to urban vegetation management and the impacts on urban bird and bat assemblages. *Landscape and Urban Planning* 153: pp.28-39.

14. Hardgrove, S. and **Livesley, S.J.** (2016), Applying spent coffee grounds directly to urban agriculture soils greatly reduces plant growth. *Urban Forestry and Urban Greening*, 18: pp.1-8

15. *Coutts, A., White, E., Tapper, N.J., Beringer, J. and **Livesley, S.J.** (2016), Temperature and human thermal comfort effects of street trees across three contrasting street canyon environments. *Theoretical and Applied Climatology* 124: pp.55-68.

16. Ossola, A., Hahs, A., Nash, M. and **Livesley, S.J.** (2016), Habitat complexity enhances comminution and decomposition processes in urban ecosystems. *Ecosystems,* 19(5): pp.927-941.

17. *Sanusi, R., Johnstone, D., May, P. and **Livesley, S.J,** (2016), Street orientation and the side of street greatly influence the microclimatic benefits street trees provide in summer. *Journal of Environmental Quality Special Section*, 45(1): pp. 167-174.

18. **Livesley, S.J.**, Ossola, A., Threllfall, C.G., Hahs, A. and Williams, N.S.G. (2016), Soil carbon and carbon: nitrogen ratio change under tree canopy, tall grass and turf grass areas of urban green space. *Journal of Environmental Quality*, 45(1): pp.215-223.

19. ***Livesley, S.J.**, McPherson, E.G. and Calfapietra, C. (2016), The urban forest and ecosystem services: impacts on urban water, heat and pollution cycles at the tree, street and city scale. *Journal of Environmental Quality,* 45(1): pp.119-124.

20. Ossola, A., Hahs, A, Christie, F., Nash, M. and **Livesley, S.J.** (2015), Urban habitat complexity affects species richness but not environmental filtering of morphologically-diverse ants. *PeerJ,* 2015(10): e1356.

21. Szota, C., Farrell, C., **Livesley, S.J.** and Fletcher, T.D. (2015), Slat tolerant plants increase nitrogen removal from biofiltration systems affected by saline water. *Water Research*, 83: pp.195-204.

22. Fest, B., Wardlaw, T., **Livesley, S.J.**, Duff, T.J. and Arndt, S.K. (2015), Changes in soil moisture drive soil methane uptake along a fire regeneration chronosequence in a eucalypt forest landscape. *Global Change Biology* 21: pp.4250-4264.

23. Ossola, A., Hahs, A. and **Livesley, S.J.** (2015), Habitat complexity influences fine scale hydrological processes and the incidence of stormwater runoff in managed urban ecosystems. *Journal of Environmental Management*, 159: pp.1-10.

24. Threlfall, C.G., Walker, K., Williams, N.S.G, Hahs, A.K., Mata, L., Stork, N. and **Livesley, S. J.** (2015), The conservation value of urban green space habitats for Australian native bee communities. *Biological Conservation*, 187: pp.240-248.

25. Majumder, R., **Livesley, S.J.**, Gregory, D. and Arndt, S.K. (2015), Storage management influences greenhouse gas emissions from biosolids. *Journal of Environmental Management*, 151: pp.361-368.

26. Arndt, S.K., Sanders, G., Bristow, M., Beringer, J., Hutley, J.B. and **Livesley, S.J.** (2015), Vulnerability of native savanna trees and exotic Khaya senegalensis to seasonal drought. *Tree Physiology*, 35: pp.783:791.

27. *Norton, B.A., Coutts, A., **Livesley, S.J.**, Harris, R.J., Hunter, A. and Williams, N.S.G. (2015), Planning for cooler cities: prioritising the use of green infrastructure to mitigate high temperatures in urban landscapes. *Landscape and Urban Planning*, 134: pp.127-138.

28. Fest, B., **Livesley, S.J.**, von Fischer, J.C. and Arndt, S.K. (2015), Repeated fuel reduction burns have little long term impact on soil greenhouse gas exchange in a dry sclerophyll eucalypt forest. *Agricultural and Forest Meteorology*, 201: pp.17-25.

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Refereed conference papers only when the paper was published in full in the proceedings

None

Other (e.g. major exhibitions, compositions, or performances)

None

ARC grants in the last 10 years:

Project Id	CI Name/s	Amount Funded	Years	PrSoject Title	Papers
LP0774812	Hutley; Beringer; Arndt; Livesley; Cook; Butterbach-Bahl	$190,000	3	Integrative assessment of disturbance and land-use change on total greenhouse gas balance and nutrient cycling in savanna ecosystems	38, 41, 42, 43, 44, 45, 46
LE0882936	Arndt, Livesley, Beringer	$130,000	1	Mobile Ecosystem Gas-exchange Analyzer (MEGA)	50
LP100100073	Hutley, Beringer, Livesley, Arndt, Boggs	$308,000	3	Greenhouse gas and water resource implications of clearing and afforestation in the Daly River catchment, north Australia	11, 30, 26, 36,
LP110100686	Livesley, Williams, Stork, Hahs	$200,000	3	Ecosystems services from large urban green spaces - the biodiversity and carbon benefit of urban golf courses	2, 3, 5, 12, 13, 16, 18, 20, 23, 24,
DP120101735	Arndt, Livesley, Von Fischer	$270,000	3	Methane uptake of forest soils	4, 7, 22, 28
LP140100885	Livesley, Fletcher, Arnt, Lombardi, Morison and Kachenko	$540,000	3	Species traits, substrates and stormwater grates: improving urban tree health using polluted stormwater	21
DP150103135	Amati Livesley, Brack	$272,000	3	Seeing the good from the trees: remotely sensing the urban forest	1, 9

G13. Research Opportunity and Performance Evidence (ROPE) - Ten career-best research outputs

(Upload a PDF of no more than four A4 pages with a list of your ten career-best research outputs, with a brief paragraph for each research output explaining its significance.)

Uploaded PDF file follows on next page.

G13. Research Opportunity and Performance Evidence (ROPE) - Ten career-best research outputs

1. **Livesley, S.J.**, Kiese, R., Miehle, P., Weston, C.J., Butterbach-Bahl, K., Arndt, S.K. (2009), Soil-atmosphere exchange of greenhouse gases in a *Eucalyptus marginata* woodland, a clover-grass pasture and *P. radiata* and *E. globulus* plantations. *Global Change Biology*, 15: pp.425-440. **IF: 8.44, cited: 43**

> LP0455475, Arndt, Weston, Butterbach-Bahl, Livesley; $416,144; 3 years; Non-$CO_2$ greenhouse gas emissions in afforested ecosystems in southeastern Australia - fluxes, processes and regional budget.
> The first comprehensive field study of the overall ecosystem greenhouse gas balance following land-use change in Australia demonstrating multiple greenhouse gas benefits of afforestation.

2. Norton, B.A., Coutts, A., **Livesley, S.J.**, Harris, R.J., Hunter, A. and Williams, N.S.G. (2015), Planning for cooler cities: prioritising the use of green infrastructure to mitigate high temperatures in urban landscapes. *Landscape and Urban Planning,* 134: pp.127-138. **IF: 3.65, cited: 51**

> Applied study and decision framework for the use of thermal image mapping, socio-economic GIS layers and strategic selection and placement of green infrastructure elements to provide prioritised neighbourhood cooling.

3. **Livesley, S.J.**, Grover, S., Hutley, L.B., Jamali, H., Butterbach-Bahl, K., Fest, B., Beringer, J., Arndt, S.K. (2011), Seasonal variation and fire effects on CH_4, N_2O and CO_2 exchange in savanna soils of northern Australia. *Agricultural Forest Meteorology,* 151: pp.1440–1452. **IF: 4.46, cited: 34**

> LP0774812, Hutley, Beringer, Arndt, Livesley, Cook, Butterbach-Bahl;$190,000; 3 years; Integrative assessment of disturbance and land-use change on total greenhouse gas balance and nutrient cycling in savanna ecosystems.
> First field-based study characterising inter-daily, seasonal and fire impacst upon CH_4, N_2O and CO_2 flux from savanna soil and termites using continuous measures.

4. Miehle, P., **Livesley, S.J.**, Li, C., Feikema, P.M., Adams, M.A., Arndt, S.K. (2006), Quantifying uncertainty from large scale model predictions of forest carbon dynamics. *Global Change Biology,* 12: pp.1421-1434. **IF: 8.44, cited: 38**

> LP0455475, Arndt, Weston, Butterbach-Bahl, Livesley; $416,144; 3 years; Non-$CO_2$ greenhouse gas emissions in afforested ecosystems in southeastern Australia - fluxes, processes and regional budget.
> We demonstrate that regional predictions of forest growth can be produced with greater confidence after comprehensive evaluation of up-scaling issues, which improves models.

5. Coutts, A., White, E., Tapper, N.J., Beringer, J. and **Livesley, S.J.** (2016), Temperature and human thermal comfort effects of street trees across three contrasting street canyon environments. *Theoretical and Applied Climatology*, 124: pp.55-68. **IF: 2.43 cited: 19**

> Long-term, high temporal resolution study demonstrating the superior benefit of trees for pedestrian cooling in shallow street canyons, as compared to inner-city deep street canyons.

6. Hunter Block, A., Aye, L., Williams, N.S.G., Rayner, J.P., Hes, D. and **Livesley, S.J.** (2014), Quantifying the thermal performance of green façades: a critical review. *Ecological Engineering*, 63: pp.102-113. **IF: 2.58, cited: 41**

Critically assesses the measurement and modeling of urban green facades demonstrating the need for minimum parameter measurement, reporting for cross-comparison and discipline advancement.

7. Macfarlane, C., Arndt, S.K., **Livesley, S.J.**, Edgar, A.C., White, D.A., Adams, M.A., Eamus, D. (2007), Estimation of leaf area index in eucalypt forest with vertical foliage, using cover and fullframe fisheye photography. *Forest Ecology and Management*, 242: pp.756-763. **IF: 2.83, cited: 45**

LP0455475, Arndt, Weston, Butterbach-Bahl, Livesley; $416,144; 3 years; Non-$CO_2$ greenhouse gas emissions in afforested ecosystems in southeastern Australia - fluxes, processes and regional budget.
Provides a scientifically rigorous demonstration of a simple digital camera technique to accurately estimate canopy leaf area.

8. **Livesley, S.J.**, Gregory, P.J. and Buresh, R.J. (2001), Competition in tree row agroforestry systems. 1. Distribution and dynamics of fine root length and biomass. *Plant and Soil*, 227: pp.149-161. **IF: 2.97, cited: 37**

Shows that fine root distribution greatly determines resource competition between crops and trees, regardless of most limiting soil resource (water or nitrogen).

9. Miehle, P., **Livesley, S.J.**, Feikema, P.M., Li, C., Arndt, S.K. (2006), Assessing productivity and carbon sequestration capacity of *Eucalyptus globulus* plantations using the process model Forest-DNDC: Calibration and validation of the forest growth sub-module PnET. *Ecological Modelling*, 192: pp.83-94. **IF: 2.28, cited: 48**

LP0455475, Arndt, Weston, Butterbach-Bahl, Livesley; $416,144; 3 years; Non-$CO_2$ greenhouse gas emissions in afforested ecosystems in southeastern Australia - fluxes, processes and regional budget.
The process based model Forest DNDC is calibrated and validated for Australian conditions for the first time.

10. Dalal, R.C., Allen, D.E., **Livesley, S.J.**, Richards, G. (2008), Magnitude and biophysical regulators of methane emission and consumption in the Australian agricultural, forest, and submerged landscapes: a review. *Plant and Soil*, 309(1-2): pp.43-76. **IF: 2.97, cited:92**

LP0455475, Arndt, Weston, Butterbach-Bahl, Livesley; $416,144; 3 years; Non-$CO_2$ greenhouse gas emissions in afforested ecosystems in southeastern Australia - fluxes, processes and regional budget.
The review established current state of knowledge gaps, uncertainty and understanding for landscape level methane exchange processes in the Australia.

G14. Research Opportunity and Performance Evidence (ROPE) - Further evidence in relation to research impact and contributions to the field from 2007 onwards, including those most relevant to this Proposal.

(Write a maximum of 7500 characters (approximately 1000 words). Detail further evidence in relation to research impact and contributions to the field. Click on the information icon and refer to the Instructions to Applicants for the required content and formatting.)

1) Dr Livesley PhD studies concentration upon a field investigation of fine root distribution in tree-crop systems and competition for water and nitrogen resources, which contributed significantly to strategic model development by validating below-ground modules for the HyPAR model (UK). Dr Livesley has continued to contribute to the validation and development of tree growth and soil-plant-atmosphere interaction models, such as PNET-DNDC, 3PG and CABALA). Applied research designed to test, validate and develop industry relevant models is central to this current proposal.
Dr Livesley was introduced to use of stable isotope 15N pool dilution techniques at the University of Reading UK, where many of these techniques were developed, and then continued to develop industry relevant research skills in the use of 15N isotopes when he was employed by UWA as the RO on an ARC Linkage to track microbial transformation and tree root uptake of nitrogen compounds in effluent irrigated plantations in Western Australia. This research changed industry management these plantations to minimise the risks of groundwater N contamination. Expertise in use of 15N labelled isotope techniques and the ability to apply them meaningfully to industry relevant questions is central to several of aims in the current proposal.
Since moving to the Burnley Campus in 2007, Dr Livesley has developed a profile in urban ecosystem research. He has secured several industry funding programs from NGIA for various research student projects, for example to investigate the use of i-Tree models in an Australian context, or the energy saving benefit of tree shade. This research has led to NGIA adopting this model to help Australia's nursery industry promote the environmental benefits of urban trees. Dr Livesley has worked closely with NGIA through consultancy research using i-Tree to estimate tree canopy cover of inner and outer suburb residential areas of Brisbane, Melbourne and Perth – directly contributing to NGIA's 2012 campaign for 'More Tree Please'.
Dr Livesley, urban ecosystem research contribution increased greatly with the award of an ARC Linkage investigating the biodiversity and carbon benefits of large urban green spaces – through central involvement of Australia's golf course industry. Dr Livesley
Dr Livesley has been invited to present his research at industry symposium in Canberra (NGIA Urban Greenscape 2009), Perth (Growing Trees with less water 2011), Adelaide (TreeNET 2010). Switzerland (2014) to raise the research content and evidence base for the environmental benefits of urban trees. This research has been published in low impact, but industry relevant journals, in recent years (Urban Ecosystems, and Journal of Arboriculture and Urban Forestry) and presented at The State of Australian Cities 2012.
Through NGIA sponsorship, Dr Livesley led the design and delivery of a major educational exhibition at the 2011 Melbourne International Flower and Garden Show demonstrating the 'Energy Saving Benefits of UrbanTrees'. This led to popular media articles in newspapers and on radio.
2) Dr Livesley has shown an increasing level of performance throughout his academic career, and since 2004 has collectively been party to funding awards >$5M from various sources, such as the ARC, government agencies, local councils and industry bodies. Since 2004, he has been a CI on four completed Linkage projects (LP0455475, LP0774812, LP110100686, LP100100073) and one Discovery project (DP120101735). Currently, he is leading two ARC Linkage projects: LP140100885 'Species traits, substrates and stormwater grates: improving urban tree health using polluted stormwater' and LP160100780 'Managing urban trees for people and wildlife', and contributes to an ARC Discovery project: DP150103135 'Seeing the good from the trees – using LiDAR to measure the urban forest'.
Dr Livesley has contributed to a multi-university project ($296k) for the Victorian Centre for Climate Change Adaptation Research (VCCCAR) investigating the role of urban vegetation in ameliorating the urban heat island. He was awarded $53k in 2010/2011 from NGIA to quantify the energy saving benefit that trees provide to adjacent buildings.
Dr Livesley is a research contributor to the recently awarded NESP 'Clean Air and Urban Landscapes' program through the 'Urban Greening' sub-project. This program will be a strong driver of research, industry and government collaboration and shared goals towards a change in practice and policy in Australian urban planning.
The successful research activity and outputs from these projects has led to consistent journal publication output, conference presentation and PhD supervision. Dr Livesley's research has provided some of the first quantitative data on the magnitude of trace gas exchange in natural and managed forest and agricultural soils, as well as the soil biogeochemical processes that influence this exchange. Dr Livesley's research has been national in focus with successful collaborative research in New South Wales, Western Australia and the Northern Territory alongside, CSIRO, Monash, Charles Darwin University, the AGO (now DECCW) and various state government and private industry bodies. Dr Livesley has provided leadership within Australia's ecosystem exchange and micro-climate research community by co-organizing a regional Australia and New Zealand non-CO2 conference in 2007, and a week-long 'OzFlux' workshop in 2010, including seminar presentations and field demonstrations.
Dr Livesley regularly contributes to national and international symposia and workshops on topics as varied as:

land-use change, global carbon cycling, urban green infrastructure, trace gas exchange and savanna ecosystems. He has been a guest editor for Plant and Soil, Special Issue 2008, and regularly reviews for top ranking, international journals (Agricultural and Forest Meteorology, Oecologia, Plant and Soil, Ecosystems).
Dr Livesley recently Guest Edited an 'Urban Forest and Ecosystem Service' Special Section in the Journal of Environmental Quality that received 13 high quality contribution from around the globe. Guest editing with Dr Greg McPherson of USDA urban forests, and Dr Carlo Calfapietra from Italy. He was also a Guest Editor of a Special Issue in the Open Access journal 'Forests' following the hosting of the 2nd International Conference on Urban Tree Diversity in Melbourne in February 2016. Guest Editing with Dr Francisco Escobedo from Florida, USA and Dr Justin Morgneroth of New Zealand. This Special Issue received 17 international manuscripts relating to urban trees and the urban forest, many having been presented at the International Conference.
Dr Livesley's strong national research standing has been recognized by the ARC, acted as an 'Oz Reader'since 2007.

G15. Currently held ARC Projects

(This information is auto-populated from your RMS profile and will include any 'active' Project which has not yet had a Final Report approved and the Project file closed by the ARC. If you have any concerns with the information recorded here, contact your Administering Organisation's Research Office. NOTE: If you hold a CI or a PI role on the Project/s listed in the table below you must ensure a progress statement is provided in H2. This requirement applies to the following schemes: Discovery Projects, Discovery Indigenous Researchers Development, Discovery Indigenous, Discovery Early Career Researcher Award, Linkage Projects, Industrial Transformation Research Hubs, Industrial Transformation Training Centres or any ARC Fellowship scheme. Please click on the information icon and refer to the Instructions to Applicants for further information.)

Identifier	Scheme Name	Investigators	Admin Organisation	Project Title	Funding	End Date
DP120101735	DP 2012 R1	Prof Stefan Arndt ; A/Prof Stephen Livesley ; Asst Prof Joseph von Fischer	The University of Melbourne	Methane uptake of forest soils	$270,000	31/12/2015
DP150103135	DP 2015 R1	A/Prof Marco Amati ; A/Prof Stephen Livesley ; A/Prof Cristopher Brack	RMIT University	Seeing the good from the trees: remotely sensing the urban forest	$274,326	31/12/2018
LP140100885	LP 2014 R1	A/Prof Stephen Livesley ; Prof Timothy Fletcher ; Prof Stefan Arndt ; Dr Anthony Kachenko ; Dr Peter Morison ; Mr Darren Coughlan	The University of Melbourne	Species traits, substrates and stormwater grates: improving the health of urban trees by using polluted stormwater as a resource	$333,000	11/05/2018

LP160100780	LP 2016 R1	A/Prof Stephen Livesley ; A/Prof Richard Fuller ; Dr Melanie Davern ; A/Prof Dieter Hochuli ; Dr Dave Kendal ; A/Prof Rodney van der Ree ; Dr Caragh Threlfall	The University of Melbourne	Managing urban trees	$320,000	05/12/2019

Part G - Personnel and ROPE (A/Prof Wesley Imms)

G1. Personal Details

(To update personal details, click the 'Manage Personal Details' link below. Note this will open a new browser tab. When returning to the form ensure you 'Refresh' the page to capture the changes made to your profile.)

Participation Type

Chief Investigator

Title

A/Prof

First Name

Wesley

Second Name

David

Family Name

Imms

G2. Role of Partner Investigator

(Please indicate which of the Partner Investigator role options from A7.3.3 of the Funding Rules apply to your role on this Project. Select all options that apply.)

G3. Will you be residing predominantly in Australia for the duration of the Project?

(This is a 'Yes' or 'No' question. Indicate whether you will be residing predominantly in Australia for the duration of the Project, taking into account any international travel. If you are applying as a CI and you answer 'No' to this question you will be prompted to contact your Research Office to check your eligibility.)

Yes

G4. Qualifications

(To update any qualifications, click on the 'Manage Qualifications' link below. Note this will open a new browser tab. When returning to the form ensure you 'Refresh' the page to capture the changes made to your profile.)

Conferral Date	AQF Level	Degree/Award Title	Discipline/Field	Awarding Organisation	Country of Award
01/03/2003	Doctoral Degree	Doctor of Philosophy	Curriculum Studies	University of British Columbia	Canada
05/07/1997	Masters Degree	Master of Arts	Art Education	University of British Columbia	Canada
07/12/1985	Bachelor Degree	Bachelor of Education	Visual Art Education	South Australian College of Advanced Education	Australia

G5. Are you currently undertaking a Higher Degree by Research which will be conferred after 1 July 2017?

(This is a 'Yes' or 'No' question. If you are applying as a CI and your answer is 'Yes' to this question you will be

prompted to contact your Research Office.)

No

G6. Research Opportunity and Performance Evidence (ROPE) - Current and previous appointment(s) / position(s) - from 2007 onwards

(To update any details in this table, click on the 'Manage Employment Details' link below. Note this will open a new browser tab. When returning to the form ensure you 'Refresh' the page to capture the changes made to your profile. Click on the information icon above and refer to the Instructions to Applicants for more information.)

Description	Department	Contract Type	Employment Type	Start Date	End Date	Organisation
Lecturer D	Melbourne Graduate School of Education	Permanent	Full Time	01/02/2000		The University of Melbourne

G7. Employment Details as at Commencement date of Project

(This question will be used to determine your eligibility. Confirm your employment status at all organisations that you will be associated with as at the Commencement Date for the Project (1 July 2017). Enter the relevant appointment type and Full-Time Equivalent (FTE) for each organisation. Click on the information icon for further information.)

Org name	Is this an Eligible Organisation?	Please choose your appointment type for this organisation.	Please enter your FTE for this Organisation
The University of Melbourne	Yes	Employee	1.0

G8. Further Details Regarding Partner Investigator Status - Do you hold a remunerated appointment at an Eligible Organisation?

(NOTE: this question is mandatory ONLY FOR PIs WHO:
• at G3 confirmed that they will reside predominantly in Australia for the duration of the proposed Project; AND
• at G5 confirmed that they are not currently undertaking a Higher Degree by Research which will be conferred after 1 July 2017; AND
• at G7 indicated that they would hold either:
- an appointment at an Eligible Organisation equal or greater than 0.2FTE; OR
- Emeritus Appointment at an Eligible Organisation

This is a 'Yes' or 'No' question. If you select 'Yes', you will be further prompted to justify your participation on this Proposal as a PI with reference to sections A7.2 and A7.3 of the Funding Rules. Click on the information icon for further information.)

Do you hold a remunerated appointment at an Eligible Organisation?

Justification of PI status

G9. Relevant organisation for this Proposal

(Enter the Organisation that is relevant to your participation on this Proposal, and that you will be associated with as at the Commencement Date for the Project (1 July 2017). The 'relevant organisation' is the primary organisation that will be supporting your involvement in this Project if it is funded. Note that the Organisation must be listed in G7 for this question to validate.)

Relevant Organisation

The University of Melbourne

G10. What is your time commitment to this Project?

(Enter your time commitment to this Project as a Full-Time Equivalent (FTE). Note that an FTE of 1.0 represents a full-time commitment (i.e. 5 days per week).)

0.1

G11. Research Opportunity and Performance Evidence (ROPE) - Details of your career and opportunities for research from 2007 onwards.

(Write a maximum of 5250 characters (approximately 750 words). Please detail your career and opportunities.)

i) Associate Professor Imms was awarded a PhD in Curriculum Studies from the University of British Columbia, Canada, in May 2003.

ii) A/Prof Imms has acted as MGSE Associate Dean (Research Training), and its Chair of Examiners. He has been classified 'research active' since 2004, was awarded an Early Career Researcher Grant in 2004, and Special Studies Program (Long) leave in 2008. He won the MGSE Research Excellence Award in 2014 and its Research Partnership Excellence Award in 2015. He has over seventy HERDC publications, extensive invited national and international conference presentations, and has secured for his university over $11.7m in external research grants. He was CI on a recently completed University Learning and Teaching Initiative Grant grant, Lead CI on two current ARC LPs, the Evaluating 21st Century Learning Environments project, and the Innovative Learning Environments and Teacher Change Project. He engages in a suite of consultancies, Category 3 research projects, and practitioner-focused workshops around Australia and New Zealand. His learning environments work, relevant to this application, includes over $2M in current research projects, leading two research teams of over 20 employees, liaising with national and international industry partners including Education Departments in Qld, NSW, the ACT, Telstra Australia, Steelcase Education in the USA and Ecophon Acoustics in Sweden. His projects include a cohort of 20 Masters and PhD student projects, 95% of whom he is principal supervisor. Of these, 50% are interstate or overseas students who come to his university to work in his projects, and are of the highest calibre, with more than half holding APA or equivalent stipends.

iii) For the past seventeen years Associate Professor Imms has been employed in the Melbourne Graduate School of Education (MGSE) at the University of Melbourne (UoM), in a full-time continuing teaching/research position, until recently with a 50/50 split between those two tasks. Since 2013, he has reduced teaching due to growing research and administration roles. A/Prof Imms is Head of Visual Art and Design Education and Managing Director of the cross-faculty (Education and Architecture) Learning Environments Applied Research Network, or LeaRN.

iv) N/A

v) He has the active support of two dedicated research teams - an Arts Education group in the Melbourne Graduate School of Education, with professorial support for ongoing research; and support gained through membership in Learning Environments Applied Research Network, working in partnership with internationally acclaimed leaders in this field. He has a proven history of mentoring RHD students to completion, including prize winning theses and past students achieving tenured positions in this and other faculty. He has fostered research through strategic cross-disciplinary collaborations and convening research conferences and symposia - for example, three 2017 RHD symposia convened by him within his projects are are running in Australia, Europe and North America - a total of 55 abstracts have been accepted from RHD in these regions, and an edited book will provide the first global snapshot of research being conducted in learning environments.

iv) He edited a peer-reviewed journal for six years, the principal aim of which was developing research and publication skills in upcoming academics.

G12. Research Opportunity and Performance Evidence (ROPE) - Significant research outputs and ARC grants from 2007 onwards

(Upload a PDF of no more than ten A4 pages with a list of all research outputs, such as journal articles and refereed conference papers, book and book chapters. Use asterisks to identify research outputs relevant to this Proposal. Click on the information icon or refer to the Instructions to Applicants for the required content and formatting.)

Uploaded PDF file follows on next page.

G12. Research Opportunity and Performance Evidence (ROPE) - Significant research outputs and ARC grants

Edited Research Books

1. ***Imms, W.**, Cleveland, B. and Fisher, K. (Eds.) (2016), *Learning environments evaluation. Snapshots of emerging issues, methods and knowledge*, Sense Publishing, Rotterdam, Netherlands.
2. ***Imms, W.**, Cleveland, B. & Fisher K. (Eds.). (2016), *What works? Emerging research in learning environment evaluation*, Amsterdam, Netherlands: Sense Publishing.

Scholarly Book Chapters

3. ***Imms, W**. (2016), New generation learning environments: How can we find out if what works is working? In: *Learning environments evaluation. Snapshots of emerging issues, methods and knowledge* (eds. **W. Imms**, B. Cleveland and K. Fisher), Sense Publishing, Rotterdam, Netherlands, pp. 19-32. doi 10.1007/978-94-6300-537-1_2
4. ***Imms, W**, Cleveland, B. and Fisher, K. (2016), Pursuing that elusive knowledge about what works in learning environment design. In: *Learning environments evaluation. Snapshots of emerging issues, methods and knowledge* (eds. **W. Imms**, B. Cleveland and K. Fisher), Sense Publishing, Rotterdam, Netherlands, pp. 3-16.
5. ***Imms, W.** (2016), Occupying curriculum as space. In: *The translational design of schools: An Evidence-based approach to aligning pedagogy and learning environments in schools* (ed. K. Fisher), Sense Publishing, Rotterdam, Netherlands, pp. 145-155.
6. *Sala-Oviedo, A. and **Imms, W.** (2016), The role of evaluation as an environment space planning tool. In: *Learning environments evaluation. Snapshots of emerging issues, methods and knowledge* (eds. **W. Imms**, B. Cleveland & K. Fisher), Sense Publishing, Rotterdam, Netherlands, pp. 143- .
7. *Byers, T. and **Imms, W**. (2016), Evaluating the change in space in a technology-enabled primary years setting. In: *The translational design of schools: An evidence-based approach to aligning pedagogy and learning environments in schools* (ed. K. Fisher), Sense Publishing, Rotterdam, Netherlands, pp. 215-236.
8. ***Imms, W.,** Cameron, S. and Ruanglertbutr, P. (2015), Trends in longitudinal data reporting early career Visual Art teacher art making experiences. In: *Reciprocity: Learning from, giving back* (eds. G. Grant and **W. Imms**), University of Melbourne, Melbourne, Australia, pp. 93-119. ISBN 9780992540470.
9. ***Imms, W.** and Ruanglertbutr, P. (2014), Teacher Art-maker project research report. In: **Connections: Teaching, Art, Life** (P. Ruanglertbutr and **W. Imms**), University of Melbourne, Melbourne, Australia, pp.68-93. ISBN 9780992540401.
10. Brown, R., **Imms, W**., Watkins, M. and O'Toole, J. (2009), Valuing the Visual Arts. In: *Education in the Arts* (C. Sinclair, N. Jeanneret and J O'Toole), Oxford University Press, Melbourne, Australia, pp. 131-159.

Refereed Journal Articles

11. **Imms, W**. and Byers, T. (2017), Evidence concerning the impact of classroom design on teacher pedagogy, and student engagement and performance in mathematics. *Learning Environments Research,* 20: pp. 139-142.
12. *Bradbeer, C., Byers, T., Cleveland, B., Kvan, T., Mahat, M. and **Imms, W.** (2017), The 'state of play'concerning New Zealand's transition to innovative learning environments: Preliminary results from phase one of the ILETC project. *Journal of Educational Leadership Policy and Practice*, 32(1).
13. **Imms, W.** and Healy, S. (2016), The Teacher Art-maker Project: Towards the phenomenon of the teacher as a practitioner. *Journal of Artistic and Creative Education*, 10(1), pp.88-97.
14. *Byers, T., Hartnell-Young, E., and **Imms, W.** (2016), Empirical evaluation of different classroom spaces on students' perceptions of the use and effectiveness of 1-to-1 technology. *British Journal of Educational Technology*. doi:10.1111/bjet.12518

15. *Byers, T., **Imms, W.** and Hartnell-Young, E. (2014), Making the case for space: The effect of learning spaces on teaching and learning. *Curriculum and Teaching*, 29(1): pp.5-19. doi:10.7459/ct/29.1.02
16. Wielgosz, M. and **Imms, W.** (2013), Visual art, ESL students and social transition: Exploring innovative possibilities. *Curriculum Perspectives*, 33(3): pp.13-22.
17. **Imms, W.** and Ruanglertbutr, P. (2012), The teacher as an art maker: What do new teachers identify as 'the issues'. *Australian Art Education*, 35(2).
18. **Imms, W.** and Ruanglertbutr, P. (2012), Can early career teachers be artists as well? *Canadian Review of Art Education*, 39; pp.7-23.
19. ***Imms, W.** (2011), Architecture, craftsmanship, and the art of inhabitation. *Journal of Artistic and Creative Education*, 5(2): pp.94-109.
20. Godinho, S. and **Imms, W.** (2011), Voyage of the SS Discovery, and The Truman Show: Case studies of integrative approaches to bridging the disciplinary divides. *Curriculum & Teaching*, 26(1): pp.87-107.
21. **Imms, W.** (2011), Lessons for Art Education from Australia's Boys Education Lighthouse Schools programme. *Australian Art Education*, 34(2): pp.59-78.
22. **Imms, W.** (2011), Masculinity and Visual Culture. *Asia-Pacific Journal for Arts Education*,10(1): pp.1-27.
23. ***Imms, W.** (2010), Habitation: Occupying space in the National Curriculum. *Australian Art Education*, 33 (Special Issue).
24. **Imms, W.** (2009), The International Creative Boy Initiative: Issues associated with developing international research opportunities. *Australian Art Education*, 32 (Special Issue): pp.1-8. (PoP=9).
25. **Imms, W.** (2008), Boys engaging masculinities. *Journal Interdisciplinary Gender Studies*, 10(2) 30-45.
26. Wielgosz, M. and **Imms, W.** (2007), A brief history of creativity research: Where to now for Art Education? *Australian Art Education*, 30(1): pp.47-67.

Refereed Conference Papers

27. ***Imms, W**. (2016), Aligning pedagogy and space: An Australasian evidence-based approach. In: *Keynote address at the 'From the classroom to the learning environment' International conference on school design and learning spaces for schools in the Third Millennium'*, Rome, Italy, Dec 13-14 2016.
28. *Mitcheltree, H., Cleveland, B. and **Imms, W**. (2016), Whats Working? In: *Whats Working?* Melbourne, Australia, June 1 2016.
29. ***Imms, W**. (2015), Building an evaluative framework for evaluation of innovative learning environments. In: *Word Congress of Education*, Dublin, Ireland, October 20 2015, pp.37-. (86 papers selected from 967 submissions.)
30. ***Imms, W.** (2015), Towards a robust framework for evaluating 21st century learning environments. In: *Terrains: Mapping learning environment evaluation across the design and education landscape*, Melbourne, Australia, June 5 2015, pp.89-92.
31. *Byers, T. and **Imms, W.** (2014), Making the case for space: The effect of classroom layout on teacher and student usage and perceptions of one to one technology. In: *Australian Computers in Schools Conference*, Adelaide, Australia, September 30-October 3 2014, pp.61-69. doi: 10.13140/2.1.1849.7288
32. Jeanneret, N. and **Imms, W.** (2012), Arts partnerships, schools and inclusivity: Implications for music education. In: *11th Cultural Diversity in Music Education Conference*, National Institute of Education, Singapore, January 21 2012.
33. Godinho, S. and **Imms, W.** (2009), Bridging the Curriculum Divides: Cross-disciplinary approaches to learning. In: Crossing divides: ensuring access, equity and quality in literacy and English education, *The Australian Literacy Educators' Association National Conference for Teachers of English and Literacy*, Hobart, Australia. July 9-12.

Other Research Outputs

Commissioned and grant funded research reports

34. *Cleveland, B., Soccio, P. and **Imms, W.** (2017), *Report from stage one of the TELE project*, LEaRN University of Melbourne, Melbourne, Australia.
35. *Byers, T. and **Imms, W.** (2016), *Does Space make a difference*.
36. ***Imms, W.** (2014), Educational priorities for the design of a resource centre: *Final report of Module 1SSEI evaluation survey*, LEaRN University of Melbourne, Melbourne, Australia..
37. *DeLaHarpe, B., Mason, T., McPherson, M., Fisher, K. and **Imms, W.** (2014), *Not a waste of space: Professional development for staff teaching in New Generation Learning Spaces*. Available: http://www.olt.gov.au/system/files/resources/ID11_2050_de%2520la%2520Harpe_report_2014.pdf
38. ***Imms, W.** (2013), *The Hayward-Midson Education Brief report*, LEaRN University of Melbourne, Melbourne, Australia.
39. ***Imms, W.** (2013), *Future curriculum profile report for the Hayward-Midson 'creativity* precinct', LEaRN University of Melbourne, Melbourne. doi: 10.13140/RG.2.1.2192.8483
40. *Cleveland, B., **Imms, W**. and Fisher, K. (2013), *From principles to practical application: Developing and sustaining innovative educational practices in innovative learning environments*, LEaRN University of Melbourne, Melbourne, Australia.
41. ***Imms, W.** and Byers, T. (2012), Assessment of the impact of learning spaces on use of technology, pedagogy and student learning., LEaRN University of Melbourne, Melbourne, Australia.
42. *Cleveland, B., **Imms, W.**, Newton, C. and Fisher, K. *Post occupancy evaluation of learning environments. Development of the SSEI*, LEaRN University of Melbourne, Melbourne, Australia.
43. **Imms, W.,** Jeanneret, N. and Stevens-Ballinger, J. (2011), *Partnerships between schools and the professional arts sector: Evaluation of impact on student outcomes*, Arts Victoria, Melbourne, Australia.
44. Donelan, K., Irvine, C., Imms, W., Jenneret, N. and O'Toole, J. (2009), *Partnerships between Schools and the Professional Arts Sector* (Paper No. 19 June), Department of Education and Early Childhood Development, Melbourne, Australia.
45. **Imms, W**., Ward, M., Adamson, K. and Collie, R. (2007), The Compendium: Teaching resources for teaching boys, Commonwealth of Australia, Department of Education, Employment & Workplace Relations, Canberra, Australia. ISBN 978-0-642- 77661-7.
46. Cuttance, P., **Imms, W.,** Godhino, S., Hartnell-Young, E., Thompson, J., McGuinness, K. and Neale, G. (2007), Boys Education Lighthouse Schools Project, Stage 2 Final Report, Department of Education, Employment & Workplace Relations, Canberra, Australia. URI: http://vuir.vu.edu.au/id/eprint/4789

Invited conference presentations

47. ***Imms, W.** (2017), Easy come, easy go. In: *3rd Annual School Planning, Design & Construction Conference*, Novotel on Collins, Melbourne, Australia, May 24 2017.
48. ***Imms, W.** (2017), Learning in complex environments. In: *Invited address, Methodist ladies College*, Kew, Melbourne, Australia, May 11 2017.
49. ***Imms, W.** (2017), Great spaces, great learning? Issues concerning the measurement of impact of innovative learning environments. In: *Invited address, Australian Council for Educational Leaders*, May 17 2017.
50. ***Imms, W.** (2017), Evidence. In: *Learning Environments One Day Symposium* (Keynote address), Auckland University of Technology, Auckland, New Zealand, Feb 14 2017.
51. ***Imms, W.** (2017), Researching learning and teaching in complex environments. In: *Talking Spaces 7: Intersections*, University of Melbourne, Melbourne, Australia, Feb 9 2017.
52. ***Imms, W.** (2017), Pursing the elusive evidence of 'what works' in learning environments. In: *Talking Spaces 7: Intersections*, University of Melbourne, Melbourne, Australia, Feb 10 2017.

53. ***Imms, W.** (2016), Aligning pedagogy and space: An Australasian evidence-based approach. In: '*From the classroom to the learning environment' International conference on school design and learning spaces for schools in the Third Millennium'* (Keynote address), Rome, Italy, Dec 13-14 2016.
54. ***Imms, W.** (2016), Cultural collisions: A multi-disciplinary approach to researching innovative learning environments. In: *University of Melbourne Research Retreat* (Invited address), Torquay Victoria, Australia, November 10.
55. **Imms, W.** (2016), *IPQC conference*, Melbourne, Australia March 2016
56. **Imms, W.** (2015), Innovative learning spaces: Catalysts/agents for change, or 'just another fad'? In: *Modern Learning Environments, Philosophy of Education Society of Australasia* (Invited symposium address), Australian Catholic University, Melbourne Australia, December 5 2015.
57. ***Imms, W.** and Cleveland, B. (2015), Innovative learning environments: Building strategic partnerships. In: *Australian Institute of Schools Grant Block Authority* (Invited address), Sydney, Australia, November 23 2015.
58. ***Imms, W** (2015), How do we help teachers make the most of innovative learning environments? In: *Queensland Government Research Showcase* (Invited address), Brisbane, Australia, November 24 2015.
59. ***Imms, W** (2015), Innovative learning environments: How do we know if what works is working? In: *New Generation Learning Spaces Design Conference* (Keynote address), Sydney Australia, March 172015.
60. **Imms, W.** (2014), Boys doing art: The 'problems', and implications for art education. In: *Boys in Visual Art Education Symposium* (Keynote address), St Edmunds School, Canberra, Australia, July 1-3 2014.
61. * **Imms, W.** and Byers, T. (2014), A matter of measurement: Evaluating the impact of learning environments. In: *Generation Learning Spaces Conference* (Keynote address), Sydney, Australia, March 23 2014.
62. ***Imms, W.** and Wheaton, A. (2014), Making the case for space: The effect of learning spaces on teaching and learning. In: *Future Schools Conference* (Keynote address), Australian Technology Park, Sydney, Australia, March 13 2014.
63. ***Imms, W.** (2012), Interrogation of science teaching spaces: What have we missed? In: *Building Steering Committee review* (Invited panellist), Melbourne Grammar School, Melbourne, Australia, May 14 2012.
64. *Imms, W. (2012), Space for all: National Curriculum issues in art education. In: Australian Art Education (Keynote panellist), National Portrait Gallery, Canberra, Australia, January 24 2012.

International conference presentations

65. * **Imms, W.** and Mahat, M. (2017), Preliminary results from the Innovative Learning Spaces and Teacher Change project. In: *17th Biennial Conference of the European Association for Research on Learning and Instruction* (EARLI), Tampere, Finland, August 29 2017.
66. ***Imms, W.**, Mahat, M., Cleveland, B., Peters, S, Leonard, R. and Andrews, (2017), Industry and Academic Collaboration in Learning Space Design and Use. In: *European Educational Research Association* (EERA/ECER) (Symposium presentation), Copenhagen, Denmark, August 22 2017.
67. *Byers, T., **Imms, W.** and Hartnell-Young, E. (2015), Use of empirical evidence to support changes to teachers' pedagogical practice in contemporary and technology-enabled learning environments. In: *Second 21st Century Academic Forum Conference*, Harvard University, Massachusetts, U.S.A. doi:10.13140/RG.2.1.4508.0488
68. ***Imms, W.** (2015), Towards an effective framework for evaluating the impact of new generation learning environments. In: *World Congress on Education*, Dublin, Ireland, October 19-21 2015.
69. **Imms, W.** and Ruangertbutr, P. (2015), Teachers as 'practitioners': Researching some myths about 'staying active' during early-career teaching. In: *Congress on Education*, Dublin, Ireland. October 19-21 2015. (80 abstracts blind-peer reviewed from 950 submitted.)

70. *Leonard, R., Cleveland, B. and **Imms, W.** (2015), Driving next generation learning environments: Using design/research partnerships to effect pedagogic change. (Under review). In: *Council for Educational Facility Planning International World Congress*, San Diego, U.S.A., October 21-25 2015.
71. **Imms, W.** and O'Donoghue, D (2014), Mens' places and spaces considered through art and art making. In: *International Society for Education in the Arts* (InSEA), Melbourne, Australia, July 2014.
72. **Imms, W.** and Ruangertbutr, P. (2014), To do or not to do? Trends in longitudinal data concerning new Visual Art teachers' art making, including impact on production, quality of teaching, and employment retention. In: *International Society for Education in the Arts* (InSEA), Melbourne, Australia, July 2014.
73. **Imms, W.** (2012), Can early career teachers be artists as well? In: *The Inaugural International Teaching Artist Conference*, Oslo, Norway, June 18 2012. (75% rejection on abstracts submitted).
74. ***Imms, W**. (2011), Architecture, craftsmanship and the art of inhabitation. In: *33rd International Society for Education Through the Arts (InSEA) World Congress*, Hungary, June 25 2011.
75. O'Donoghue, D., Freedman, K. and **Imms, W.** (2011), Visualizing masculinities: The Place of the Visual Arts in the education of boys. In: *National Art Education Association*, Baltimore, U.S.A. June 2011.
76. **Imms, W.** (2009), AARE Voyage of the SS Discovery. In: *AARE*, Canberra, Australia.
77. **Imms, W.** & Nash, G. (2008), Boys and creativity: Arts-rich pedagogy, engagement, and the construction of egalitarian male identities. In: *32nd International Society for Education Through the Arts (InSEA) World Congress,* Osaka, Japan, August 10 2008.
78. **Imms, W.** (2008), Boys and visual culture. In: *Masters Forum*, Northern Illinois University, Illinois, U.S.A., September 8 2008.
79. **Imms, W.** (2008), Lessons for Art Education from Australia's Boys' Education Lighthouse Schools programme. In*: Art Education Research Seminar, Centre for Research into Creativity and Learning in Education*, Roehampton University, London U.K., October 28 2008.

National conference presentations

80. Coleman, K., Toscano, M., Morris, J., Grant, G., Healy, S. and **Imms, W.** (2017), TAP2: Politics to practice. In: *Australian Association for Research in Education*, Canberra, Australia, November 2017.
81. * Tuckwell, D., Edwards, A., Grocott, L., Mahat, M. and **Imms, W.** (2017), Designing stakeholder engagement: How experiential workshops create space for teachers to question, propose and share narratives around innovative learning environments. In: *Australian Association for Research in Education*, Canberra, Australia, November 2017.
82. * **Imms, W.** (2017), The 'crafted home': Inhabiting special places, and implications for school design. In: Australian Association for Research in Education, Canberra, Australia, November 2017.
83. *Mahat, M and **Imms, W.** (2017), AARE Melbourne (ILETC). In: *Australian Association for Research in Education*, Canberra, Australia, November 2017.
84. * Byers, T., **Imms, W.** and Wheaton, A. (2015), Empirical Evidence that supports changes to pedagogical practice and tracks learning gains in contemporary and technology-enabled learning environments. In: *Excellence in Professional Practice Conference 2015*, ACER, Sydney, Australia, May 21-23. doi: 10.13140/RG.2.1.3328.4007
85. ***Imms, W**. (2014), Evaluating the impact of new generation learning environments: Emerging issues, methods and knowledge. In: *Australian Association for Research in Education* (AARE), Brisbane, Australia, December 1-4 2014.
86. **Imms, W.** & Ruangertbutr, P. (2014), 'Doing' as well as teaching: The effect of active practice on teaching quality. In: *Australian Association for Research in Education* (AARE), Brisbane, Australia, December 1-4 2014.

87. ***Imms, W.** (2013), The effect of NGLS on technology, pedagogy, student engagement and learning outcomes. In: *The 8th International Conference of the Middle Years of Schooling*, Gold Coast, Queensland, Australia, May 23-25 2013. (70% rejection rate on abstracts.)
88. **Imms, W.** and Jeanneret, N. (2012), The evaluation of Victoria's Artist-in-schools programs: Implications for Visual Art Education. In: *National Visual Arts Education Conference*, National Portrait Gallery, Canberra, Australia, January 23-25 2012.
89. ***Imms, W.** and Cleveland, B. (2011), What impact does the physical environment have on teaching and learning? The role of the Learning Environments Applied Research Network (LEaRN). In: *Artistic and Creative Education MGSE Colloquium*, September 2 2011.
90. ***Imms, W.** (2010), Occupying space in the national curriculum. In: *Australian Art Education/VADEA Research Symposium*, ACU, Sydney, Australia, July 2010.
91. **Imms, W.** and Godinho, S. (2010), Voyage of the SS Discovery and The Truman Show: Fifty years of lessons in trans-disciplinary curriculum. In: *Australian Association for Research in Education* (AARE), Canberra, Australia, 2010.
92. ***Imms, W.** (2010), My house is my canvas: The creativity of inhabitation. In: *Australian Association for Research in Education* (AARE), Canberra, Australia, 2010.
93. **Imms, W.** and Godinho, S. (2009), Voyage of the SS Discovery and The Truman Show: Fifty years of lessons in trans-disciplinary curriculum. In: *Artistic and Creative Education MGSE Colloquium*, September 28 2009.
94. Godinho, S. and **Imms, W.** (2009), Bridging the Curriculum Divides: Cross-disciplinary approaches to learning. Crossing divides: ensuring access, equity and quality in literacy and English education. In: *The Australian Literacy Educators' Association National Conference for Teachers of English and Literacy*, Hobart, Tasmania, Australia, June 9-12 2009.

ARC grants awarded in the last ten years where applicant has been a CI or Fellow:

Project Id	CI/PI/Fellow Name/s	Amount Funded	Amount of Years	Project Title	Outputs
LP130100880	Imms, W., Kvan, T., Dinham,	328,218	3	Evaluation of 21st Century Learning Environments	1, 3, 4, 5, 6, 7, 14, 15, 27, 28, 29, 30, 31, 35, 56, 57, 58, 59, 67, 68, 84, 85,
LP150100022	Imms, W., Hattie, J., Kvan, T., Fisher, K., Cleveland, B., Newton, C., Grocott, L.	930,000	4	Innovative Learning Environments and Teacher Change	11, 12, 27, 47, 48, 49, 50, 51, 52, 53, 54, 55, 65, 66, 83

G13. Research Opportunity and Performance Evidence (ROPE) - Ten career-best research outputs

(Upload a PDF of no more than four A4 pages with a list of your ten career-best research outputs, with a brief paragraph for each research output explaining its significance.)

Uploaded PDF file follows on next page.

G13. Research Opportunity and Performance Evidence (ROPE) - Ten career-best research outputs

1. *__Imms, W.__ (2016), New generation learning environments: How can we find out if what works is working? In: *Learning environments evaluation. Snapshots of emerging issues, methods and knowledge* (eds. W. Imms, B. Cleveland and K. Fisher), Sense Publishing, Rotterdam, Netherlands, pp. 19-32. doi 10.1007/978-94-6300-537-1_2

    Re-conceptualises the purpose and needs of learning environment evaluation practices. It structures a rationale for including such evaluation as part of a comprehensive analysis of what works in contemporary schooling. LP130100880: Imms, Dinham, Fisher, Kvan, $328,000, 2013-2016, Evaluating 21stC Learning Environments

2. *Bradbeer, C., Byers, T., Cleveland, B., Kvan, T., Mahat, M. & **Imms, W**. (In press). The 'state of play' concerning New Zealand's transition to innovative learning environments: Preliminary results from phase one of the ILETC project. *Journal of Educational Leadership Policy and Practice*, 32(1).

    Written as project lead, this article provides the first evidence published of the existence of a direct relationship between classroom type, student deep learning and teacher mind frames. LP150100022 Imms, Hattie, Kvan, Clarke, Cleveland, Grocott & Fisher. $2,013,500, Innovative Learning Environments and Teacher Change.

3. *__Imms, W.__ (2016), Occupying curriculum as space. In: *The translational design of schools: An Evidence-based approach to aligning pedagogy and learning environments in schools* (ed. K. Fisher), Sense Publishing, Rotterdam, Netherlands, pp. 145-155.

    Landmark publication in arguing that occupation and use of space is embedded in individual's negotiation of curriculum in modern school systems.

4. *__Imms, W.__, Cleveland, B. & Fisher K. (Eds.). (2016), *What works? Emerging research in learning environment evaluation*, Amsterdam, Netherlands: Sense Publishing.

    This publication represents the latest thinking about methods for evaluating modern learning environments. Its scope is significant (across acoustics, design, teacher practice, policy, teacher collaboration, etc.). It is eagerly awaited by industry partners as a text for future research and development. LP130100880: Imms, Dinham, Fisher, Kvan, $328,000, 2013-2016, Evaluating 21stC Learning Environments.

5. *Byers, T., **Imms, W.**, Hartnell-Young, E. (2014), Making the case for space: The effect of learning spaces on teaching and learning. *Curriculum and Teaching*, 29(1): pp.5-19.

    Co-authored with a PhD from LP130100800, this publication is one of only a small number that directly links modern learning environment design to student learning outcomes. It trials the applied medical sciences single subject research design (SSRD) approach in a school setting, with results that has see its authors invited to present three keynote addresses to industry conferences in 2014 and 2015. LP130100880: Imms, Dinham, Fisher, Kvan, $328,000, 2013-2016, Evaluating 21stC Learning Environments.

6. *Byers, T., **Imms, W.**, & Hartnell-Young, E. (Under review), Evaluating the change in space in a technology-enabled primary years setting. *American Educational Research Journal.*

    Co-authored with a PhD from LP130100800, to be published in world leading journal in education (hIndex of 260), this article argues spatial arrangements and technology has a measurable effect of student learning outcomes and engagement. LP130100880: Imms, Dinham, Fisher, Kvan, $328,000, 2013-2016, Evaluating 21stC Learning Environments.

7. **Imms, W.** (2001), Multiple masculinities and the schooling of boys. *Canadian Journal of Education*, 25(2): pp.152-166.

Highly cited evidence informing social structures controlling student behaviours within school settings.

8. *__Imms, W.__, and Byers, T., (2017), Evidence concerning the impact of classroom design on teacher pedagogy, and student engagement and performance in mathematics. *Learning Environments Research*, 20: pp.139-142.

Early and rare evidence that spatial arrangements impacts learning outcomes. Few previous studies internationally have been able to isolate space as a variable in this regard. LP130100880: Imms, Dinham, Fisher, Kvan, $328,000, 2013-2016, Evaluating 21stC Learning Environments.

9. *__Imms, W.__ and Byers, T. (2012), *Assessment of the impact of learning spaces on use of technology, pedagogy and student learning*. Acquittal report, retrieved 21 May, 2012 from www.churchie.com.au

Final report highlighting the use of single-subject design methodology when evaluating the impact of learning environments on student engagement, teacher pedagogy, and student learning outcomes.

10.*Cuttance, P., **Imms, W.**, Godhino, S., Hartnell-Young, E., Thompson, J., McGuinness, K., and Neale, G. (2007), *Boys Education Lighthouse Schools Project*, Stage 2 Final Report. Canberra, Australia: Australian Government. http://www.dest.gov.au/sectors/school_education/publications_resources/profiles/Boys_Education_Stage_Two_Final_Report_2006.htm#abstract

Largest classroom intervention sponsored by Australian Government at that time ($8.4m), investigating factors influencing educational outcomes of students in Australian urban, regional and isolated schools (over 50 site specific research projects).

G14. Research Opportunity and Performance Evidence (ROPE) - Further evidence in relation to research impact and contributions to the field from 2007 onwards, including those most relevant to this Proposal.

(Write a maximum of 7500 characters (approximately 1000 words). Detail further evidence in relation to research impact and contributions to the field. Click on the information icon and refer to the Instructions to Applicants for the required content and formatting.)

A/Prof Imms has gained an enviable reputation internationally as an innovative and highly effective researcher in the rapidly growing area of the design and use of modern learning environments. He has produced outputs that are leading international developments in this cross-disciplinary field. Apart from his large international projects, this includes his implementation of industry-focused research think tanks on three continents, his initiative in building large, high-quality PhD programs to advance thinking on this topic, and his proven capacity in instigating large-scale collaborative projects that provide interdisciplinary, evidence based knowledge in an area of international demand.

A/Prof Imms has secured more than $12M in external funding for his projects. He has built the only existing international network on this topic that includes fellow researchers, state and national government policy personnel, state and national infrastructure experts, and a swathe of more than 50 research-higher-degree students in over 15 countries. Of note, this network includes more than a dozen industry companies across the USA, Sweden, UK and NZ, including acoustics and engineering firms, one of the world's largest corporate furniture firms, internationally leading telecommunications companies, museums, state and national education departments, and global design profession organisations. As an example of his impact, A/Prof Imms has been invited to present on his groups research to European governments, he has three book contracts in process, and invitations from two publishers to edit book series on his topic.

A/Prof Imms is Director of his Faculty's Learning Environments Research Hub, a Director of the multi-disciplinary and cross faculty Learning Environments Applied Research Network, and is an invited external expert to the American Institute of Architects' Learning Environments research sub-committee.

A/Prof Imms' recognition internationally has been acknowledged by 32 keynotes and invited addresses in five countries. These are predominately to practitioner, government and cross-disciplinary groups, illustrating the transferability of his academic work to 'coal-face' scenarios. As examples of the range of outlets for his scholarship, he has been invited to present to the Italian Government on issues concerning national direction for school infrastructure developments, refereed an application for a Canadian Distinguished University Scholar, the establishment of a Doctoral College in Sweden, and a nomination for the Royal Society of Canada. One particular acknowledgement was the selection of one of A/Prof Imms' ARC LP projects to be with 14 (selected from >140) research projects from his university featured in a year-long promotion of 'research that makes a difference'.

A/Prof Imms is on the editorial board of two journals, was founding editor of another specialist journal now in its 10th year, and reviews regularly for ARC LPs and a range of journals including the world-leading AERJ. He is featured regularly in media presentations (12 in the past 12 months), has contributed to more than a dozen pod casts in three countries during that time including evening commercial-station news broadcasts concerning learning environment developments.

A/Prof Imms has supervised to completion 30 doctoral, masters and honours theses. He currently supervises 17 doctoral and Fulbright students who come from five countries to study within his programs; of these, approximately 90% are principal supervisions, and approximately 50% are APA Scholarship or equivalent stipend students, a measure of their high calibre.

A/Prof Imms' research supervision and team mentoring is supported by more than thirty years teaching experience in K-12 schools, and in undergraduate and postgraduate tertiary programs in two countries. He has written taught and coordinated more than 20 subjects at the tertiary level, and has a student approval rating in the top 5% of lecturers in a faculty that has rated since 2014, by discipline, in the top five internationally together with the ilk of Harvard, Cambridge, and Stanford. He has teaching awards in all sectors of his teaching experience, and together with research awards, he has 10 acknowledgements of his capacity to conflate teaching and research in two countries and across three disciplines.

G15. Currently held ARC Projects

(This information is auto-populated from your RMS profile and will include any 'active' Project which has not yet had a Final Report approved and the Project file closed by the ARC. If you have any concerns with the information

recorded here, contact your Administering Organisation's Research Office. NOTE: If you hold a CI or a PI role on the Project/s listed in the table below you must ensure a progress statement is provided in H2. This requirement applies to the following schemes: Discovery Projects, Discovery Indigenous Researchers Development, Discovery Indigenous, Discovery Early Career Researcher Award, Linkage Projects, Industrial Transformation Research Hubs, Industrial Transformation Training Centres or any ARC Fellowship scheme. Please click on the information icon and refer to the Instructions to Applicants for further information.)

Identifier	Scheme Name	Investigators	Admin Organisation	Project Title	Funding	End Date
LP130100880	LP 2013 R1	A/Prof Wesley Imms ; Prof Thomas Kvan ; Prof Stephen Dinham ; A/Prof Kenneth Fisher ; Dr Terry Byers ; Ms Ana Sala-Oviedo ; Mr John Leonard ; Mr Vaughan Smith ; Mr Simon Rayhanabad ; Ms Susan Heath	The University of Melbourne	Evaluating 21st century learning environments	$328,218	09/06/2017
LP150100022	LP 2015 R1	A/Prof Wesley Imms ; Prof John Hattie ; Prof Thomas Kvan ; Prof David Clarke ; Dr Benjamin Cleveland ; A/Prof Clare Newton ; A/Prof Kenneth Fisher ; Prof Dr Lisa Grocott	The University of Melbourne	Innovative learning environments and teacher change	$930,000	23/05/2020

Part G - Personnel and ROPE (Dr Robyn Schofield)

G1. Personal Details

(To update personal details, click the 'Manage Personal Details' link below. Note this will open a new browser tab. When returning to the form ensure you 'Refresh' the page to capture the changes made to your profile.)

Participation Type

Chief Investigator

Title

Dr

First Name

Robyn

Second Name

Family Name

Schofield

G2. Role of Partner Investigator

(Please indicate which of the Partner Investigator role options from A7.3.3 of the Funding Rules apply to your role on this Project. Select all options that apply.)

G3. Will you be residing predominantly in Australia for the duration of the Project?

(This is a 'Yes' or 'No' question. Indicate whether you will be residing predominantly in Australia for the duration of the Project, taking into account any international travel. If you are applying as a CI and you answer 'No' to this question you will be prompted to contact your Research Office to check your eligibility.)

Yes

G4. Qualifications

(To update any qualifications, click on the 'Manage Qualifications' link below. Note this will open a new browser tab. When returning to the form ensure you 'Refresh' the page to capture the changes made to your profile.)

Conferral Date	AQF Level	Degree/Award Title	Discipline/Field	Awarding Organisation	Country of Award
20/12/2014	Bachelor Honours Degree,Graduate Certificate, Graduate Diploma	Graduate Certificate in University Teaching	Higher Education	University of Melbourne	Australia
07/05/2004	Doctoral Degree	PhD	Environmental Science	University of Auckland	New Zealand
01/03/2000	Bachelor Honours Degree,Graduate Certificate, Graduate Diploma	BSc (Hons)	Chemistry	University of Otago	New Zealand

G5. Are you currently undertaking a Higher Degree by Research which will be conferred after 1 July 2017?

(This is a 'Yes' or 'No' question. If you are applying as a CI and your answer is 'Yes' to this question you will be prompted to contact your Research Office.)

No

G6. Research Opportunity and Performance Evidence (ROPE) - Current and previous appointment(s) / position(s) - from 2007 onwards

(To update any details in this table, click on the 'Manage Employment Details' link below. Note this will open a new browser tab. When returning to the form ensure you 'Refresh' the page to capture the changes made to your profile. Click on the information icon above and refer to the Instructions to Applicants for more information.)

Description	Department	Contract Type	Employment Type	Start Date	End Date	Organisation
Director of Environmental Science Hub	Faculty of Science	Contract	Part Time	11/04/2018	31/03/2020	The University of Melbourne
Senior Lecturer	School of Earth Sciences	Contract	Full Time	01/09/2017	31/03/2020	The University of Melbourne
Lecturer of Climate System Science	School of Earth Sciences	Contract	Full Time	01/03/2014	31/08/2017	The University of Melbourne
Research Fellow	School of Earth Sciences	Contract	Full Time	01/06/2011	28/02/2014	The University of Melbourne
Research Fellow - Humboldt, Marie Curie	Climate Processes	Contract	Full Time	01/07/2006	30/04/2011	Alfred Wegener Institute for Polar and Marine Research

G7. Employment Details as at Commencement date of Project

(This question will be used to determine your eligibility. Confirm your employment status at all organisations that you will be associated with as at the Commencement Date for the Project (1 July 2017). Enter the relevant appointment type and Full-Time Equivalent (FTE) for each organisation. Click on the information icon for further information.)

Org name	Is this an Eligible Organisation?	Please choose your appointment type for this organisation.	Please enter your FTE for this Organisation
The University of Melbourne	Yes	Employee	1.0

G8. Further Details Regarding Partner Investigator Status - Do you hold a remunerated appointment at an Eligible Organisation?

(NOTE: this question is mandatory ONLY FOR PIs WHO:
• at G3 confirmed that they will reside predominantly in Australia for the duration of the proposed Project; AND
• at G5 confirmed that they are not currently undertaking a Higher Degree by Research which will be conferred after 1 July 2017; AND
• at G7 indicated that they would hold either:
- an appointment at an Eligible Organisation equal or greater than 0.2FTE; OR
- Emeritus Appointment at an Eligible Organisation

This is a 'Yes' or 'No' question. If you select 'Yes', you will be further prompted to justify your participation on this Proposal as a PI with reference to sections A7.2 and A7.3 of the Funding Rules. Click on the information icon for further information.)
Do you hold a remunerated appointment at an Eligible Organisation?

Justification of PI status

G9. Relevant organisation for this Proposal

(Enter the Organisation that is relevant to your participation on this Proposal, and that you will be associated with as at the Commencement Date for the Project (1 July 2017). The 'relevant organisation' is the primary organisation that will be supporting your involvement in this Project if it is funded. Note that the Organisation must be listed in G7 for this question to validate.)

Relevant Organisation

The University of Melbourne

G10. What is your time commitment to this Project?

(Enter your time commitment to this Project as a Full-Time Equivalent (FTE). Note that an FTE of 1.0 represents a full-time commitment (i.e. 5 days per week).)

0.1

G11. Research Opportunity and Performance Evidence (ROPE) - Details of your career and opportunities for research from 2007 onwards.

(Write a maximum of 5250 characters (approximately 750 words). Please detail your career and opportunities.)

i) Dr Schofield completed a Doctoral Degree in Environmental Science from the University of Auckland 13 years ago.

ii) Dr Schofield held two prestigious European research scholarships: Humboldt (2006-2007) and a EU Marie Curie fellowship (2007-2010) working at the Alfred Wegener Institute (AWI) in Potsdam, Germany and spent a further 4 months as a research scientist on an EU project. Since 1st of June 2011 Dr Schofield held a research fellowship at the University of Melbourne (UniMelb), being appointed a lecturership in Climate System Science in 2014 and prompted to a senior lecturership in 2016. On the 11th of April 2017 Dr Schofield was appointed the inaugural Director of the Environmental Science Hub a cross faculty coordination and leadership role to develop teaching and research in Environmental Science, holding this concurrently with her senior lecturer position. Since 2014 Dr Schofield has developed several courses, growing the first year student numbers substantially. She has supervised 3 PhD to completion, and currently supervises 3 PhD students primarily and co-supervisors a further 3 students. Dr Schofield's graduates now hold positions at MIT and Oak Ridge national laboratory. Dr Schofield has been involved in attracting $18M of research funding / logistical support since 2011.

iii) Apart from parental leave and international mobility periods (1 month 2007, 13.5 months in 2009 and 1 month in 2011) Dr Schofield has worked full-time. From 2007 to 2014: Dr Schofield engaged in 5 years of FTE research only with a 75% research, 25% administration split. Since 2014 (3.5 years) Dr Schofield has held a Teaching and Research role (35% research, 30% teaching and 35% administration / engagement). Since April 2017 Dr Schofield has taken on a 50% faculty directorship role (35% research, 25% teaching and 40% administration / engagement). Dr Schofield's research outputs in the last 10 years are the result of 8.5 years FTE employment with 5.0 in research (59%).

iv) Dr Schofield took 13.5 month combined maternity and parental leave from 19th of December 2008 to 30th January 2010. Dr Schofield is the primary carer for a school aged child (born 2009) restricting her ability to work outside office hours. Dr Schofield 2007 underwent 1 month of further intensive German language training and spent 1 month relocating to Melbourne.

v) Dr Schofield has been mentored by world leading research groups in New Zealand, US, Germany and now Australia. Her mentor's include the 2007 WG1 IPCC Co-chair Dr Susan Solomon at NOAA in Boulder, Colorado during her postdoctoral work and multimillion Euro EU project leader (SCOUT-O3 and StratoClim) Dr Markus Rex

at AWI in Germany. This world class mentoring continued at the University of Melbourne where she commenced in Prof David Karoly's group in Earth Sciences and has now developed her own research group.

vi) In 2016 Dr Schofield has coordinated the build of an ARC LIEF facility AIRBOX – a multi-institutional $1.5M unique facility for mobile atmospheric composition and aerosol monitoring. Dr Schofield's collaborative efforts have attracted several Marine National Facility and Antarctic Science grants for multimillion dollar logistical support, several which she has led. Dr Schofield has authored international reports such as the WMO scientific assessments of ozone and in 2016 was appointed to the International Ozone commission. Dr Schofield is an associate editor of the EGU Atmospheric Measurement Techniques journal, and routinely reviews international grant applications and peer-reviewed literature. Within Australia Dr Schofield is an Associate Investigator in the Centre of Excellence for Climate System Science and the inaugural chair of the Australian Meteorological and Oceanographic Society's Atmospheric and Oceanic composition expert group. Dr Schofield is a member of the Melbourne Energy Institute's executive board and currently is being mentored by the Dean and Deputy Dean in the Faculty of Science in her Directorship role for the Environmental Science hub.

G12. Research Opportunity and Performance Evidence (ROPE) - Significant research outputs and ARC grants from 2007 onwards

(Upload a PDF of no more than ten A4 pages with a list of all research outputs, such as journal articles and refereed conference papers, book and book chapters. Use asterisks to identify research outputs relevant to this Proposal. Click on the information icon or refer to the Instructions to Applicants for the required content and formatting.)

Uploaded PDF file follows on next page.

G12. Research Opportunity and Performance Evidence (ROPE) - Significant research outputs and ARC grants

Publications:	**30**
Citations:	**463**
H-index:	**11**

Publications relevant to this proposal indicated by *

This 10 year period includes the following career interruptions (14.5 months + carer responsibilities):

- 1 month intensive language course (September 2007)
- 13.5 months of maternity leave (19th December 2008 – 30th January 2010)
- 1 month career break in May 2011 to relocate to Australia
- Primary carer for school aged child (born January 2009)

Scholarly Book Chapters

1. *Harris, N.R.P., Wuebbles, D.J., (Lead authors) Daniel, J.S., Hu, J., Kuijpers, L.J.M., Law, K.S., Prather, M.J., **Schofield, R.** (co-authors) Fleming, E.L., Hossaini, R., Jackman, C.H. and Phoenix, D. (contributors) (2014), Scenarios, information, and options for policymakers. In: *Scientific Assessment of Ozone Depletion: 2014*, Chapter 5, pp.1-60, Global Ozone Research and Monitoring Project-Report No. 55, World Meteorological Organization, Geneva, Switzerland. **Cites: 10**

2. *Dameris, M., Godin-Beekmann, S., (Lead authors) Alexander, S., Braesicke, P., Chipperfield, M., de Laat, J., Orsolini, Y., Rex, M., Santee (co-authors), M., van der A., Diaz, A., Hassler, B., Kreher, K., Langematz, U., Müller, R., Pitari, G., Pitts, M., **Schofield, R.** and Weber, M. (contributors) (2014), Polar ozone: Past, present and future. In: *Scientific Assessment of Ozone Depletion: 2014*, Chapter 3, Global Ozone Research and Monitoring Project-Report No.55, World Meteorological Organization, Geneva, Switzerland.

3. Douglass, A., V. Fioletov, S. Godin-Beekman, R Müller, R S Stolarski, and A Webb + 31 coauthors, **Schofield R**. + 28 contributors (2014), Stratospheric ozone and Surface Ultravoilet. In: *Scientific Assessment of Ozone Depletion: 2010*, Chapter 2, Global Ozone Research and Monitoring Project-Report No. 52, 516 pp., World Meteorological Organization, Geneva, Switzerland. **Cites: 25**

Refereed Journal Articles

4. Morgenstern, O., Hegglin, M. I., Rozanov, E., O'Connor, F. M., Abraham, N. L., Akiyoshi, H., Archibald, A. T., Bekki, S., Butchart, N., Chipperfield, M. P., Deushi, M., Dhomse, S. S., Garcia, R. R., Hardiman, S. C., Horowitz, L. W., Jöckel, P., Josse, B., Kinnison, D., Lin, M., Mancini, E., Manyin, M. E., Marchand, M., Marécal, V., Michou, M., Oman, L. D., Pitari, G., Plummer, D. A., Revell, L. E., Saint-Martin, D., **Schofield, R.,** Stenke, A., Stone, K., Sudo, K., Tanaka, T. Y., Tilmes, S., Yamashita, Y., Yoshida, K. and Zeng, G. (2017), Review of the global models used within the Chemistry-Climate Model Initiative (CCMI). *Geosci. Model Dev*., 10, 639671. doi:10.5194/gmd-10-639-2017, **[IF: 3.549] Cites: 2**

5. Gionfriddo, C.M., Tate, M., Wick, R.R., Schultz, M.B., Zemla, A., Thelen, M.P., **Schofield, R**., Krabbenhoft, D.P., Holt, K.E. and Moreau, J.W. (2016), Antarctic sea ice bacteria transform mercury into neurotoxic methylmercury. *Nature Microbiology*, 1, 16127. doi:10.1038/nmicrobiol.2016.127, **[IF: new Nature group journal], Cites: 4**

6. Zhao, X., Strong, K., Adams, C., **Schofield, R**., Yang, X., Richter, A., Friess, U., Blechschmidt, A.M., and Koo, J.H. (2016), A Case Study of a Transported Bromine Explosion Event in the Canadian High Arctic. *Journal of Geophysical Research: Atmospheres*, 121(1): pp.457-477. **[IF: 3.44], Cites: 3**

7. Humphries, R. S., Klekociuk, A. R., **Schofield**, **R.,** Keywood, M., Ward, J. and Wilson, S. R., (2016),

*Unexpectedly high ultrafine aerosol concentrations above East Antarctic sea-ice. *Atmospheric Chemistry and Physics*, 16(4): pp.2185–2206. doi:10.5194/acp-16-2185-2016 **[IF: 5.298], Cites: 0**

8. Stone, K.A., Morgenstern, O., Karoly, D.J., Klekociuk, A.R., French, W.J.R., Abraham, N.L. and **Schofield, R**. (2016), Evaluation of the Australian Community Climate and Earth-System Simulator Chemistry-Climate Model, Evaluation of the ACCESS – chemistry–climate model for the Southern Hemisphere. *Atmospheric Chemistry and Physics Discussions*, 16: pp.2401–2415. doi:10.5194/acp-16-2401-2016 **[IF: 5.298], Cites: 3**

9. Klekociuk, A., Krummel, P.B., Tully, M.B., Gies, H.P., Alexander, S.P., Fraser, P.J., Henderson, S.I., Javorniczky, J., Shanklin, J.D., **Schofield, R**. and Stone, K.A. (2015), The Antarctic Ozone Hole during 2013. *Australian Meteorological and Oceanographic Journal*, 65(2): pp.247-266. **Cites: 2**

10. Humphries, R.S., **Schofield, R**., Keywood, M.D., Ward, J., Pierce, J.R., Gionfriddo, C.M., Tate, M.T., Krabbenhoft, D.P., Galbally, I.E., Molloy, S.B. and Klekociuk, A.R. (2015), Boundary layer new particle formation over East Antarctic sea ice – possible Hg driven nucleation? *Atmospheric Chemistry and Physics*, 15(23): pp.13339-13364. doi: 10.5194/acp-15-13339-2015 **[IF: 5.298], Cites 4**

11. Frey, W., **Schofield, R.**, Hoor, P., Kunkel, D., Ravegnani, F., Ulanovsky, A., Viciani, S., D'Amato, F. and Lane, T.P. (2015), The impact of overshooting deep convection on local transport and mixing in the tropical upper troposphere/lower stratosphere (UTLS). *Atmospheric Chemistry and Physics*, 15: pp.6467-6486. doi:10.5194/acp-15- 1041-2015. **[IF: 5.298], Cites: 5**

12. ***Schofield, R.**, Avallone, L. M., Kalnajs, L. E., Hertzog, A., Wohltmann, I. and Rex, M. (2015) First quasi-Lagrangian in-situ measurements of Antarctic Polar springtime ozone: observed ozone loss rates from the Concordiasi long-duration balloon campaign, Atmos. Chem. Phys., 15, 2463-2472, doi:10.5194/acp-15-2463-2015. **[IF: 5.298], Cites: 2**

13. Stone, K., Tully, M.B., Rhodes, S.K. and **Schofield, R.** (2015), A new Dobson Umkehr ozone profile retrieval method optimising information content and resolution. *Atmospheric Measurement Techniques*, 8(3): pp.1043-1053. doi:10.5194/amt-81043-2015 **[IF: 3.206], Cites: 2**

14. * Canziani, P.O., O'Neill, A., Schofield, R., Raphael, M., Marshall, G.J. and Redaelli, G. (2014), World climate research program special workshop on climatic effects of ozone depletion in the southern hemisphere: Assessing the evidence and identifying gaps in the current knowledge. *Bulletin of the American Meteorological Society,* 95(6). doi: 10.1175/BAMS-D-13-00143.1 **[2012 IF: 6.591]**

15. * Hay, T.D., Bodeker, G.E., Kreher, K., Schofield, R., Liley, J.B., Scherer, M. and McDonald, A.J. (2012), The NIMO Monte Carlo model for box-air-mass factor and radiance calculations. *Journal of Quantitative Spectroscopy and Radiative Transfer,* 113(9): pp. 1-18. **[2012 IF: 2.380], Cites: 4**

16. *Kremser, S., **Schofield, R.**, Bodeker, G.E., Connor, B.J., Rex, M., Barret, J., Mooney, T., Salawitch, R.J., Canty, T., Frieler, K., Chipperfield, M.P., Langematz, U. and Feng, W. (2011), Retrievals of chlorine chemistry kinetic parameters from Antarctic ClO microwave radiometer measurements. *Atmospheric Chemistry and Physics,* 11(11): pp. 5183-5193. **[2012 IF: 5.510], Cites: 3**

17. ***Schofield, R.**, Fueglistaler, S., Wohltmann, I. and Rex, M. (2011), Sensitivity of stratospheric Br-y to uncertainties in very short lived substance emissions and atmospheric transport. *Atmospheric Chemistry and Physics,* 11(4): pp. 1379-1392. **[2012 IF: 5.510], Cites: 12**

18. *Kritten, L., Butz, A., Dorf, M., Deutschmann, T., Kuhl, S., Prados-Roman, C., Pukite, J., Rozanov, A., **Schofield, R.** and Pfeilsticker, K. (2010), Time dependent profile retrieval of UV/vis absorbing radicals from balloon-borne limb measurements - a case study on NO2 and O-3. *Atmospheric Measurement Techniques,* 3(4): pp. 933-946. **[2012 IF: 3.205], Cites: 10**

19. **Schofield, R.**, Frieler, K., Wohltmann, I., Rex, M., Von Hobe, M., Stroh, F., Koch, G., Peter, T., Canty, T., Salawitch, R., and Volk, C. (2008), Polar stratospheric chlorine kinetics from a self-match flight during SOLVEII/EUPLEX. *Geophysical Research Letters,* 35(1): L01807. doi:01810.01029/02007GL031740 **[2012 IF:**

3.982], Cites: 11

20. *Melamed, M., Langford, A., Daniel, J., Portmann, R., Miller, H., Eubank, C., **Schofield, R.**, Holloway, J. and Solomon, S. (2008), Sulfur dioxide emission flux measurements from point sources using airborne near ultraviolet spectroscopy during the New England Air Quality Study 2004. *Journal of Geophysical Research,* 113(2): D02305. doi:02310.01029/02007JD008923 **[2012 IF: 3.174], Cites: 3**

21. Forster, P.M., Bodeker, G., **Schofield, R.**, Solomon, S. and Thompson, D. (2007), Effects of ozone cooling in the tropical lower stratosphere and upper troposphere. *Geophysical Research Letters,* 34(23): L23813. doi:23810.21029/22007GL031994 **[2012 IF: 3.982], Cites: 39**

22. Langford, A., **Schofield, R.**, Daniel, J., Portmann, R., Melamed, M., Miller, H., Dutton, E. and Solomon, S. (2007), On the variability of the ring effect in the near ultraviolet: Understanding the role of aerosols and multiple scattering. *Atmospheric Chemistry and Physics,* **7**(3): pp.575-586. **[2012 IF: 5.510], Cites: 17**

23. Verlinde, J., Harrington, J., McFarquhar, G., Yannuzzi, V., Avramov, A., Greenberg, S., Johnson, N., Zhang, G., Poellet, M., Mather, J., Turner, D., Eloranta, E., Zak, B., Prenni, A., Daniel, J., Kok, G., Tobin, D., Holz, R., Sassen, K., Spangenberg, D., Minnis, P., Tooman, T., Ivey, M., Richardson, S., Bahrmann, C., Shupe, M., Demott, P., Heymsfield, A. and **Schofield, R.** (2007), The mixed-phase Arctic cloud experiment. *Bulletin of the American Meteorological Society,* 88(2): pp. 205-221. **[2012 IF: 6.591], Cites: 143**

24. **Schofield, R.**, Daniel, J., Portmann, R., Miller, H., Solomon, S., Eubank, C., Melamed, M., Langford, A., Shupe, M. and Turner, D. (2007), Retrieval of effective radius and liquid water path from ground-based instruments: A case study at Barrow, Alaska. *Journal of Geophysical Research,* 112(21): D21203. doi:21210.21029/22007JD008737 **[2012 IF: 3.174], Cites: 5**

25. Daniel, J., Portmann, R., Miller, H., Solomon, S., Langford, A., Eubank, C., **Schofield, R.**, Turner, D. and Shupe, M. (2006), Cloud property estimates from zenith spectral measurements of scattered sunlight between 0.9 and 1.7 mu m. *Journal of Geophysical Research,* 111(16): D16208. doi:16210.11029/12005JD006641 **[2012 IF:**

3.174], Cites: 6

26. Hendrick, F., Van Roozendael, M., Kylling, A., Petritoli, A., Rozanov, A., Sanghavi, S., **Schofield, R.**, Von Friedeburg, C., Wagner, T., Wittrock, F., Fonteyn, D. and De Maziere, M. (2006), Intercomparison exercise between different radiative transfer models used for the interpretation of ground-based zenith-sky and multi-axis DOAS observations. *Atmospheric Chemistry and Physics,* 6(1): pp. 93-108. **[2012 IF: 5.510], Cites: 38**

Refereed conference papers only when the papers was published in the full proceedings

27. Salawitch, R., Canty, T., Stimpfle, R., Wilmouth, D, Anderson J.G., von Hobe, M., Stroh, F., Rex, M., **Schofield, R.**, Santee, M., Kinnison, D.E., Kurylo, M.J. and Sinnhuber, B.M. (2009), Impact of recent laboratory measurements of the ClOOCl cross section on our understanding of polar ozone chemistry. In: *Abstracts of Papers of the American Chemical Society*, Vol. 237, Pages: 363.

28. Rex, M., **Schofield, R**., Canty, T. and Salawitch, R. (2009), Understanding of ozone loss rates in the polar vortex: Models and measurements. In: *Abstracts of Papers of the American Chemical Society*, Vol. 237, Pages: 364.

Other

29. * **Schofield, R.** and Stevenson, M. (2017) Australia needs stricter rules to curb air pollution, but there's a lot we could all do now. *The Conversation*, January 19. 3287 reads.

30. * **Schofield, R.**, Walter, C. Silver, J., Brear, M., Rayner, P. and Bush, M. (2017) Clean Air and Urban Landscapes NESP hub / Melbourne Energy Institute Submission on the "Better fuel for cleaner air" discussion paper from the Dept of Energy and Environment, March 10.

ARC grants awarded in the last ten years where applicant has been a CI or Fellow:

Project Id	CI/PI/Fellow Name/s	Amount Funded	Amount of Years	Project Title	Outputs
LE150100048	P Rayner, **R Schofield**, Z Ristovski, P Nelson, C Murphy (nee PatonWalsh), A Bowie, D Belusic, S Alexander, M Keywood, A Williams, N. Jones, S Lawson, S Wilson, G. Ayoko, D Griffith, B Miljevic, S Siems, R Sinnott	$630,000	2015	Atmospheric integrated research on burdens and oxidative capacity (AIR-BOX)	AIRBOX mobile atmospheric chemistry facility built
LE150100089	A. Pitman, A. Williams, A. Hogg, T. Lane, M. England, C.Jakob, J. Evans, P. Spence, S. Sherwood, M. Reeder, D. Karoly, N. Bindoff, J. Catto, M. Nikurashin, K. Walsh, N. Holbrook,	$490,000	2015	Connecting big data with high performance computing for climate system science	4, 8

	R. Schofield, D. Dommenget, S. Downes, B. Gayen, P. Hall, T. Pugh, R. Colman, A. Hirst, A. Moise, L. Botten, R. Wilkinson				
DP150101649	Z Ristovski, M Keywood, G Jones, B Miljevic, **R Schofield**, A Virtanen, R Modini, M Harvey, G Johnson, M Cope, T Petaja	$263,500	2015-2017	Great Barrier Reef as a Significant Aerosol Source	
DP160101598	D. Griffith, N. Deutscher, J. Fisher, C. Murphy (nee PatonWalsh) **R. Schofield**, S Wilson, C. Clerbaux, F. Desmet, L Emmons, C. Vigouroux	$987,569	2016-2021	Tackling Atmospheric Chemistry Grand Challenges in the Southern Hemisphere	

G13. Research Opportunity and Performance Evidence (ROPE) - Ten career-best research outputs

(Upload a PDF of no more than four A4 pages with a list of your ten career-best research outputs, with a brief paragraph for each research output explaining its significance.)

Uploaded PDF file follows on next page.

G13. Research Opportunity and Performance Evidence (ROPE) - Ten career-best research outputs

1. **Schofield, R.,** Kreher, K., Connor, B.J., Johnston, P.V., Thomas, A., Shooter, D., Chipperfield, M.P., Rodgers, C.D. and Mount, G.H. (2004), Retrieved tropospheric and stratospheric BrO columns over Lauder, New Zealand. *Journal of Geophysical Research: Atmospheres*, 109: D14304. doi:14310.11029/12003jd004463. **[Impact Factor: 3.021, citations: 35]**

   This paper received the Editor's highlight questioning elevated free tropospheric BrO. Trace-gas remote sensing can determine the oxidizing capacity of the atmosphere.

2. **Schofield, R**., Connor, B.J., Kreher, K., Johnston, P.V. and Rodgers, C.D. (2004), The retrieval of profile and chemical information from ground-based UV-visible spectroscopic measurements. *Journal of quantitative spectroscopy and radiative transfer*, 86(2): pp.115-131. doi:110.1016/s00224073(1003)00278-00274. **[Impact Factor: 3.193, citations: 22]**

   This paper described my novel retrieval algorithm combining observations made using different viewing geometries to obtain time varying vertical trace-gas profiles.

3. **Schofield, R**., Fueglistaler, S., Wohltmann, I. and Rex, M. (2011), Sensitivity of stratospheric Br y to uncertainties in very short lived substance emissions and atmospheric transport. *Atmospheric Chemistry and Physics*, 11(4): pp.1379-1392. doi:1310.5194/acp-1311-1379-2011. **[Impact Factor: 5.520, citations: 12]**

   This paper identifies the uncertainties in the stratospheric Br_y budget. It focuses the proposed work on the critical uncertainties when modelling atmospheric transport.

4. **Schofield, R.,** Frieler, K., Wohltmann, I., Rex, M., Von Hobe, M., Stroh, F., Koch, G., Peter, T., Canty, T., Salawitch, R. and Volk, C.M. (2008), Polar stratospheric chlorine kinetics from a self-match flight during SOLVE-II/EUPLEX. *Geophysical Research Letters*, 35(1): L01807. doi:01810.01029/02007GL031740. **[Impact Factor: 3.792, citations: 11]**

   This paper demonstrating chemical kinetic studies of ozone loss in the polar stratosphere, led to improving laboratory rates made under relevant atmospheric conditions.

5. Langford, A.O., **Schofield, R**., Daniel, J.S., Portmann, R.W., Melamed, M.L., Miller, H.L., Dutton, E.G. and Solomon, S. (2007), On the variability of the Ring effect in the near ultraviolet: understanding the role of aerosols and multiple scattering. *Atmospheric Chemistry and Physics*, 7(3): pp.575-586. doi:510.5194/acp-5197-5575-2007. **[Impact Factor: 5.520, citations: 17]**

   This paper utilized my radiative transfer model to study UV-Vis spectra to obtain aerosol properties. It demonstrates development of an innovative new observational technique.

6. Forster, P.M., Bodeker, G., **Schofield, R**., Solomon, S. and Thompson, D. (2007), Effects of ozone cooling in the tropical lower stratosphere and upper troposphere. *Geophysical Research Letters*, 34(23): L23813. doi:23810.21029/22007GL031994. **[Impact Factor: 3.792, citations: 40]**

   This paper highlighted the radiative implications of lower stratospheric ozone loss. This will be used in the proposed work to determine composition-driven climate changes.

7. Verlinde, J., Harrington, J.Y., McFarguhar. G.M., Yannuzzi, V.T., Avramov, A., Greenberg, S., Johnson, N., Zhang, G., Poellot, M.R., Mather, J.H., Turner, D.D., Eloranta, E.W., Zak, B.D., Prenni, A.J., Daniel, J.S., Kok, G.L., Tobin, D.C., Holz, R., Sassen, K., Spangenberg, D., Minnis, P., Tooman, T.P., Ivey, M.D., Bahrmann, C.P., DeMott, P.J., Heymsfield, A.J., **Schofield, R.** (2007), The mixed-phase Arctic cloud experiment. *Bulletin of the American Meteorological Society*, 88(2): pp.205-221. doi:210.1175/BAMS-1188-1172-1205. **[Impact Factor: 6.026, citations: 143]**

   This paper described the mixed-phase cloud experiment, a large collaborative measurement and modeling effort, demonstrating collaborative team and cloud experience.

8. * Melamed, M.L., Langford, A.O., Daniel, J.S., Portmann, R.W., Miller, H.L., Eubank, C.S., **Schofield, R**., Holloway, J. and Solomon, S. (2008), Sulfur dioxide emission flux measurements from point sources using airborne near ultraviolet spectroscopy during the New England Air Quality Study 2004. *Journal of Geophysical Research: Atmospheres*, 113: D02305. doi:02310.01029/02007JD008923. **[Impact Factor: 3.021, citations: 3]**

   This paper derived sulfur dioxide fluxes using aircraft-based UV-Vis measurements. These techniques will be used in the proposed work in interpreting sulfur remote sensing measurements.

9. Struthers, H., Kreher, K., Austin, J., **Schofield, R**., Bodeker, G., Johnston, P., Shiona, H. and Thomas, A. (2004), Past and future simulations of NO 2 from a coupled chemistry-climate model in comparison with observations. *Atmospheric Chemistry and Physics*, 4(8): pp.2227-2239. doi:2210.5194/acp-2224-2227-2004. **[Impact Factor: 5.520, citations: 14]**

   By comparing chemistry-climate model output with ground based measurements this collaborative study highlights reevaluation of long term remote sensing data for climate model validation.

10. Hendrick, F., Roozendael, M.V., Kylling, A., Petritoli, A., Rozanov, A., Sanghavi, S., **Schofield, R.**, Friedeburg, C.V., Wagner, T., Wittrock, F. and Fonteyn, D. (2006), Intercomparison exercise between different radiative transfer models used for the interpretation of ground-based zenith-sky and multi-axis DOAS observations. *Atmospheric Chemistry and Physics*, 6(1): pp.93-108. doi:110.5194/acp-5196-5193-2006. **[Impact Factor: 5.520, citations: 38]**

    This radiative transfer model intercomparison for UV-Vis trace gas profile retrievals, demonstrated my radiative transfer model to be at the forefront of global activities.

G14. Research Opportunity and Performance Evidence (ROPE) - Further evidence in relation to research impact and contributions to the field from 2007 onwards, including those most relevant to this Proposal.

(Write a maximum of 7500 characters (approximately 1000 words). Detail further evidence in relation to research impact and contributions to the field. Click on the information icon and refer to the Instructions to Applicants for the required content and formatting.)

Dr Schofield's research is internationally recognized as being of the highest quality as evidenced by her being elected to the International ozone commission and associate journal editor. Her expert opinion is often sort to review, comment and contribute to international policy relevant processes. Nationally she is the inaugural chair of the Atmospheric and Oceanic composition expert group for the Australian Meteorological and Oceanographic Society. She has a total of 28 publications over her research career commencing with her PhD in 2000 - all in top tier journals with impact factors of 3 and above. She has an h- index of 11 (web of science) and h-index:13 i10-index:16 (google scholar), and her papers average 16.0 citations per article with a total of 482 citations (775 google scholar).
1. Keynotes and invited presentationsGenerally Dr Schofield gives 3-4 conference presentations per year and she chairs the atmospheric chemistry session at the Australian Meteorological and Oceanographic Society annual meeting. She has given numerous invited presentations most recently at 2017 joint IAPSO-IAMAS-IAGA assembly in Cape Town on the 1st September and the AMOS 30 year celebration event in Melbourne, 23rd August 2017. Other addresses include Keynote address "Tropical tropopause layer processes driving stratospheric composition – focus on polar ozone relevant species" at the XXXII SCAR & COMNAP, held 13-25 July, 2012 in Portland Oregon and as an invited respondent speaker at the Australian Academy of Science's Geoengineering the Climate? A Southern Hemisphere Perspective, conference held 26-27 September 2011, Shine Dome, Canberraand several invited seminars at the Universities of Heidelberg, 31 January 2008; Institut für Meteorologie, Freie Universität Berlin, 26 November 2007 and University of Toronto. 29 October 2007.
2. Prizes, honours, awards and grants. While at the University of Melbourne Dr Schofield has lead or been involved in attracting $18.1M worth of research support: ARC: $2.37M; Australian Antarctic Science: $538k; Department of Environment NESP Clean Air and Urban Landscapes hub: $8.85M; International: $454k; University cash: 1.15M; Logistical: 4.7M. She continues to be approached to form integral parts of research teams interested in the interdisciplinary aspects of atmospheric science. As well as leading two Antarctic Science grants, she been part of 4 significant logistic grants from the Marine National Facility the RV Investigator (being at sea twice).

3. Research Mentoring
i.) (PhD: 3 completed, 5 current) Dr Tim Hay, University of Canterbury completed 2011 as co-supervisor.
ii.) Mr Kane Stone, University of Melbourne (completed 2016 as primary-supervisor: "Investigating variability and trends in stratospheric ozone using observations and modeling"
iii.) Dr Caitlin Gionfriddo, University of Melbourne completed 2017 as co-supervisor: "Mercury biogeochemical cycling in East Antarctica", provided opportunity to take field measurements in Antarctica.
vi.) Dr Schofield is currently the primary supervisor for Ms Sonya Fiddes, PhD candidate "Understanding the role of aerosols from the Great Barrier Reef", Mr Robert Ryan "Using MAXDOAS measurements to understand southern hemispheric oxidative chemistry" and Ms Sushma Chen Reddy "Air sea trace gas transfer processes" and she co-supervises 3 others.
vii.) Dr Schofield has supervised several ARC Climate System Science summer scholars and mentored Dr Wiebke Frey, through a German Research Foundation postdoctoral grant award (April 2013 – March 2015)
4. Professional activities: Member of the Melbourne Energy Institute executive (2016-present). Chair of the expert group for atmospheric and oceanic composition for the Australian Meteorological and Oceanographic Society (2015-2018). Elected to the International Ozone Commission member (2016-2019), Associate Editor for the Atmospheric Measurement Techniques journal - an Open Access Journal of the EGU (Impact Factor 3.335) since 2012.
ii. Expert Reviewer: Journals• Nature Communications, Nature, Atmospheric Chemistry and Physics (Impact Factor: 5.520)• Atmospheric Measurement Techniques (Impact Factor: 3.335)• Journal of Geophysical Research – Atmospheres (Impact Factor: 3.021).Research Funding Proposals US National Science FoundationPhD theses University of CanterburyReports World Meteorological Organisation's Scientific Assessment of Ozone Depletion and SPARC Data Initiative report.
5. Professional activities: committees - International conference/workshop organising committees: Dr Schofield annually chairs a special session at the AMOS conference (since 2013). She recently presented the Australasian and International Ozone Commission reports to the International Commission on Atmospheric Chemistry and Global Pollution in Cape Town. She was on the scientific organising committee member for the World Climate Research Program's Special Workshop on Climatic Effects of Ozone Depletion in the Southern Hemisphere, held 25th February to 1st March, 2013, Buenos Aires, Argentina; Conference organising committee member for XXXII SCAR and Open Science Conference & COMNAP, Portland Oregon, 13-25 July, 2012 (secured funding travel support from the Australian Academy of Sciences (AAS))Session Co-Chair for the SPARC (Stratospheric Processes and their Role in Climate).

• International scientific assessments and policy relevant activities: Contributing and co-author to the World Meteorological Organisation's latest Scientific Assessment of Ozone Depletion in Chapter 3 (Polar Ozone) and Chapter 5 (Policy relevance) respectively for the 2014 report.Contributing author to the World Meteorological Organisation's Scientific Assessment of Ozone Depletion in Chapter 2: Stratospheric ozone: WMO Scientific Assessment of Ozone Depletion: 2010.Contributing author and presenter to the World Climate Research Program's project "Stratospheric Processes and their Role in Climate" initiative of "The Role of Halogen Chemistry in Polar Stratospheric Ozone Depletion" workshop report, February 2009.Member of the "Australian Ozone Science" group organised by Annie Gabriel (Ozone and Synthetic Greenhouse Gas Policy as part of the Department of the Environment, Canberra) coordinating Australian policy and ozone science for Montreal Protocol commitments• Led CAUL/MEI submission to the Dept of Energy and Environment March 2017 on "Better fuel for cleaner air" discussion paper.
• Media and Outreach: Mercury emissions: Conversation, August 2017 (4700 reads); Vehicle emissions: Conversation, January 2017 (3800 reads). Einstein A Go-Go - 26 February 2017. Ozone: UpClose University of Melbourne podcast series – January 2015. Morwell's air quality (19 February 2014);Climate study with DMS emissions, ABC pm (26 August 2013);Antarctic Research: Science Matters – UniMelb's Faculty of Science website: September – December 2012;UpClose University of Melbourne podcast - February 2013;Three Triple R – 102.7 FM Einstein A Go-Go guest: 10 February 2013
6. Other activities and associations: Associate Investigator for the ARC Centre of Excellence for Climate System ScienceVisiting Scientist at the Australian Antarctic Division in Hobart, 2012-2016
7. Datasets: 9 datasets (Schofield) arising from the SIPEX II cruise are available on the limited access data centre: http:// data.aad.gov.au/aadc/

G15. Currently held ARC Projects

(This information is auto-populated from your RMS profile and will include any 'active' Project which has not yet had a Final Report approved and the Project file closed by the ARC. If you have any concerns with the information recorded here, contact your Administering Organisation's Research Office. NOTE: If you hold a CI or a PI role on the Project/s listed in the table below you must ensure a progress statement is provided in H2. This requirement applies to the following schemes: Discovery Projects, Discovery Indigenous Researchers Development, Discovery Indigenous, Discovery Early Career Researcher Award, Linkage Projects, Industrial Transformation Research Hubs, Industrial Transformation Training Centres or any ARC Fellowship scheme. Please click on the information icon and refer to the Instructions to Applicants for further information.)

Identifier	Scheme Name	Investigators	Admin Organisation	Project Title	Funding	End Date
DP150101649	DP 2015 R1	Prof Zoran Ristovski ; A/Prof Graham Jones ; Dr Branka Miljevic ; Dr Robyn Schofield ; Dr Graham Johnson ; Dr Melita Keywood ; Prof Annele Virtanen ; Dr Robin Modini ; Dr Michael Harvey ; Dr Martin Cope ; Prof Tuukka Petaja	Queensland University of Technology	GBR as a significant source of climatically relevant aerosol particles	$263,500	31/12/2017

DP160101598	DP 2016 R1	Prof David Griffith ; Dr Nicholas Deutscher ; Dr Jenny Fisher ; A/Prof Clare Murphy (nee Paton-Walsh) ; Dr Robyn Schofield ; A/Prof Stephen Wilson ; Prof Cathy Clerbaux ; Dr Filip Desmet ; Dr Louisa Emmons ; Dr Corinne Vigouroux	University of Wollongong	Tackling Atmospheric Chemistry Grand Challenges in the Southern Hemisphere	$980,900	31/12/2020
LE150100048	LE 2015 R1	Prof Peter Rayner ; Dr Robyn Schofield ; Prof Zoran Ristovski ; Prof Peter Nelson ; A/Prof Clare Murphy (nee Paton-Walsh) ; A/Prof Andrew Bowie ; Dr Nicholas Jones ; A/Prof Stephen Wilson ; Prof Godwin Ayoko ; Prof David Griffith ; Dr Branka Miljevic ; A/Prof Steven Siems ; Prof Richard Sinnott ; Dr Simon Alexander ; Dr Melita Keywood ; Dr Alastair Williams ; Ms Sarah Lawson	The University of Melbourne	Atmospheric integrated research on burdens and oxidative capacity	$630,000	31/12/2016

LE150100089	LE 2015 R1	Prof Andrew Pitman ; Mr Allan Williams ; Dr Andrew Hogg ; A/Prof Todd Lane ; Prof Matthew England ; Prof Christian Jakob ; A/Prof Jason Evans ; Dr J. Paul Spence ; Prof Steven Sherwood ; Prof Michael Reeder ; Prof David Karoly ; Prof Nathaniel Bindoff ; Dr Jennifer Catto ; Dr Maxim Nikurashin ; Prof Kevin Walsh ; A/Prof Neil Holbrook ; Dr Robyn Schofield ; Dr Dietmar Dommenget ; Dr Stephanie Downes ; Dr Bishakhdatta Gayen ; Prof Lindsay Botten ; Mr Tim Pugh ; Dr Robert Colman ; Dr Anthony Hirst ; Dr Aurel Moise ; Dr Ross Wilkinson	The University of New South Wales	Connecting big data with high performance computing for climate science	$490,000	31/12/2015

Part H - Research Support and Statements on Progress (LP170100315)

H1. Research support for all Participants

(For all Participants on this Proposal, please provide details of:

i)Current submitted ARC Proposals (i.e. for which the outcome has not yet been announced)
ii)Any newly funded ARC Projects which are not showing in the Participant's question G15 (Currently held ARC Projects) at the time of Proposal submission; and
iii)Research funding from sources other than the ARC (in Australia and overseas) for the years 2016-2021 inclusive. That is, list all Projects/Proposals/Fellowships awarded or requests submitted involving that Participant for funding for the years 2016 to 2021 inclusive.)

Uploaded PDF file follows on next page.

H1 – Research Support Current ARC Proposals and newly funded ARC Projects which are not yet active										
Description (All named investigators on any proposal or grant/fellowship in which a participant is involved, project title, scheme and round)	Same **Research Area** (Yes/No)	**Support Status** (Requested/Current/Past)	**Proposal/Project ID**	**2017** ($'000)	**2018** ($'000)	**2019** ($'000)	**2020** ($'000)	**2021** ($'000)	**2022** ($'000)	**2023** ($'000)
White, Stevenson, Hes, Livesley, Schofield, Imms *A multicriteria design platform to enhance active school trips* ARC Linkage Projects 2017	Y	R	**LP170100315**		185	223	152			
Imms. *Smart Spaces? Student inhabitation of innovative learning spaces.* ARC Future Fellowship	Y	R	**FT180100322**		128	261	245	256	128	

Funding from non-ARC sources										
Description (All named investigators on any proposal or grant/fellowship in which a participant is involved, project title, source of support, scheme and round)	**Same Research Area** (Yes/No)	**Support Status** (Requested/Current/Past)	**Proposal/Project ID** (for NHMRC proposals only)	**2017** ($'000)	**2018** ($'000)	**2019** ($'000)	**2020** ($'000)	**2021** ($'000)	**2022** ($'000)	**2023** ($'000)
White Title: *Topographic accessibility modelling for people with mobility impairments*, MNSI and MSEI	Y	P	n/a	20						
White, Kimm *PedCatch: Translating Research at Melbourne* University of Melbourne	Y	C	n/a	25						
Imms *University of Melbourne Establishment Grant 2018.*	Yes	R	n/a		123					
Imms, CLEVELAND *Plans to Pedagogy* Category 3 grant	Yes	C	n/a		300	300	300			
Stevenson Cars and cities: reducing road trauma and enhancing population health *2018 NHMRC Research Fellowship*	Yes	R	1136250		148	148	148	148	148	
Stevenson, Giles-Corti, Newton, Sugiyama, Sarvi, Thompson. Development and trial of a co-benefits calculator *2015 CRC for Low Carbon Living*	Yes	C	n/a	71	170					

Stevenson Reducing the burden of road injury *2013 NHMRC Research Fellowship*	Yes	C	1043091	135						
Schofield, Alexander, Fisher, Humphries, Keywood, Klekociuk, Lane, Lawson, Protat, Ristovski, Utembe, Woodhouse *CAMMPCAN – Chemical and Mesoscale Mechanisms of Polar Cell Aerosol Nucleation* Australian Antarctic Science grant, 2017	N	C	n/a	60.2 + 60k in-kind logistic support	82.64 + 120k in-kind logistic support	7				
Protat, **Schofield**, Jakob, Keywood, Franklin, Hu, Siems, Schulz, Hoyle, Peter, Lane, Zhu, Reeder, Belusic, Hamilton *Clouds, Aerosols, Precipitation, Radiation, and atmospherIc Composition Over the southeRn oceaN (CAPRICORN*) Marine National Facility sea-time, 2018-2019	N	C	n/a		2,235 (in-kind logistic support only)					
Stevenson *Cars and cities: reducing road trauma and enhancing population health* University of Melbourne salary contribution for 2018 NHMRC Research Fellowship	Y	C	n/a		52	53	55	57		

H2. Statements on Progress for ARC-funded Projects

(A progress statement must be provided for any currently funded ARC Project that involves a Participant on this Proposal as a CI or PI. This requirement only applies to funding held under the Discovery Projects, Discovery Indigenous Researchers Development, Discovery Indigenous, Discovery Early Career Researcher Award, Linkage Projects, Industrial Transformation Research Hubs, Industrial Transformation Training Centres or any ARC Fellowship scheme. Click on the information icon or refer to the Instructions to Applicants for further information.)

Project ID

LP160100780

First Named Investigator

Stephen Livesley

Scheme

Linkage Projects

Statement

Uploaded PDF file follows on next page.

LP160100780 - Managing urban trees for people and wildlife Livesley, Kendal, Threlfall, Davern Hochuli and Fuller

Project overview
Local governments spend millions of dollars planting and maintaining urban trees every year. Existing research provides little guidance to these land managers when making critical decisions in a rapidly changing social and physical environment. This project will explore the effects of different urban tree types and plantings upon people and wildlife in the Cities of Melbourne, Moreland and Ballarat so they can better plan their future urban forests. The project will combine tree inventory data with new information on the social and ecological effects of trees (e.g. human well-being, bird diversity) to guide future tree management decisions that lead to better social and environmental outcomes for Australia's cities into the future.

Project appointments
The project contracts were signed December 2016, and the project commenced January 2017. The Post-doc position was advertised in February 2017 and the preferred Post-doc (Camilo Ordonez) was appointed in August 2017. A PhD student has yet to be appointed.

Progress of research
The project team had a one-day workshop in September 2017 to agree objectives and research activities that focussed upon:
1) Local government decision-making on urban tree management: interviews with managers
2) Exploring tree-removal patterns: using removal, land use and planning activity data
3) Tree-removal events (before and after) monitoring biodiversity and social perspectives
4) Social attitudes and values towards urban trees and local wildlife: based on social data

Human ethics and Animal ethics applications have been submitted for the overall project. These should be active in the New Year. Tree biodiversity (invertebrate and tree) activities have commenced in the City of Melbourne. This will be expanded as ethics approval comes through. Other local government partners will be included in the 2018/2019 summer.
Tree removal data, along with land-use and planning permits/development is being collected from all local government partners. Promising research questions and initial findings are evident.

Research journal outputs
None

Conference presentations
Livesley S J ORAL "Managing urban trees for people and wildlife". Biodiversity Research and Monitoring Forum, Docklands Hub, City of Melbourne June 2017.

Project ID

DP150103135

First Named Investigator

CI Amati

Scheme

Discovery Projects

Statement

Uploaded PDF file follows on next page.

DP150103135: Amati, Livesley and Bracks. *Seeing the good from the trees: remotely sensing the urban forest*

Progress summary
Research agreement was signed February 2015 and the project Research Fellow (Parmehr) commenced in March 2015. RMIT have contributed a stipend and fee scholarship to the project. An HDR student (Dias Baptista) was recruited to the project in March 2015. A Zebedee unit was purchased by Brack for scanning work.
Two members of the team (Livesley and Amati) are involved with the National Environment Science Program's Clean Air and Urban Landscapes hub. This is providing a means to spread the findings of the research in a wider network. CI Amati led research to benchmark the national tree and green cover for Australian metropolitan LGAs in 2017. This work was helped by the baseline work completed as part of this ARC DP.
Data collection with a rainfall simulation on different canopy densities at University of Melbourne's Burnley campus in December 2015 were completed. A field trial in the MCG was also completed. Currently a paper is under preparation for the journal *Hydrological Processes* with submission expected by the end of 2017.
Recent discussions with the consultancy Alluvium are leading to a joint project to integrate the findings of the PhD work into a costing of the benefits of reduced run off on Port Phillip Bay.

Student research training
PhD student (Mariana Dias Baptista) Start March 2015. *Understanding the impact of canopy density on the ability of trees to capture rainfall*. Expected completion Dec 2018.

Research journal publication outputs
EG Parmehr, M Amati, EJ Taylor and SJ Livesley (2016) Estimation of urban tree canopy cover using random point sampling and remote sensing methods. Urban Forestry & Urban Greening
EG Parmehr, M Amati, CS Fraser (2016) Mapping urban tree canopy cover using fused airborne Lidar and Satellite Imagery Data. - ISPRS Annals of Photogrammetry, Remote Sensing & Spatial Information Sciences
M Wang, HC Chang, JR Merrick, M Amati (2016) Assessment of solar radiation reduction from urban forests on buildings along highway corridors in Sydney. Urban Forestry & Urban Greening
M Amati, B Boruff, P Caccetta, D Devereux, J Kaspar… (2017) Where should all the trees go? Investigating the impact of tree canopy cover on socio-economic status and wellbeing in LGA's. Vision 202020, NGIA, Canberra, Australia.

Engagement and impact
Presentation at 2nd International Conference on Urban Tree Diversity in February 2016.
Presentation at the GreeninUrbs Conference, Orvieto April 2017
More than 70 media mentions for CI Amati between November-December alone.
- WALGA Urban Tree Canopy Framework Workshop, Perth (Monday 28 August)
- Invitation to speak at the Australian Coastal Councils Conference (Geelong, 21 March 2018)
- Invitation to speak at the Open Day at Specialty Trees (Hamish Mitchell) (6th December 2017)
- Numerous mentions during CAUL Roadshows (August 2018)

Project ID

LP140100885

First Named Investigator

Stephen Livesley

Scheme

Linkage Projects

Statement

Uploaded PDF file follows on next page.

LP140100885: Species traits, substrates and stormwater grates: improving the health of urban trees by using polluted stormwater as a resource
Livesley, Fletcher, Kachenko, Morison, Arndt & Coughlan

Project overview
This project will develop stormwater control measures which improve both the health of urban trees and the quality of urban waterways and water resources. Such measures have the potential to capture and utilise/treat significant volumes of polluted stormwater generated by roads and other impervious surfaces in cities. The practical outcome will be delivery of: (i) a manual for local and state government agencies which provides technical detail on how to design tree-based stormwater control systems, including standard drawings; and (ii) a tree-based node for the 'MUSIC model'; used as a strategic planning tool by the majority of local government organisations across Australia to optimise use of stormwater control measures.

Project appointments
The project had an initial delay, due to signature of partner agreements, which were finalised on May 12th, 2015. The post-doc (Chris Szota) was appointed in June 2015. The PhD student (Jasmine Thom) was appointed in May 2016.

Progress of research
Two student projects aligned with this ARC LP have commenced to compare the trade-off between high water use and drought tolerance in a wide range of tree species. The first is comparing how 13 commonly used urban tree species (representing 40% of Melbourne's urban forest) perform if retrofitted to receive stormwater. The second selected 20 potential urban tree species from habitats around Australia with features analogous to tree-based stormwater control measures.
An MPhil student (Vaugh Grey) aligned to this ARC LP installed five street-stormwater treatments in Barrow Street in the City of Moreland and has tracked water retention and tree growth for 18 months. The PhD student Jasmine Thom has commenced processing tree water use data from street-based stormwater control measures and this component will be completed in the January 2018. Similarly, Jasmine Thom has instrumented 16 trees in the Barrow Street experiment to assess water use in three of the five stormwater control treatments. Jasmine will concentrate on nursery trials throughout 2018.
The Post-doc Chris Szota will continue writing of manuscripts through 2018 as well as preparation of a street tree stormwater system guide for local government in collaboration with Victorian Water authorities, local governments and the horticulture industry. Jasmine Thom will conclude with MUSIC model testing and module development in 2019.

Research journal outputs
Szota C, Coutts A M, Thom J K, Virahsawmy H K, Fletcher T D and Livesley S J (2017) Street tree stormwater control measures can retain significant volumes of runoff but may not improve tree performance. Landscape and Urban Planning (Submitted November 2017).
Grey V, Szota C, Livesley S J and Fletcher T D (2017) Establishing street trees in stormwater control systems can substantially increase tree growth when extended waterlogging is avoided. Urban Forestry and Urban Greening (Submitted December 2017).
Szota C, McCarthy M J, Sanders G J, Farrell C, Fletcher T D, Arndt S K and Livesley S J (2017) Identifying tree water use strategies to improve retention performance of biofiltration systems. (To be submitted Jan 2017)

Conference presentations
Thom J (2017) POSTER "Redirecting stormwater to promtoe health, growth and water use of street trees planted in infiltration systems. GreenSurge International Conference, Malmo, Sweden.
Szota C, Thom J and Grey V (2017) "
Thom J (2017) ORAL "Redirecting stormwater to promtoe health, growth and water use of street trees planted in infiltration systems. GreenCities 2017, Bologna (Italy), 12 - 15 September 2017

Project ID

DP150101649

First Named Investigator

Z. Ristovski

Scheme

Discovery Projects

Statement

Uploaded PDF file follows on next page.

Statement on progress of ARC-funded Projects

Granting scheme: ARC DISCOVERY DP150101649 (2015-2017)

Chief Investigators: Prof Zoran Ristovski, Dr Melita Keywood, A/Prof Graham Jones, Dr Branka Miljevic, Dr Robyn Schofield, Prof Annele Virtanen, Dr Robin Modini, Dr Michael Harvey, Dr Graham Johnson, Dr Martin Cope, A/Prof Tuukka Petaja

Project: The Great Barrier Reef (GBR) as a significant source of climatically relevant aerosol particles

Date Reported: January 2017

The multi institutional contract was signed in April 2015. A decision was made to conduct also land-based measurements. A selection of few suitable places has been made. The final choice for Garners Beach site was made after analysing the backtrajectories at each of the sites for the period to coincide with the ship voyage.

An honours student has been recruited at QUT that has started in June 2015. The student is supervised by the CSIRO PI's (Cope) and QUT CI (Ristovski).

A joint PhD student supervised by the CI's (Ristovski and Schofield) has received training at University of Melbourne on the use of GLOMAP (Global Model of Aerosol Processes) as well as ACCESS (Australian Community Climate Earth System Simulator).

Several of the CI's have participated in the first trial voyage for the new RV Investigator (Ristovski, Keywood, Schofield and Miljevic). The Cold Water Trial 2015 was conducted from the 28.01.-18.02.2015. in the Southern Ocean and Antarctic waters (down to 65degS). This was an excellent opportunity to test the functioning of the ship, its two dedicated atmospheric laboratories (Aerosol Laboratory and the Air Chemistry Laboratory) and the associated atmospheric sampling equipment. All of the facilities and equipment performed to its expectation.

Voyage on the RV Investigator occurred from 28th September to 24th October 2016. This was the first dedicated atmospheric voyage of the RV Investigator. Around 30 scientists from over 10 institutions worldwide participated in the voyage. A very comprehensive set of measurements was conducted not only of the composition of the atmosphere but also on the concentration of relevant VOC's in the water column as well as detailed study of the cloud cover.

In addition to the measurements on board the RV Investigator a measurement station was setup on the shore. From 13th September to 20th October 2016, the AIRBOX mobile air chemistry laboratory was deployed to a semi-rural coastal site at Garners Beach, Queensland. The AIR-BOX was funded through a LIEF Grant LE150100048 and this was its first deployment. The suit of instrumentation in the AIR-BOX almost replicated those deployed on the RV Investigator. For over 10 days the RV Investigator was positioned upwind of the AIR-BOX with the aim of studying the changes in the atmosphere as the air mass travels from the reefs to the shore (rainforests). This is the first time such comprehensive measurements have been conducted in the marine environment.

It is also interesting to note that the voyage was also coupled to the NASA PRISM flights over the GBR region.

A workshop is planed for June 2017 aimed at providing the quality assurance of the collected data. All data has been stored on the CSIRO's (MNF's) servers.

Project ID

DP160101598

First Named Investigator

D. Griffith

Scheme

Discovery Projects

Statement

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Progress report for project DP160101598 – David Griffith, Nicholas Deutscher, Jenny Fisher, Clare Murphy, Robyn Schofield, Stephen Wilson + 4 international PIs **11-November-2017**

The project consists of 5 themes:

Theme 1: How do biogenic emissions influence the Australian tropospheric ozone budget?

A PhD student (Jesse Greenslade) has developed the analytical tools to infer isoprene emissions from satellite formaldehyde following a 2-week visit to a new collaborator, Prof Paul Palmer (U. Edinburgh), with significant expertise in this area. First results were presented at the Atmospheric Chemistry & Composition Observations & Modelling Conference and will be presented at the American Geophysical Union Fall Meeting in December. A publication will be submitted early next year.

Work to date has highlighted a deficiency of observations in biogenically-enhanced regions with which to validate the improved models arising from this work. We have acquired other funding to address this gap, and have started ground-level measurements that will provide useful data for use in this project. Finally, we have contributed to validating biogenic VOC measurements from the IASI satellite. Particular efforts this year have gone into closing the HCOOH budget and this has led to novel ideas that are presented in a paper currently under peer review. PI Clerbaux (lead of the IASI trace gas program) visited the Wollongong-based CIs in late January to further collaborative activities related to IASI validation.

Theme 2: How do longer-lived species (CH_4, CO) control the SH background atmospheric chemistry?

PhD student Beata Bukosa visited Prof Dylan Jones (U. Toronto) in May 2017, where they commenced work on creating a joint GEOS-Chem simulation of CO_2, CH_4 and CO. Bukosa has also worked on using CO and CO_2 to examine signatures from ENSO events in the southern hemisphere, and has presented this work at several conferences. Bukosa and CI Deutscher have worked on calibrating and assessing data from several in situ instruments, including on moving platforms in and around Australia.

CI Fisher led a paper detailing an improved method for simulating CO, allowing model simulations to independently quantify the secondary production of CO from oxidation of non-methane VOCs. This development will be critical for assessing the impacts of CO in the SH, as secondary production can be an important contributor to the total CO here. We have continued to provide high-quality remote-sensing measurements of carbon monoxide (CO) and methane (CH_4) for the purposes of satellite validation, and this has contributed to many publications.

Theme 3: How important are reactive halogen oxides in the reactive chemistry of the atmosphere?

The detection of BrO and IO via MAX-DOAS are technically challenging, and quantification requires the retrieval of aerosols first, as they provide a significant portion of the atmospheric scattering that the technique relies upon. Significant progress has been made on the retrieval of the vertical distribution of aerosols (Task 4, see below). Slant column retrievals of BrO and IO have, to date, not found evidence of concentrations above the detection limit. However, there remains significant work in refining the retrieval algorithms, the focus of an instrument comparison exercise held in Melbourne in February/ March 2017 and the focus of a workshop in August 2017, also in Melbourne. Nicholas Jones, (partially funded by this DP) is visiting New Zealand in November 2017 to further develop the analysis process.

Theme 4: How do different aerosol sources affect the aerosol vertical distribution over Australia?

Vertical profiles of aerosol scattering have been retrieved from MAX-DOAS data collected at Wollongong. There has been an initial comparison with LIDAR data, that was collected at the same site for a one month period (2012), which suggests that the retrievals are both seeing similar scattering profiles, although this remains a work in progress. Once this work has been completed the techniques will be applied to the other datasets (Cape Grim, Darwin).

Theme 5: How are concentrations of key stratospheric species changing in the southern hemisphere?

Key stratospheric and tropospheric trace gas species were measured during 2016 and 2017 using the high resolution FTIR. Data up to and including 2016 were analysed using agreed protocols within the Network for the Detection of Composition Change (NDACC), including ozone, HCl, CH_4, N_2O, CO, C_2H_6, and HCN, and uploaded to the NDACC archive. An upgrade to the Darwin high resolution FTIR has begun; this will allow measurement of additional gases.

Project ID

LP130100380

First Named Investigator

M Stevenson

Scheme

Linkage Projects

Statement

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Project ID: LP130100380
Chief investigators: M Stevenson, M Johnson, J Oxley, L Meuleners, B Gabbe, G Rose.
Scheme: ARC Linkage
Project title: Safer cycling in the urban road environment.

Aim:
This study is the first comprehensive study in Australia that combines academic, government and community efforts to enhance cycling activity while addressing safety concerns. The study takes an innovative, multi-disciplinary approach to understanding the issues contributing to cyclist injury with a particular focus on the urban road environment. The study will develop new road designs which will improve the urban cycling experience. Australia's first cycling simulator (BikeSim) will be built as part of this study and will be used to safely evaluate the new road prototypes which will be designed to improve cyclist safety and maintain the efficiency and mobility of vehicles.

Statement on Progress:
LP130100380 was awarded in June 2013. It is a four-staged project: the first two stages (in-depth study of crash involved cyclists and naturalistic cycling study of non-crash involved cyclists) are being undertaken to describe the contributing factors to cyclist crashes and identify features of the urban road environment that increase risk of collision. The second two stages (prototype development and bicycle simulator studies) will be undertaken to develop and evaluate effective urban prototypes that have the potential to achieve large reductions in numbers of cyclist collisions.

The Project Management Committee comprised of CIs, PIs and PO representatives has been formed in accordance with the agreement and is meeting quarterly.

All in-depth case group data has been collected from the Melbourne-based hospitals. The control group naturalistic data collection commenced mid-2014 and is continuing. Ethics approvals were granted in April and over 40 participants have been recruited and bikes have been instrumented. Additional GPS coordinate data has been provided by Ambulance Victoria which will assist in identifying recruitment locations.

The Perth-based study is also progressing. Training for recruitment and bike instrumentation has been completed. Ethics applications have been submitted and approved, and data collection has commenced. Ten crash-involved case group cyclists have been recruited and interviewed, and five control group non crash-involved participants have been recruited and bikes instrumented.

Three PhD students have been selected for this project, two Melbourne-based and one Perth-based. One Melbourne based student and the Perth-based student are using the case and control group data for their research, and the second Melbourne-based student commenced his candidature in June 2014 and is building the BikeSim, with validation studies commenced in early 2015.

The POs are fully engaged in the project and have contributed the agreed cash and in-kind as specified in the contract.

Publications to date:

1. O'Hern S, Oxley J, **Stevenson M.** Validation of a bicycle simulator for road safety research. *Accident Analysis and Prevention* (accepted 7 January 2017).
2. Lawrence B, **Stevenson M**, Oxley J, Logan D. Geospatial analysis of cycling injury trends: An investigation in Melbourne, Australia. *Traffic Injury Prevention*, 2015, 16(5):513-518.
3. **Stevenson M**, Johnson M, Oxley J, **Meuleners L**, Gabbe B, Rose G. Safer cycling in the urban road environment. *Injury Prevention,* 2014, [10 06 2014]: doi:10.1136/injuryprev-2014-0141287.

Project ID

LP150100680

First Named Investigator

M Stevenson

Scheme

Linkage Projects

Statement

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Project ID: LP150100680
Chief investigators: M Stevenson, D Mortimer, A Harris.
Scheme: ARC Linkage
Project title: Effects of feedback and incentive-based insurance on driving behaviours

Aims:
We propose the first experimental study to examine the extent to which direct-feedback and incentive-based insurance modify a drivers' behaviour. The study will apply in-vehicle telematics and, by linking information obtained from the technology directly to personalised safety messaging along with the calculation of individual personal injury and property damage insurance premiums. The study has the potential to profoundly influence not only the insurance industry by reducing individual risk and insurance scheme liability, but also deliver reductions in road trauma among the target population namely, young drivers.

Statement on Progress:
The study was awarded June 2015. Ethics approval has been obtained from both the University of Melbourne and Curtin University. The first phase of the study is a simulator experiment in collaboration with Curtin University to assess the effects of financial incentives on driving behaviour. Development of a bespoke driving scenario has been completed and advertising materials were developed to recruit 80 participants. As of early December 2016, 78 participants were recruited and have completed the simulator session.

Publications to date:
1. **Stevenson M**, Harris A, Mortimer D, Wijnands J, Tapp A, Peppard F, Buckis S. The effects of feedback and incentive-based insurance on driving behaviours: study approach and protocols. *Injury Prevention*, 2017, published online 10 Jan, doi: 10.1136/injuryprev-2016-042280.

Another manuscripts has been submitted to scientific journals. This manuscript describes a new, innovative methodology for the early identification of behavioural change in drivers using in-vehicle telematics. Findings of this study has been disseminated at the Australasian Road Safety Conference in Canberra and the Conference on Complex Systems in Amsterdam, The Netherlands.

Project ID

LP150100022

First Named Investigator

W. Imms

Scheme

Linkage Projects

Statement

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LP15100022 Progress Report: Innovative Learning Environments and Teacher Change (ILETC). 10 November 2017.

ILETC received funding in June 2016 for a four-year Linkage Project. The project is on track, exceeding progress on stated milestones.

June – December 2016 saw finalisation of the project agreement with 15 partners, establishment of the project team, development of research plan and project management strategy, recruitment of 5 PhD students, initiation of data collection, PhD training and development of connections with each partner organisation:

- Preliminary literature review to inform development of 3 systematic reviews.
- Phase 1 survey (n=822) in Oct- Dec 2016; publication of results in 2017.
- 3 Conference papers in 2016.
- Regional workshops delivered in Sydney, Auckland and Christchurch.
- Development of partner relationships through briefings and partners meetings.
- Website launch and social media engagement supporting engagement of key stakeholder groups and encouraging participation in project events.

Jan- Nov 2017 involved a range of research activities, development of PhD student capacity and research projects, recruitment of additional 3 PhD students, 3 international symposia and think tank meetings, international conference presentations and growing network of educators, architects and policy makers engaged in the project. Fulbright Scholar for 2017. The specific achievements include:

- Teacher workshops completed with 153 teacher/principal participants.
- Analysis and reporting on survey in Technical Report 1/2017 (Survey) and Technical Report 2/2017 (Teacher workshops in) + summary fact sheets.
- Confirmation of 4 PhD students + 2 scheduled for December 2017.Recruitment of additional 3 PhD students. 3 PhD workshops and regular video conferencing meetings.
- Presentation at 6 conferences in Singapore and Australia + ECER (Copenhagen) and EARLI (Finland).
- Partner meeting attended by all partner organisations with active contributions to development of next phase of research.
- Running 3 RHD symposia and 3 industry Thinktanks in Australia, Europe and USA (current research activity, international academic connections). 3 x Peer-reviewed proceeding + 1 edited book (Springer) in progress.
- C1 article published in Journal of Educational Leadership, Policy and Practice on survey data.
- Fieldwork by PhD students in Australian and New Zealand.

Highlights of the project include:

Findings contributing new knowledge and insights into learning and physical space.
Successful dissemination strategy through technical reports, website and fact sheets.
15 fully engaged partner organisations, high engagement with research activities.
Substantial sector-engagement with project outputs shared with mailing list of over 800.
International industry liaison and outreach, including three international conferences (Transitions 2017) and growing connections via partners' networks.

Associate Professor Wesley Imms, ILETC Lead Chief Investigator

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Project ID

LP130100880

First Named Investigator

W. Imms

Scheme

Linkage Projects

Statement

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LP130100880 Progress Report: Evaluation of 21st Century Learning Environments.

20 November 2018.

E21LE received funding in July 2013 for a three-year Linkage Project, with funding ending June 2016 and the project ceasing June 2017. The project is now in a 12-month reporting period, due to end June 2018.

The project met all objectives outlined in the original proposal, and is on track to report as scheduled.

Timeline:

- 2013 saw the setting up of the project, recruitment of three PhDs, ARC compliance and governance needs met, PhD Workshop 1 and Partners Meeting 1 were held.
- 2014 focused on refining the research design, website construction, writing of research protocols and refining the timeline, developing individual PhD proposals, PhD confirmations, the running of the first RHD Symposium (Snapshots), running an industry/academic conference (Talking Spaces), running four PhD workshops, running 2 Partner Meetings, and various PhD skills workshops in NVivo, Endnote and the like.
- 2015 focused on E21LE fieldwork across sites in Victoria, SA and Qld, gaining of ethics, running required PhD Advisories, running Snapshots 2 and Talking Spaces symposium and conference, producing publications including C1 articles, a book proposal, and various industry-focused non-peer reviewed publications.
- 2016 saw the publication of an edited book, various C1 publications and non-peer reviewed publications, initial data analysis from fieldwork, various conference presentations, running of Snapshots 3 and Talking Spaces Symposium and conferences, Partners Meeting, four PhD workshops, final data analysis for two PhD projects, and ten drafting of various final reports.
- 2017 is producing the final project outcome, a book under contract with ACER Press, Melbourne. the completion of the final two PhDs, Snapshots 4 and the Talking Spaces conference.

Highlights of the project include:

- Three PhD projects have been successfully implemented, with one (Byers) being awarded in early 2016, another (Oliver) under examination December 2017. The third (Sala-Oviedo) has been granted extended sick leave, is under close monitoring by her Committee, and is due for completion in December 2018.
- Significant publications, including one edited book and one monograph (in progress), eight book chapters, 10 C1 and other HERDCs including conference proceedings.
- Significant industry liaison and outreach, including three conferences (Talking Spaces).
- Significant research capacity building, including the facilitation of three PhDs (one completed, one in late stage, one under extended sick leave), the running of three international RHD symposia drawing on papers from five countries
- 'Offshoot' research projects based on findings and networks coming from E21LE.

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Project ID

DP120101735

First Named Investigator

Prof Stefan Arndt

Scheme

Discovery Projects

Statement

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***DP120101735**: Arndt, Livesley, von Fischer. "Methane uptake of forest soils"*

The starting date for this grant was 1 June 2012 and the project follows three key objectives:

1: Collect data on methane uptake and its controls. Date will be derived from a climatically and geographically diverse set of forest sites in Victoria.

2: Determine the controls of methane uptake. A thorough analysis of the physical controls of diffusion, ecophysiological traits of different methanotroph communities and the environmental determinants of methanotroph community composition.

3: Improve model predictions of methane uptake. Improve the mechanistic treatment of methane uptake in ecosystem models to predict uptake by forest soils at regional scales.

This project led to novel and exciting new findings in the fundamental mechanisms that control methane uptake by forest soils. Up to 90% of the variation in methane uptake are controlled by soil moisture. As soil moisture increases the diffusion of methane into the soil decreases. This enables exciting new opportunities to model methane uptake on larger scales. Variation in methanotroph communities did not seem to play a major role in the methane uptake process.
Our rainfall exclusion experiment indicated that climate change may lead to greater methane uptake rates in forest soils in the future. Drier conditions probably will lead to greater methane uptake by forest soil. A reduction of around 20% of soil moisture by an experimental rainfall reduction setup led to a >50% increase in methane uptake.
Our fire studies indicated that repeated fuel reduction burns have very little long-term impacts on methane uptake. Fuel reduction burns are the primary management intervention to prevent major bushfires. Our fire studies also show that severe stand replacing bushfires likely have significant impacts on methane uptake, as any differences in soil methane uptake between forest stands of different age were predominantly driven by differences in soil moisture status.
Overall the project discovered new paradigms on a fundamental biogeochemical process that differ from results reported from other ecosystems. The relationship between soil moisture and soil methane flux was near identical at the investigated forest sites in SE Australia when soil moisture was expressed as soil air-filled porosity (AFP).

We have eight manuscripts accepted in high ranking journals:

Fest B.J., Livesley S.J., von Fischer J.C., Arndt S.K. (2015) Repeated fuel reduction burns have little long term impact on soil greenhouse gas exchange in dry sclerophyll eucalypt forests. *Agricultural and Forest Meteorology 201: 17-25.*

Fest B.J., Wardlaw T., Livesley S.J., Duff T.J., Arndt S.K. (2015) Changes in soil moisture drive soil methane uptake along a >200 year chronosequence of forest regeneration from fire. *Global Change Biology* 21 (11): 4250–4264.

Fest B, N. Hinko-Najera, W. Tim, D. Griffith, S. J. Livesley, and S. Arndt (2017) Soil methane oxidation in both dry and wet temperate eucalypt forests show near identical relationship with soil air-filled porosity. Biogeosciences 14(2): 467-479

Beringer, J., Hutley, L. B., McHugh, I., Arndt, S. K et al. (2016) An introduction to the Australian and New Zealand flux tower network - OzFlux. Biogeosciences, 13, 5895-5916

Fest B, Hinko-Najera N, von Fischer J, **Livesley S J**, Arndt S K (2017) A reduction in throughfall can increase methane uptake in forest soils – a negative feedback to climate change? Ecosystems 20 (2): 368–379

Hinko-Najera N, Fest B, **Livesley S J** and Arndt S K (2015) Reduced throughfall decreases autotrophic respiration, but not heterotrophic respiration in a temperate broadleaved evergreen forest. Agricultural and Forest Meteorology 200:66-77

Majumder R, **Livesley S J,** Gregory D and Arndt S K (2015) Storage management influences greenhouse gas emissions from biosolids. Journal Environmental Management 151: 361-368.

Majumder R, **Livesley S J,** Gregory D and Arndt S K (2014) Biosolid stockpiles are a significant point source for greenhouse gas emissions. Journal of Environmental Management 143: 34-43.

Project ID

LP160101446

First Named Investigator

Prof Lynn Meuleners

Scheme

Linkage Projects

Statement

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PROJECT ID: LP160101446
PROJECT TITLE: A longitudinal study examining driving performance and self-regulation practice in drivers with mild dementia
INVESTIGATORS: Prof L Meuleners and Prof M Stevenson
SCHEME: ARC Linkage

AIMS AND BACKGROUND: Despite the high prevalence of dementia in older drivers, a substantial gap remains in the evidence regarding the natural progression of the disease and its impact on driving performance and driver self-regulation practices. Our aim is to assess longitudinal changes in the driving performance, driving self-regulation, mobility and satisfaction with mobility for older drivers with mild dementia, compared to that of older drivers without dementia. The proposed project will create a partnership between leading researchers and policymakers to provide an answer to a complex problem. We believe the findings from the study will optimise management of driving outcomes and mobility for this group. The multi-phase study consists of four objectives.

PROGRESS TO DATE: The formal agreement to establish the grant between the industry partners and the universities has just been signed (Nov 2017) and the research program will begin January 2018.