



Variation Agreement Project B1.2

THIS AGREEMENT is made on the _____ day of _____ 2017

THE CRC FOR WATER SENSITIVE CITIES, Building 74, Monash University, Clayton, Victoria, 3800 (CRCWSC)

AND the parties named in Item 1 of the Schedule (Other Parties)

BACKGROUND:

- A. CRCWSC and the Other Parties entered into the Document named in Item 2 of the Schedule (Document).
- B. CRCWSC and the Other Parties wish to vary the Document in accordance with this Agreement.

IT IS AGREED AS FOLLOWS:

- | | |
|--|--|
| <p>1. Definitions</p> <p>1.1 Terms which are defined in the Document and used in this Agreement have the meaning given to them in the Document, unless stated otherwise.</p> <p>2. Effective date of variation</p> <p>2.1 The effective date of this Agreement is the date set out in Item 3 of the Schedule (Effective Date).</p> <p>2.2 Clause 2.1 does not affect any right or obligation arising before the Effective Date.</p> <p>3. Variation</p> <p>3.1 The parties agree that from the Effective Date the Document will be varied in accordance with Item 4 of the Schedule.</p> <p>3.2 Save for varying the Document as specified in this Agreement, all other provisions in the Document remain unchanged.</p> | <p>4. General</p> <p>4.1 Costs: Each party remains responsible for its own costs and expenses in entering into this Agreement.</p> <p>4.2 Signatories: The signatories to this Agreement warrant that they have the authority to enter into this Agreement on behalf of the party they are stated to represent.</p> <p>4.3 Counterparts: This Agreement may be executed in any number of counterparts. All counterparts taken together will constitute the one Agreement.</p> <p>4.4 Electronic Signatures: Each party may communicate its execution of this Agreement by successfully transmitting an executed copy of this Agreement by facsimile or email to each other party.</p> |
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EXECUTED as an Agreement

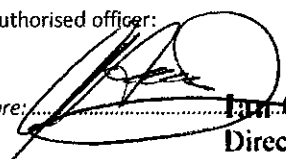
SIGNED for and on behalf of [CRCWSC]
by its authorised officer:

Signature: 

Name: BEN FARNAGE

Date: 2/9/17

SIGNED for and on behalf of THE UNIVERSITY OF QUEENSLAND
by its authorised officer:

Signature:  **Ian G. Harris**
Name: **Director, Research Partnerships**
UQ Research and Innovation
The University of Queensland
Date: **31/8/17**

SCHEDULE

Item	Description
1. Other Parties	THE UNIVERSITY OF QUEENSLAND ABN 63 942 912 684 of St Lucia in the state of Queensland (UQ).
2. Document	Project Agreement Variation B1.2. Catchment scale landscape planning for water sensitive cities in an age of climate change. Executed 10 December 2014.
3. Effective Date	1 July 2017
4. Variations	<p>Project Agreement revised budget for FY1718 provided to:</p> <ul style="list-style-type: none">• Extend Project end date from July 2017 to 30th September 2017 due to delays in staff recruitment.• Provide \$12,000 from UQ B1.2 project lifetime budget in Q1 FY1718 for Research Fellow salary (La Leung \$7,000) and Operations (Research assistant & report preparation/editing \$5,000) as per Budget Table. <p>Milestone variation:</p> <p>Work undertaken in the project to 30th June 2017 will be included in the final milestone report which will be delivered by 30th September 2017.</p> <p>Revised expenditure budget is provided in Table below:</p>

Budget Table

		Requested FY1718 Q1
B1.2		\$12,000
University of Queensland		\$12,000
Faculty of Engineering		\$12,000
School of Chemical Engineering		\$12,000
Dr Steve Kenway - UQ		
Level B RF La Leung		\$7,000
Operations UQ		
Research Assistant		\$5,000



Variation Agreement – Project B1.2

THIS AGREEMENT is made on the 10th day of December 2014

THE CRC FOR WATER SENSITIVE CITIES, Building 74, Monash University, Clayton, Victoria, 3800 (CRC)

AND the parties named in Item 1 of the Schedule (Other Parties)

BACKGROUND:

- A. CRC and the Other Parties entered into the Document named in Item 2 of the Schedule (Document).
- B. CRC and the Other Parties wish to vary the Document in accordance with this Agreement.

IT IS AGREED AS FOLLOWS:

- | | |
|--|--|
| <p>1. Definitions</p> <p>1.1 Terms which are defined in the Document and used in this Agreement have the meaning given to them in the Document, unless stated otherwise.</p> <p>2. Effective date of variation</p> <p>2.1 The effective date of this Agreement is the date set out in Item 3 of the Schedule (Effective Date).</p> <p>2.2 Clause 2.1 does not affect any right or obligation arising before the Effective Date.</p> <p>3. Variation</p> <p>3.1 The parties agree that from the Effective Date the Document will be varied in accordance with Item 4 of the Schedule.</p> <p>3.2 Save for varying the Document as specified in this Agreement, all other</p> | <p>provisions in the Document remain unchanged.</p> <p>4. General</p> <p>4.1 Costs: Each party remains responsible for its own costs and expenses in entering into this Agreement.</p> <p>4.2 Signatories: The signatories to this Agreement warrant that they have the authority to enter into this Agreement on behalf of the party they are stated to represent.</p> <p>4.3 Counterparts: This Agreement may be executed in any number of counterparts. All counterparts taken together will constitute the one Agreement.</p> <p>4.4 Electronic Signatures: Each party may communicate its execution of this Agreement by successfully transmitting an executed copy of this Agreement by facsimile or email to each other party.</p> |
|--|--|

EXECUTED as an Agreement

SIGNED for and on behalf of [CRC] by its authorised officer:

Signature: *[Handwritten Signature]*
 Name: ROBYN MCLACHLAN
 Date: 10 Dec. 2014

SIGNED for and on behalf of **MONASH UNIVERSITY**
by its authorised officer:

Signature:.....

Name:.....

Date:

*Included
in error.
[Signature]*

SIGNED for and on behalf of **GRIFFITH UNIVERSITY**
by its authorised officer:

Signature: *Nicki Patemore*

Name: *NICKI PATEMORE*

Date: *13/11/14*

SIGNED for and on behalf of **THE UNIVERSITY OF QUEENSLAND**
by its authorised officer:

Signature:.....

Name:.....

Date:

SCHEDULE


Item	Description
1. Other Parties	<p>MONASH UNIVERSITY (ABN: 12 377 614 012) of Wellington Road, Clayton, Victoria</p> <p>GRIFFITH UNIVERSITY (ABN 78 106 094 461) of Nathan, Queensland</p> <p>THE UNIVERSITY OF QUEENSLAND (ABN 63 942 912 684) of St Lucia, Queensland</p>
2. Document	Project Agreement B1.2
3. Effective Date	1Jan15
4. Variations	<p>Revision of Item 15 Resources: Annexure C, to be replaced by the budget in the table below for FYs 14/15 – 16/17.</p> <p>Budget change: allocation of an RF to GU at 0.75 FTE for 2 yrs commencing 1Jan15 as per revised budget schedule below.</p> <p>Note: unexpended budget surplus from prior years has been utilised to provide the new budget.</p>

SIGNED for and on behalf of **MONASH UNIVERSITY**
by its authorised officer:

Signature:.....

Name:.....

Date:

Included
in error.


SIGNED for and on behalf of **GRIFFITH UNIVERSITY**
by its authorised officer:


Signature:.....

Name:.....

Date:

SIGNED for and on behalf of **THE UNIVERSITY OF QUEENSLAND**
by its authorised officer:

Signature:.....
Name:.....
Date:


Nicole Thompson
Director, Research Strategy and Management
UQ Research and Innovation
The University of Queensland

Date: 9.12.2014

SCHEDULE

Item	Description
1. Other Parties	MONASH UNIVERSITY (ABN: 12 377 614 012) of Wellington Road, Clayton, Victoria GRIFFITH UNIVERSITY (ABN 78 106 094 461) of Nathan, Queensland THE UNIVERSITY OF QUEENSLAND (ABN 63 942 912 684) of St Lucia, Queensland
2. Document	Project Agreement B1.2
3. Effective Date	1Jan15
4. Variations	Revision of Item 15 Resources: Annexure C, to be replaced by the budget in the table below for FYs 14/15 – 16/17. Budget change: allocation of an RF to GU at 0.75 FTE for 2 yrs commencing 1Jan15 as per revised budget schedule below. Note: unexpended budget surplus from prior years has been utilised to provide the new budget.

The information displayed here is private and confidential.

Cooperative Research Centre for Water Sensitive Cities



Project Agreement

Project Number: B1.2

Project Name: Catchment Scale Landscape Planning for
Water Sensitive Cities in an Age of Climate Change

Participants: The University of Queensland and Griffith
University



An Australian Government Initiative



THIS AGREEMENT IS MADE BETWEEN

CRC FOR WATER SENSITIVE CITIES LTD ABN 19 158 409 137 of Clayton in the state of Victoria (**Company**).

AND

The Project Participants set out in Schedule 1

Recitals

- A. The Company is responsible for the governance, management and co-ordination of the Centre.
- B. The Project Participants are participants in the Centre.
- C. The Centre's Activities include overseeing four Research Programs. Each Research Program has a designated Program Leader who is responsible for the coordination and conduct of the Research Programs.
- D. Within the Research Programs, the Centre determines the general nature of the research projects to be conducted and then in conjunction with the Project Participants, develops the detailed research project B1.2 - Catchment Scale Landscape Planning for Water Sensitive Cities in an Age of Climate Change. The Centre also manages the funding of the Project.
- E. The Project to which this Project Agreement relates has been approved by the Board as a Project to be carried out by the Project Participants with funding from the Company as part of the Activities of the Centre.
- F. By signing this Project Agreement, the Parties acknowledge their agreement to carry out the Project in accordance with the following terms.

PROJECT DETAILS

1 Dictionary

- 1.1 In this Project Agreement, unless the context otherwise requires, the following definitions apply:
 - (a) **BIP Participant** means the Party that has made the relevant Project BIP available to the Project.
 - (b) **Centre** means the Cooperative Research Centre for Water Sensitive Cities.
 - (c) **Centre IP** means the Centre IP arising from the Project.
 - (d) **Contributed Personnel** means the persons identified in Schedule 1 as the personnel who will conduct or be involved in the Project.
 - (e) **Participants Agreement** means either the Essential Participants Agreement or an Other Participant Agreement, entered into by the Company and a participant in the Centre.

- (f) **Parties** means the Project Participants and the Company and **Party** means any one of them.
 - (g) **Project** means the project set out in Schedule 1.
 - (h) **Project BIP** means the Background Intellectual Property of the Parties described in Schedule 1 or that is subsequently made available to the Project under the Participants Agreement.
 - (i) **Research Project Proposal** means the proposal for the Project attached as Annexure B.
- 1.2 Words and phrases used in this Project Agreement that also appear in Schedule 1 [Definitions and Interpretation] of the Participants Agreement, and that are not specifically defined in this Project Agreement, will have the meaning given to those words and phrases in Schedule 1 of the Participants Agreement.

2 Paramountcy

If there is an inconsistency between this Project Agreement and a Participants Agreement, this Project Agreement will prevail to the extent of that inconsistency.

3 Application of Participants Agreement

The Project Participants acknowledge and agree that:

- (a) the conduct of the Project forms part of the Centre Activities;
- (b) all the provisions of the Participants Agreement that, expressly or by implication, apply to the conduct of Projects, will with any necessary amendment, be deemed to form part of this Project Agreement; and
- (c) this Project Agreement will be read with and deemed to form part of the Participants Agreement.

4 Project

In consideration of:

- (a) the payment of the Project Funds to the Project Participants by the Company; and
- (b) the making available of the Project Contributions to the Project by the Parties,

the Parties will conduct the Project in accordance with this Project Agreement and the Participants Agreement.

5 Term

- 5.1 The Project will commence on the Project Commencement Date and will be completed on the Project Completion Date unless terminated earlier or otherwise agreed by the Parties.
- 5.2 A Project Participant may terminate this Project Agreement upon thirty days written notice to the other Parties, if another Project Participant:
 - (a) abandons the Project; or
 - (b) fails to achieve a Milestone or deliver a Deliverable within 60 days of the time specified in this Project Agreement,

and the Project Participant seeking to terminate has fully documented the work that it has completed and for which it has been funded before it gives notice of termination to the other Parties.

6 Payment and Project Contributions

- 6.1 Each Project Participant must make available to the Project, its Project Contributions in accordance with the Participants Agreement and Schedule 1.
- 6.2 The Company will:
- (a) pay to the Project Participants the Project Funds; and
 - (b) distribute the Project Contributions,
- in accordance with the Participants Agreement and Schedule 1.
- 6.3 In addition to its rights under the Participants Agreement, the Company may withhold some or all of the Project Funds and Project Contributions from a Project Participant that has not complied with the Project Agreement or the Participants Agreement in conducting the Project.

7 Performance

- 7.1 The Responsible Participant must ensure that the Project Leader fulfils the responsibilities and duties set out in Annexure A, in addition to any obligations set out in the Participants Agreement. The Responsible Participant must notify the Company upon becoming aware that the Project Leader is unable or is likely to become unable to fulfil the requirements in Annexure A for the duration of the Project.
- 7.2 In addition to any obligations under the Participants Agreement, each Project Participant must, and must ensure its Contributed Personnel, cooperate with the Project Leader, act in accordance with the Participants Agreement, and carry out its part of the Project to enable the Project to be conducted in accordance with this Project Agreement.

8 Meetings

- 8.1 The Project Leader must attend the following minimum number of meetings for the duration of the Project and for a period of up to [6] months following the Completion Date, either in person or using technology available to the meeting:
- (a) two Centre workshops (industry focus) each Financial Year;
 - (b) two Centre workshops (research focus) each Financial Year; and
 - (c) all program meetings relevant to the Research Program to which the Project relates, as scheduled by the relevant Program Leader,
- provided that the Project Leader has been provided with reasonable prior notice of the meeting.
- 8.2 The Project Leader may be excused from attending a meeting personally if:
- (a) he or she has notified the CRC Executive of the reasons why they cannot attend, and suggested a nominee to attend in his or her place; and
 - (b) the CRC Executive consents to the nominee attending in the Project Leader's place.

If consent is provided and the nominee attends the meeting, the Project Leader will be deemed to have attended the meeting for the purposes of clause 8.1.

- 8.3 The Centre may vary the number and timing of workshops specified under clause 8.1(a) or (b) by notice to the Project Leader.
- 8.4 Attendance by any one of the persons listed in Annexure B, Item 7 will be deemed to comply with Clause 8.1.

9 Reporting

- 9.1 In addition to its obligations under the Participants Agreement, the Responsible Participant must report, or ensure that the Project Leader reports:
- (a) as required by Item 10 of the Research Project Proposal;
 - (b) to the Company when requested, in the Approved Form notified by the Company from time to time;
 - (c) to the Program Leader of the Research Program for the Project, in relation to any issues adversely affecting or likely to adversely affect the Project (including any matter that the Project Leader considers will, or may, affect the ability of the Project to satisfy the Milestones or deliver the Deliverables, or to be completed within the Project Budget) as soon as practicable after that matter or issue comes to the attention of the Project Leader; and
 - (d) to the CRC Executive or Research Advisory Sub-Committee when requested.
- 9.2 The Quarterly reports required under Clause 21 of the Essential Participants Agreement must also contain a summary of the research progress made and expenditure of cash and in-kind contributions for the Project.
- 9.3 If requested by the CRC Executive or CRC Advisory Committee, the Project Participants must provide the CRC Executive or CRC Advisory Committee with any information reasonably requested in relation to the Project.

10 Milestones and Deliverables

- 10.1 Subject to this clause, the Milestones must be achieved, and the Deliverables must be delivered to the Company at the times specified in this Project Agreement.
- 10.2 A Project Participant is not required to achieve Milestones or deliver Deliverables to the extent that its failure to do so is attributable to the acts or omissions of other Project Participants or circumstances beyond its reasonable control.

11 Project Review

- 11.1 The Project will be reviewed by the CRC Executive and Research Advisory Sub-Committee in accordance with the Participants Agreement.
- 11.2 The Board may, on the recommendation of the CRC Executive or otherwise:
- (a) implement variations to the Project; or
 - (b) terminate the Project, if following a review, the Board reasonably forms the view that the Project will not achieve its objectives,
- provided the Board acts in accordance with the Participants Agreement.

12 Intellectual Property

- 12.1 Each BIP Participant makes available its Project BIP to the Project in accordance with the Participants Agreement.
- 12.2 All Centre IP will be owned by the Company. Each Project Participant will do all things reasonably necessary, including the signing of documentation, to vest the Centre IP in the Company.
- 12.3 Each Project Participant will on request from the Company provide the Company with information in relation to the Centre IP created by its personnel.


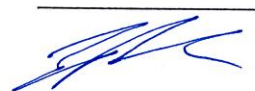
13 Contributed Personnel

- 13.1 Each Project Participant will make available its Contributed Personnel to conduct the Project in accordance with Schedule 1.
- 13.2 Subject to this clause, the Contributed Personnel of Project Participants remain subject to the terms and conditions of employment under which they are employed by Project Participants.
- 13.3 Each Project Participant will:
 - (a) take all reasonably practical steps to ensure that any working environment where:
 - (i) its Contributed Personnel work; or
 - (ii) the Project is conducted, is safe and without risk; and
 - (b) be responsible for the health and safety of:
 - (i) its Contributed Personnel at all times when they are at work; and
 - (ii) all other persons whose health or safety may be adversely affected by the conduct of the Contributed Personnel's actions.
- 13.4 Each Project Participant covenants and undertakes to procure that Centre IP created by any of its Contributed Personnel will be owned and dealt with according to this Project Agreement.

14 Commonwealth Obligations

The Parties acknowledge and agree that at any reasonable time any person designated by the Commonwealth Cooperative Research Centre Program may view the progress of the Project and that the Parties will give all assistance reasonably requested by such designated person.

EXECUTED by THE UNIVERSITY OF QUEENSLAND ABN 63 942 912 684 by its authorised officer in the presence of

) _____
)  Authorised Officer
) **Ian G Harris**
) **Director, Research Partnerships** Print full Name
) **UQ Research and Innovation**
) **The University of Queensland**
) _____
)  Witness
) Gail Roudenko
) _____
) Print Full Name
) 18/12/13
) _____
) Date

EXECUTED by GRIFFITH UNIVERSITY ABN 78 106 094 461 by its authorised officer in the presence of

Vicki Joy Pattemore

Authorised Officer

VICKI JOY PATTEMORE

Print full Name

myker

Witness

MARY WILKINSON

Print Full Name

9/12/13

Date

SCHEDULE 1 PROJECT DETAILS

Project Title	Item 1 of the Research Project Proposal.
Research Program (Recital B)	Item 4 of the Research Project Proposal.
Project Participants	<p>The Company</p> <p>Name: Robyn McLachlan Position: Chief Operating Officer, CRC for water Sensitive Cities Ltd Address: PO Box 8000, Monash University LPO, Clayton Campus VIC 3800 Telephone: + 61 (0) 3 9902 0542 Mobile: +61 (0)402 013 497 Email: robyn.mclachlan@crcwsc.org.au</p> <p>The University Of Queensland</p> <p>Name: Mr. Ian Harris Position: Director, Research Partnerships Address: The University of Queensland, Brisbane, QLD 4072 Telephone: +61 (0) 7 3365 3559 Email: director.partnerships@research.uq.edu.au</p> <p>Griffith University</p> <p>Name: Vicki Pattemore Position: Director, Office for Research Address: Nathan Camupus, 170 Kessels Road, Nathan, QLD 4111 Telephone: +61 (0) 7 3735 5456 Email: d.garklavs@griffith.edu.au</p>
Responsible Participant (clause 9)	Item 7 of the Research Project Proposal.
Contributed Personnel (clause 13)	Item 11 of the Research Project Proposal.
Project Funds (clause 4 and 6)	See Annexure C.
Project Contributions (clause 4 and 6)	See Annexure C.

Background IP (clause 12)	University of Queensland tools on quantified urban performance of potential relevance that primarily address the urban water balance, and related energy use, greenhouse gas emissions and nutrient balances (basecase and scenarios) are as follows: <ul style="list-style-type: none"> • Spreadsheets/databases and models quantifying energy use of water and wastewater utilities, and urban water use. • Material Flow Analysis Model of water and related energy in households. • Life Cycle Models and databases relating to urban water systems. • National-scale urban metabolism modelling tools including the virtual laboratory for Industrial Ecology (being developed jointly with 6 other universities and CSIRO, note IP is owned by Uni of Sydney however UQ have rights to use). 	
Project Plan	<i>Project Leader</i> (clauses 8 and 9)	Item 7 of the Research Project Proposal.
	<i>Project Commencement Date</i> (clause 5)	Item 2 of the Research Project Proposal.
	<i>Project Completion Date</i> (clause 5)	Item 2 of the Research Project Proposal.
	<i>Project Objectives</i>	Items 3 and 8 of the Research Project Proposal
	<i>Proposed strategy</i>	Item 9 of the Research Project Proposal.
	<i>Milestones</i> (clause 10)	Item 10 of the Research Project Proposal.
	<i>Deliverables</i> (clause 10)	Item 10 of the Research Project Proposal.
	<i>Project Budget</i>	Item 11 of the Research Project Proposal.
	<i>Third party contributions</i>	Item 11 of the Research Project Proposal.
	<i>Resources</i>	Item 11 of the Research Project Proposal.
	<i>Student requirements</i>	Item 11 of the Research Project Proposal.
	<i>New Assets or Capital Items</i>	Item 11 of the Research Project Proposal.
	<i>Analysis of Project risk</i>	Item 12 of the Research Project Proposal.
	<i>Analysis of Utilisation of Project outcomes</i>	Items 13 & 14 of the Research project proposal

ANNEXURE A PROJECT LEADER RESPONSIBILITIES

Project Leaders have responsibility for and must fulfil the following duties in relation to the Project:

- (a) Supervision of Project Activities in accordance with the Research Project Proposal.
- (b) Managing the utilisation of Contributions provided by the Company and Project Participants and any other resources made available for the Project Activities.
- (c) Ensuring the quality and timely delivery of Project Deliverables according to Milestones.
- (d) Actively fostering and facilitating the research collaboration amongst Project Participants.
- (e) Fostering integration of research outputs and insights across the Research Program and supporting the relevant Program Leader(s) in integrating research outputs across the Research Programs in the Centre.
- (f) Identifying and effectively managing and mitigating Project risk and raising any risk or performance issues concerning the Project in a timely manner with the Program Leader.
- (g) Attendance and active participation in Centre industry partner and research workshops.
- (h) Preparation of timely quarterly reports to the CRC Executive (suitable to be shown to the Board) on Project progress and Project Budget expenditures.
- (i) Identifying any Centre IP developed within the Project, maintaining proper records of the Centre IP developed and its use within the Project and notifying the Program Leader of such Centre IP and any potential future use of Centre IP within the Centre.

ANNEXURE B RESEARCH PROJECT PROPOSAL**RESEARCH PROJECT PROPOSAL***(max. 10 pages – excluding References)***Summary Details****1. Title of research project proposal:** *(Project Number/Project Title – max. 20 words)*

B1.2: Catchment scale landscape planning for water sensitive city-regions in an age of climate change

2. Proposed Project Commencement Date: *(month/year):* July 2013**Project Duration** *(years):* 4 years**3. Project Abstract:** *(Objectives, Outputs and Outcomes)***Aims:**

This project aims to derive a first order urban metabolism evaluation framework for the city region across urban, peri-urban and rural landscapes. This framework will be encapsulated within a whole-of-landscape planning and management city-region model that links cities ecologically and hydrologically to their region whilst accommodating the assessment of urban growth adapted to climate change. The project will ground this inquiry in statutory and non-statutory regional (catchment) scale planning processes.

Objectives:

1. To address metropolitan growth in the context of city-regional catchments through whole-of-landscape planning approaches that incorporate strategic considerations with particular regard to climate change adaptation leading to resilient landscapes;

2. To incorporate best available water and ecological science into whole-of-catchment landscape planning and growth management policies that guide future growth in greenfield, peri urban and rural landscapes for growing city regions to ensure ecological, hydrological and ecosystem services values are incorporated into these planning processes;

3. To highlight how a whole-of-landscape approach, respecting critical hydrological connections between cities and their regional catchments and between natural and built environments, can be achieved through an integrated greenspace framework incorporating natural ecosystems and green infrastructure linking cities to their regional catchments.

4. Number and name of CRC research program Program A – Society Program B – Water Sensitive Urbanism Program C – Future Technologies Program D – Adoption Pathways

5. ANZSRC Field of Research (FoR) classification

120504 Land Use and Environmental Planning

6. Keywords: *(max 6)*

Regional planning

Landscape scale

Hydrological city region

Growth management

Regional greenspace
frameworks

Scenario planning

7. Project Leader(s)**Name:** Professor Darryl LOW CHOY**Institution:** Griffith University**Department:** School of Environment**Research Proposal****8. Background & Research Questions****Background:**

Cities are not isolated entities, they exist within and ultimately depend on landscapes which extend far beyond their actual built edge. The water sensitive city needs therefore to be understood in relation to its broader catchment and all the landscape types and their water related needs that occur within that catchment. Landscapes for food production, resource extraction and industrial production need to be balanced with areas of natural habitat (and associated ecosystem services), urbanisation and urban related activities that occur beyond the city limits such as outdoor recreation. The future of these landscapes, recognising all of these values, needs to be planned in an integrated manner so as to sustainably accommodate Australia's projected population growth within resilient human settlements. This research will develop planning methods that forge and secure the synergistic relationships between these landscapes at a broader catchment scale. In particular, it will focus on statutory and non-statutory planning at these scales.

The great majority of land within our metropolitan regions is held in freehold tenure (ie owned and managed by private land holders, farmers, land developers, peri-urban commuters and a host of other private individuals). These lands are managed through the development control processes of the statutory plans of Local Government and the overarching (some statutory) planning policies of regional planning agencies and State Governments. This is the crucial intersection where a more informed scientific approach needs to be developed and inserted. Statutory planning at these scales is in its infancy in Australia and indeed, in most countries, hence the B1 program can deliver timely and innovative new approaches that will ensure that a more balanced and scientific approach is taken in land use decision making that affects metropolitan regions, human settlements and their catchments.

Whilst a small but growing number of planning jurisdictions are adopting values-led planning approaches, by-and-large these approaches are largely ill-informed by science, especially ecological and hydrological science. Hence, land use decision making processes need to be rethought in terms of ensuring that they are robust, defensible in courts of law where planning disputes are regularly arbitrated, and capable of adapting to changing circumstances, learnings and improved science.

Many city-regions are characterised by multiple single agency (single purpose / single objective) planning that is never linked nor integrated into a whole-of-region/catchment perspective. This project addresses metropolitan growth in the context of regional catchments, through a whole-of-landscape approach and will provide a platform to explore alternative institutional arrangements for catchment planning and management from a landscape scale perspective using a values led planning paradigm that is underpinned by an integration (joined-up) agenda.

This will ensure that adequate consideration is given to ecological, hydrological and ecosystem services and that those values are incorporated into metropolitan planning processes. This involves the incorporation of the best available water and related ecological science into whole-of-catchment landscape planning so as to develop statutory and non-statutory growth management plans and policies for developing our cities and regional towns with particular regard to peri urban development pressures on natural systems and productive.

Research Questions:

The key overarching research question is:

How can an integrated approach to whole-of-catchment planning and management, that is capable of linking cities ecologically and hydrologically to their region whilst accommodating urban and peri-urban growth that is adapted to climate change, be delivered through statutory and non-statutory planning processes?

Sub-research questions:

1. Can the city-scale urban metabolism framework extended to the city-region scale be incorporated into an evaluation process to support a scenario planning approach seeking to highlight strategic options of future growth in greenfield, peri urban and rural landscapes for growing city regions in an environment of uncertainty with particular regard to climate change adaptation leading to resilient landscapes?
2. Can scenario planning utilising a modified city-region metabolism framework provide insight into growth implications for the Melbourne, Perth and Brisbane metropolitan regions and demonstrate the integral links that need to be addressed through a science-based planning approach for growth management?
3. Will a regional (catchment) scale values-led planning approach ensure that ecological, hydrological and ecosystem services values are incorporated into the statutory and non-statutory planning processes of Local and State governments?
4. What planning methodologies need to be developed in order to establish a science-based planning approach for city-regional scale planning?
5. What roles can an integrated regional greenspace framework that incorporates natural ecosystems and green infrastructure, play in achieving a whole-of-landscape approach that respects critical hydrological connections between cities and their regional catchments and between natural and built environments?

9. Research plan *(methods, timelines and outputs – do not include annual workplans)*

Research Plan:

The initial phase of the project will require a comparative assessment of the different statutory and non-statutory planning systems that exist in each of the three case study city-regions. The overarching and fundamental rationale for this approach and distinction is the fact that all land use decisions and consequently landscape impacts and ongoing management challenges are inextricably linked to the planning systems that various levels of government have established – statutory planning in particular but also including the non-statutory planning regimes. This essential first step will be necessary to accommodate the three city-regions that are the focus of the CRC, namely: South East Queensland (SEQ), Perth metropolitan, Melbourne metropolitan regions. In terms of constitutional responsibilities, the States are responsible for land use and environmental planning and consequently, different systems have emerged and operate in each State and Territory. In the case of statutory planning, all State governments have delegated these responsibilities down to local government to varying degrees. Hence, this a crucial and necessary starting point for this project. It will also provide the overarching context for all other projects in Program B as well as many other projects in other Programs.

An additional phase will be directed towards the determination of the essential components of an integrated greenspace framework that can incorporate natural ecosystems and green infrastructure and link cities to their regional catchments respecting their critical surface and subsurface hydrological connections.

The next phase will involve the conceptualization and development of a city-region / whole-of-catchment systems model that is capable of addressing the various landscape values of interest

at the broad catchment scale of city-regions. This will require the establishment of a modified city-region metabolism framework that can be employed to evaluate regional scale water budgets across multiple landscape types (greenfield, peri-urban and rural) aimed at ensuring water security for each of the developing case study city regions.

The following phase will utilise and build on the outputs of previous phases to develop and conduct alternative urban growth scenarios for each of the three case study regions and assess the pros and cons of each with regard to climate change, water security, and triple bottom line evaluation of the critical landscape values of interest to this project.

The lessons drawn from these phases will then be utilised to address the issues of incorporating ecological and water science into the statutory planning processes, especially those founded on a values led approach.

The final phase will provide a synthesis of the outputs of all phases with the aim of collating and publishing scenarios of plausible futures for rapidly growing metropolitan regions that adopt a whole of landscape regional scale outlook that links cities ecologically and hydrologically to their regions. This synthesis phase will also be heavily directed to the development of guidelines and training packages for statutory and non statutory planners, principally in the land use, environmental, landscape and natural resource management fields.

Outputs:

- Scenarios of plausible futures for rapidly growing metropolitan regions providing decision makers with a 'test bed' for their intended policies in an environment of uncertainty and inconclusive science.
- Documentation of the account for trade-offs between food producing landscapes, industrial landscapes, habitat, outdoor recreation demands, urban settlement patterns and water security in major city- regions.
- The outline of a new planning methodology for whole-of-catchment planning that foregrounds ecological systems in the planning process and specifically addresses the health of the major river systems through statutory and non-statutory planning.
- A modified regional (catchment) scale planning process that can deliver a whole-of-landscape approach that links cities ecologically and hydrologically to their region.
- Exhibitions, publications, planning guidelines and policy recommendations.

A Project Reference Group (PRG) comprising key stakeholders will be established to provide guidance on the type and form of outputs from the research. The networks of the PRG members will be fully exploited to disseminate and to improve uptake of outcomes.

Outcomes:

This project will provide state, regional and local planning agencies with a comprehensive planning process and methodology which acknowledges the critical dependency that cities have on secure and high quality water sources. These considerations can be factored into the process from the outset and trade-offs can be transparently considered. It will provide a balanced approach to addressing metropolitan growth within the context of the wider city region (catchment) thereby making the crucial links between water and cities and in their regional catchments between natural and built environments. Sustainable and resilient urban and regional communities will be developed through a better understanding of probable change under future population growth and climate change scenarios. The specific focus on the three case study metropolitan city regions will provide tangible evidence of the research findings and their potential impacts.

Specifically, its outputs will be highly relevant to regional and local scale statutory and non-statutory planning undertaken by State and Local governments, Catchment Management Authorities (CMAs), and Non Government Organisations such as Natural Resource Bodies (NRBs).

Policy guidelines will be used by State, regional and local planning agencies for the management of metropolitan growth at the city-region or major catchment level.

Local and regional governments across catchments will have a process and methodology to address whole-of-catchment landscape planning in a collaborative and coordinated manner with water as the key unifying focus.

The outputs will inform CMAs and NRBs in the preparation of their catchment action plans and investment strategies and provide a much needed methodology and planning process for whole-of-catchment landscape planning on a consistent and scientific basis.

The scenarios developed for the growth in the city-region catchments will assist decision makers in dealing with the high degree of uncertainty and inconclusive science

associated with climate change and population growth by providing insight into plausible futures and with a 'test bed' to assess their policies

10. Project Deliverables and Milestones <i>(list quarterly, half-year or annual milestones as appropriate)</i>	
Project Deliverables	Milestone dates
<ul style="list-style-type: none"> • Conceptualisation of a landscape scale city-regional framework as the base for subsequent work (including hosting two whole-of-Program B workshops to conceptualise the city and regional model to form the integrating framework for subsequent research across the Program B projects). • Comparative assessment of the statutory and non-statutory planning systems in each case study region (ie SEQ, Melbourne and Perth metropolitan regions) (local and regional scales). • Disseminate findings to other Projects and Programs in CRC • Negotiate and establish Project Reference Group (PRG) for B1. 	December 2013
<ul style="list-style-type: none"> • Determination of the essential components of an integrated greenspace framework (incorporating natural ecosystems and green infrastructure) linking the city to its regional catchments with emphasis on critical surface and subsurface hydrological connections (to be subsequently refined as outputs from other Program B projects become progressively available), 	June 2014
<ul style="list-style-type: none"> • Conceptualisation of a city-region scale urban metabolism evaluation framework including a methodology for calculating and representing the ecological water budgets across multiple landscape types in the three case study city regions 	December 2014
<ul style="list-style-type: none"> • Development of a city-region / whole-of-catchment systems model incorporating a modified urban metabolism framework to evaluate regional scale water budgets across multiple landscape types (greenfield, peri-urban and rural). • Assessment of water security in the three case study city regions through the application of the city-region systems model. 	June 2015
<ul style="list-style-type: none"> • Development of alternative urban growth scenarios incorporating climate science for the three city regions. • Strategic assessment of the future of each case study region in terms of water security, and triple bottom line evaluation of the critical landscape values (using scenarios) 	December 2015
<ul style="list-style-type: none"> • Scenarios for rapidly growing metropolitan regions utilising whole-of-landscape regional scale to ecologically and hydrologically link cities to their regions • Methods for incorporating ecological and water science into the statutory planning processes, with a focus on those founded on a values led approach 	June 2016
<ul style="list-style-type: none"> • Finalisation of an initial policy 'testbed' model which allows 	June 2017

Project Deliverables	Milestone dates
planners/policy makers to test policy impacts under multiple plausible growth scenarios for the water sensitive city-region in an age of climate change.	
<ul style="list-style-type: none"> Guidelines and training packages for planners (statutory and non statutory) 	Post 2017

11. Resources *(include anticipated annual cash and in-kind budget over the duration of the project)*
See item 16.

12. Risk and Risk Management *(identify risks to the successful completion of the project and risk management measures adopted)*

Risk	Management Measures
Unavailability of climate change projections and other key data and technological inputs for scenario development for all three case study regions.	Monitor current research projects developing this data - assume data will be available when needed in this project
Failure of timely availability of relevant input from other projects and programs (as identified)	Various projects need to be aligned and coordinated within programs and across the entire CRC. A formal arrangement needs to be put into place
Unavailability of post-doctoral research fellow/s with necessary expertise and skills	Proactive recruitment strategy with personal approaches
Steve Kenway or Post Doc with his skills not available in Yr 2 (2013/2014) or not willing to accept a 0.5 appointment.	As above. Get universities to drop their on-cost and infrastructure costs

Adoption Pathways

13. Linkages to other Projects *(linkages to other research activities within the Program and across other Programs within the CRC)**

B2: Water cooling model (Peter Davies) and its possible incorporation into B1 Whole-of-catchment model

B3: Value of the corridor (value of public realm landscape) as an asset? Connection to "landscape corridors" of regional greenspace framework. Also possible connection to work with Bayesian Belief Network (BBN) modelling.

B4: UHI effects could be extended and incorporated into the whole-of region model. City scale consideration of green infrastructure and greenspace. Model different designs for urbanisation continuum along a watercourse from peri-urban to Greenfield to greyfield (brownfield?) (incorporate into B1 scenarios?).

B5a: Resilience in options. Better accounting procedures ("uncertainty"). Inclusion of flood risk management and flood resilience aspects in decision making.

B5b: Scenario planning.

B6: Urban statutory planning (although focus is local – WSUD).

A3.1: Governance best practice models (no of scales).
A3.2: Better regulations (laws) – restricted covenance.
A3.4: Deliberative governance strategies (science into decision-making).
A4.2: Economic evaluation of scenarios; scenario planning.
C1b: Catchments and water quality.
D2: Developing practitioners' capacity and capabilities (eg CPD programs).
D3: Science political partnerships.
 * based on current understanding of other Programs
Virtual Urban Water Systems (DAnCE4Water continuing development): utilisation of model/s in B1 scenario developments plus input from B1 learning

14. Linkages to Adoption Pathways activities *(outline possible adoption pathways activities to disseminate and encourage industry adoption of project outputs.*

*No details available on **Adoption Pathways activities***

References

1. References

- Calthorpe, P. and Fulton, W., 2001, The Regional City: Planning for the end of sprawl, Island Press, Washington DC.*
- Kenway, S.J., P. Lant, A. Priestley, and P. Daniels, 2011. "The connection between water and energy in cities - a review". Water Science and Technology, 63(9): p. 1983-1990.*
- Kenway, S.J., 2010, Urban Metabolism and the Water Energy Nexus - Draft Literature Review. University of Queensland, Urban Water Security Research Alliance Technical Report: Brisbane. 46p.*
- Kenway, S. J.; Gregory, A.; McMahon, J., Urban Water Mass Balance Analysis. Journal of Industrial Ecology 2011, 15, (5), 693-706.*
- Kenway, S. J.; Lant, P.; Priestley, A., Quantifying the links between water and energy in cities. Journal of Water and Climate Change 2011, 2, (4), 247-259.*
- Kenway, S.; Lant, P.; Priestley, A., Quantifying water-energy links and related emissions in cities: Appendix, Parameters and Assumptions. Journal of Water and Climate Change 2011 (online), 2, (4), i-iii.*
- Kenway, S. J.; Scheidegger, R.; Bader, H. P.; Larsen, T. A.; Lant, P., Water-related energy in households: a model designed to understand the current state and simulate possible measures. Energy and Buildings 2012.*
- Kenway, S. J. The Water-Energy Nexus and Urban Metabolism - Connections in Cities.; Urban Water Security Research Alliance: Brisbane, 2013.*

- de Haas, D.; Foley, J.; Lant, P., *Energy and greenhouse footprints of wastewater treatment plants in South-East Queensland. In Ozwater'09, Australian Water Association: Melbourne, 2009.*
- Lane, J.; De Haas, D.; Lant, P. *Life Cycle Assessment perspectives on wastewater recycling; Technical Report No. 86; Urban Water Security Research Alliance: Brisbane, 2012.*
- Lane, J.; Lant, P. *Application of Life Cycle Assessment to wastewater systems planning; Technical Report; Urban Water Security Research Alliance: Brisbane, 2012.*
- Low Choy, D., Chen, W. & Serrao-Neumann, S., 2012: "A Climate for Change: a comparative analysis of climate change adaptation in rapidly urbanising Australian and Chinese city regions", in B. Glavovic, R. Kay & A. Travers (eds.), *Climate Change and the Coastal Zone*, Spon Press/Taylor & Francis, forthcoming.
- Low Choy, D.C., 2010: "From Green Belts to Green Space", in Gleeson, B. & Steele, W. (eds): *A Climate for Growth: Planning South-East Queensland*, Uni of Qld Press.
- Low Choy, D.C., 2008: "The SEQ Regional Landscape Framework: Is Practice Ahead of Theory?", in *Urban Policy and Research*, 26(1), Mar, pp 111-124.
- Low Choy, D., Sutherland, C., Gleeson, B., Sipe, N. and Dodson, J., 2008: *Change and Continuity in Peri-Urban Australia: Peri-Urban Futures & Sustainable Development*, Monograph 4, Urban Research Program, Griffith University, Brisbane (ISBN 978 1 921291 28 9).
- Selman, P., 2006, *Planning at the Landscape Scale*, Routledge, London.

16 Resources: ANNEXURE C

The information displayed here is private and confidential.