

## SCHEDULE 1

### CONTRACT DETAILS

**Item 1. Contact Officers**

For the Territory:

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Sch 2 2.2(a)(ii)

**Item 2. Term**

From the date of this Agreement until the later of:

- (4) 31 December 2018; or
- (5) the provision by the Sponsored Party of all Sponsorship Rights.

**Item 3. Sponsorship**

- (1) \$5,000 (excluding GST).
- (2) The Sponsorship is payable by the Territory to the Sponsored Party within 30 days of receipt from the Sponsored Party of a correctly rendered tax invoice. Invoices may only be rendered by the Sponsored Party in accordance with the following:

Amount	When Invoice may be rendered
\$5,000	On execution of this Deed

**Item 4. Sponsored Activities**

The delivery of the InnovationACT 2018 (IACT18) entrepreneurship program that is open to students, staff and graduates of Canberra's major tertiary institutions. IACT18 will consist of a series of workshop, seminars and mentoring with participants forming teams to develop and innovative business venture. A selection of teams will then pitch for a share of a \$50,000 seed pool.

**Item 5. Sponsorship Rights** The Sponsored Party must:

- (1) acknowledge the Territory as a sponsor of the Sponsored Activities as follows:
  - (a) InnovationACT 2018 is supported by the ACT Government.
- (2) include the Territory Logo in each acknowledgement of the Territory except on media releases or where the Territory has provided its prior written approval for the logo to be omitted from the acknowledgement;
- (3) on reasonable notice, invite the Territory to participate in any public event or media coverage related to the Sponsored Activities;
- (4) invite feedback from the Territory in relation to the development of the program for the Sponsored Activities; and

**Item 6. Territory Logo** <http://shareservices/ACTGovt/Branding/logos.html>

DATE OF THIS AGREEMENT .....

7 November 2017

SIGNED for and on behalf of the  
**AUSTRALIAN CAPITAL TERRITORY**  
in the presence of:

Signature of witness

Brent Chick

Print name

SIGNED by or for and on behalf of  
**Australian National University**  
ABN: 52 234 063 906

in the presence of:

Sch 2 2.2(a)(ii)

Signature of second director/ secretary/ witness

\*

\*delete whichever is not applicable (see note below)

Sch 2 2.2(a)(ii)

Print name

)  
)  
) Signature of Territory delegate

Cler Hassett

Print name

Sch 2 2.2(a)(ii)

)  
)  
) Signature of director/ authorised officer/ individual\*

\*delete whichever is not applicable (see note below)

Sch 2 2.2(a)(ii)

Print name

Signature of second authorised officer\*

\*only use if Incorporated Association (see note below)

Print name

Affix common seal  
if required under  
constitution

Sch 2 2.2(a)(xi)



Sch 2 2.2(a)(xi)

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# ANU School of Music Community Outreach Program

## Overview

The ANU School of Music is a hub of musical activity and training in Canberra. It provides access to its teachers and facilities to the broader Canberra community. The ANU Community Outreach Program gives participants the tools for self-expression and creativity and fulfils an important part of the University's charter. This is a very successful program comprising over 200 students from all socio economic and cultural backgrounds.

Through the ANU Community Outreach Program the ANU aims for participants to:

- Acquire the skills to create and perform music collaboratively with oneself and others
- Engage with like-minded peers, ANU staff, and industry leaders
- Develop tools for self-expression and build confidence
- Understand the path of the 21<sup>st</sup> century musician
- Grow as artists
- Become community leaders
- Broaden their depth and breadth of musical expertise
- Engage with the history, theory and technology of music.

Objectives:

- Participants will understand how to interact and perform with other musicians in an ensemble setting
- Participants will learn how to compose and rehearse their own material as a soloist and in a group setting
- Participants will develop strategies to increase technical proficiency on their instrument and ensemble skills
- Participants will learn performing skills that will be used to foster the culture in their communities and Canberra

## Girls Jazz

Led by local jazz artist Jess Green, *Girls Swing On* will continue to gain momentum in Semester 1 2019, offering high-school age students a regular weekly 2 hour ensemble practice and 45 minutes per week of individual one-on-one tutoring with School of Music staff and other local Canberra teachers.

The weekly ensemble class will be tutored by [Sch 2.2.2\(a\)\(ii\)](#), with regular guest tutors. The weekly class will provide young women with valuable ensemble experience in a supportive environment. In addition to regular ensemble practice, there will be a number of performance opportunities for the Girls Jazz ensemble throughout the year.

This program responds to the Women in Jazz initiative that is gaining national momentum led by [Sch 2.2.2\(a\)\(ii\)](#).

## Community School of Rock

After a successful pilot in 2018, this program will run again in Semester 1 2019, with plans to run a follow-up program in Semester 2 that will introduce elements of recording and music production.

Taught by ANU School of Music alumni [Sch 2 2.2\(a\)\(ii\)](#) and [Sch 2 2.2\(a\)\(ii\)](#), together with other teachers from the Bec Taylor School of Music, this program offers novice musicians instruction in basic musical concepts as well as the opportunity to rehearse and perform with like-minded peers.

Open to anyone over the age of 18, Community School of Rock provides access to School of Music venues and resources as well as guidance and administrative support from the Open School of Music academic and professional staff.

Participants will perform live and record their music.

## My Song

In partnership with the Gugan Gulwan Aboriginal Youth Centre, My Song provides a year-long program that engages and supports Aboriginal and Torres Strait Island youth through song writing, performance and recording. The purpose of the program is to promote social and emotional wellbeing through the musical arts, the promotion of cultural practices and understanding as well as building self-confidence through self-expression and creativity.

In 2019, the My Song project will build on the relationships that began in 2018, with plans to explore opportunities to extend the program in collaboration with staff from Gugan Gulwan. This program provides approximately 50 hours of teaching per semester which is important as sustained teacher contact has been found to be extremely beneficial to indigenous learners.

## Developing Musicians Program

The Developing Musicians Program (DMP) offers students in Canberra a unique opportunity to enhance their musical development, team building skills and community awareness through classes in music and opportunities to engage the Canberra community.

It offers students from across ACT, regardless of which school they attend, the opportunity to come together with a likeminded peer group, collaborate and form social bonds in a nurturing environment that supports equity and diversity.

In 2019 the Developing Musicians Program will host 4 jazz ensembles, 26 classical ensembles and 4 theory and aural classes, tutoring over 100 students from Canberra's secondary schools and colleges. As well as regular weekly classes, students can participate in public masterclasses and workshops with visiting musicians.

In addition to these regular weekly classes, the Developing Musicians Program will also offer two Song Writing and Music Production workshop, one for adults and another for people under 18.

Students in the Developing Musicians Program are also offered frequent performance opportunities via Young Performers Concerts and other external events, including the Wesley Music Centre and the High Court.



## Girls Rock

Despite having several meetings in 2018 with the organisers of the annual Canberra Girls Rock! Camp, staff of the School of Music were unable to find common ground on which to base a year-long program.

Originally supportive of the concept, Girls Rock! staff declined the opportunity to work with School of Music staff, citing concerns about putting emphasis on musical achievement rather than simply on creativity and self-expression. Girls Rock! staff expressed further concern that any other program occupying this space in Canberra would have a potentially detrimental effect on their program.

In deference to the work already happening in this space through the team at Girls Rock!, School of Music management took the decision to cease negotiations with Girls Rock! and to terminate efforts to launch this project.

The School of Music would like to propose a meeting with artsACT at a future date to discuss plans for how to manage unspent funds.

## Staffing

In 2019, approximately 50 teachers and tutors will be employed in the Open School to deliver over 1000 hours of music teaching and tuition. These teachers will be supported by administrative staff, comprising:

Academic Convenor:	2.5 days per week
Community Outreach Coordinator:	5 days per week
Community Outreach Administrator:	3-4 days per week

In addition to this core support team, in 2019 two casual employees will be contracted for a total of around 200 hours per annum to assist with events and sound and video recording.

## Fees

In 2019, the Open School of Music collects will collect fees from program participants. Fees are used to cover equipment purchases and additional teaching not covered by grant monies. In addition, the contribution of a nominal fee provides participants with an added incentive to commit to the program.

The payment of a semester fee ensures participants commit to the programs in which they are enrolled. Communications regarding fee payments always include:

- The option of a payment plan, and;
- A caveat that fees may be waived or deferred in the case of financial hardship.
- A schedule of Open School fees appears on the next page.

Fees (continued)

<b>Open School Semester Fees</b>	
<b>Developing Musicians Program</b>	
Theory & Aural	\$120
Choir	\$170
Ensembles	\$270
<b>Girls Jazz</b>	
	\$270
<b>Community School of Rock</b>	
	\$250



# **CITIES FOR OUR TIME:**

Policies, programs and services to address time constraints on health and wellbeing

**BACKGROUND PAPER**



Sch 2 2.2(a)(ii)

January 2019

## REPORT AUTHORS

Sch 2 2.2(a)(ii)

National Centre for Epidemiology and Population Health (NCEPH)  
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Australian National University

## FUNDED BY

ACT Government, Healthy and Active Living, Chief Minister Treasury and Economic Development  
Directorate  
January 2019

## SUGGESTED CITATION

Sch 2 2.2(a)(ii) (2019) CITIES FOR OUR TIME: Policies, programs and services to address time constraints on health and wellbeing. Canberra, AUSTRALIA.

## SCOPE

This project was undertaken at the National Centre for Epidemiology and Population Health (NCEPH) at the Australian National University to support consideration of time into programs, policies, services, and actions. This report provides a review of the published literature on initiatives, interventions and policies for overcoming time barriers to services, treatment, exercise and healthy living.

## ACKNOWLEDGEMENTS

Thank you to Sch 2 2.2(a)(ii) for their help and input into this review. We are also grateful to Sch 2 2.2(a)(ii) for his insightful help and commentary on the public policy issues that surround time.



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# EXECUTIVE SUMMARY

## TIME IS VALUABLE, TO EVERYONE

The problem is that the time is limited, it can't be stretched, and most people face many demands on their time. Yet limits on availability of time, or ways to reduce demands on time, are not explicitly considered when designing cities, policies, programs, actions and services.

Governments, communities and business are well aware of the importance of financial constraints for actions to succeed and communities to thrive. Just as planning for effective policy, programs and services needs to ensure that they are affordable and equitably accessible in terms of monetary costs, they also need to be affordable and equitably accessible in terms of time costs. If actions were able to minimise, avoid, offset or address time costs, there are likely to be benefits that span better uptake, equity, health, environment and productivity.

The benefits of reducing time costs therefore go well beyond those for business. Time is valuable right across the community. The way cities are planned and services designed and delivered can improve productivity and improve health and wellbeing: the main reason people say they don't eat healthy food or be active is lack of time.

This report provides background on why, and how, Government, service providers, and urban planners could improve the health, wellbeing and productivity of their citizens, and the liveability and sustainability of their cities, by designing policies, programs and services that can address time barriers.

## WHY IS TIME BECOMING A PROBLEM FOR HEALTH, WELLBEING AND CITIES?

- > **New technology.** Technology offers opportunities for time saving (see for example the 100 hour per year time KPI for Smart Cities in the full report) but increased speed also creates greater expectations to respond quickly, adding to an experience of busyness, pressure and fatigue. Workloads can also be delivered digitally and at any time of day and this makes time at work hard to quantify, limit and regulate. Urban sprawl, congestion and lack of public infrastructure has further added to the work day for many living in major cities. There is a rising time cost of living to be addressed.
- > **A transformed labour force.** The gender composition of the workforce has changed dramatically over the past 50 years, and many women (as well as some men) combine care-giving with paid work, a change viewed as fundamental for gender equality and economic productivity. Most often statistics report individual work hours when describing trends but these do not show the impact of this social and economic change on the household. Thus in 1970 households (which were usually headed by a male breadwinner with the female full time caregiver) spent a combined total of 45 hours per week in employment. Thirty years later, with both partners most likely to be employed, the amount of time per household has increased to 80 (US figures) or 75 (Australian estimate) hours per week.
- > **Time poverty is another form of inequity.** Families, caregivers, people who work in long hour jobs or who have long commute times are particularly vulnerable to time poverty; many spending over 70 hours a week on work, care or both. There is a strong gender equity as well as life-course dimension to time poverty, and time poverty is increasingly being included in assessment of multi-dimensional poverty and social exclusion.



- > **Productivity and time.** From an economic point of view, actions to save time could boost productivity as well as health. Reducing commutes and road congestion are examples of such win/wins. Conversely, actions that increase time costs (such as poor travel infrastructure, increased service wait times) will correspondingly take time from another activity, potentially compromising productivity and participation.
- > **Staying healthy takes time.** Minimum time needed for moderate to vigorous physical activity each day is one hour for children and 30 minutes for adults, with greater health benefits accruing the more time is spent being physically active. Only one half of Canberrans meet minimum activity requirements. When people are asked why they don't exercise or eat healthy food, the most important reason they give is lack of time, ahead of lack of income or knowledge.

## WAYS DESIGN CAN APPROACH TIME COSTS

We conducted a literature review of programs, policies, services, or actions that address time constraints to healthy and active living in some way. These included Smart Cities, urban design programs, active transport programs, regulation and regulatory assessments, work-leave and flexibility policies, shorter working hour trials, social marketing campaigns, parent education programs, healthy meals provision, access to physical activity resources, and work health promotion programs. Our aim was to deliver evidence based precedents for addressing time, and we summarise programs, policies, services, or actions, their time implications, and available evaluations in the full report. We observed four main ways action design can approach time costs, singly or in combination:

### A. Reducing time burdens

*This approach looks to reduce time impacts or costs of actions (e.g., making services quicker, easier, simpler) or the action itself aims to save time (e.g. Smart city technology, streamlined public transport, urban planning for walkability and access).*

### B. Time offsetting or incentives for taking up actions

*This approach acknowledges the time cost of an activity by providing support economically or in kind to offset time costs, for example providing meals and childcare as part of a preventative parenting program with at risk parents.*

### C. Freeing up time by scheduling

*This approach focuses on saving time by changing the timing of services and actions so that they are more convenient and accessible, for example services accessed after work hours.*

### D. Addressing quality of time

*This approach aims to enhance the experience of time, for example by making physical activity more enjoyable or safe as well as convenient with well-lit green space.*

## Six principles for time-aware design

Based on this review we derived six principles to support a time-aware policy, program, service and city design.

### 1. Account for the time costs and benefits

We recommend Government funded and tendered actions include the following requirements:

- > **Assess time costs:** Cost-benefit analysis of time costs or savings should not only count the service, business or paid time involved but equally value everyone's time. For example, efforts to reduce the financial costs of services may result in shifting the time cost to consumers, these time costs need to be assessed for their health and social impacts.
- > **Reduce time costs:** Consideration needs to be given to reducing and minimising time costs of citizens and consumers, especially during the design phase.
- > **Time cost benchmarks** for actions. Delivering reductions in time costs should be a KPI for urban planning proposals, transport and other publically funded and tendered services.

### 2. Reduce time poverty

As with income poverty, some citizens are particularly time poor. Reducing time costs of actions directly, or addressing time barriers to uptake may not only free up time that can be used for other valued activities, including health, it can further improve social equity. People who are full time caregivers or combine work with caregiving are particularly time poor, and time poverty is a problem that is common among women, single parents, employed parents, and carers of people with disabilities, health problems or who are elderly. Long commutes and long work hours are growing contributors to time poverty in Australia. Mobility constraints also significantly increase the time costs for accessing many services or transport, relative to able bodied.

- > Actions or services that affect time poor groups should have a priority KPI of minimising time costs and barriers.

### 3. Respect time-limits

There is a clear limit on everybody's time – 24 hours per day. This limit sets the parameters for how much people can do. Each extra demand on time may not seem in its own right significant, but each increase in the time needed, for example, to complete a form, access a service, or traverse a sprawling or poorly serviced city has to take time from some other activity. Time trade-offs result which over the long term adds to the chronic disease burden because people prioritise work and/or family ahead of health. This puts pressure on relationships and hampers productivity, as well as adding to the rising chronic disease burden. As people become increasingly time stressed their quality of living erodes.

- > New services, procedures, administrative or regulatory requirements, transport or development plans must assess and reduce time impacts, and justify additional time costs in terms of the overall benefit delivered.



#### 4. Simpler, shorter, easier, quicker, convenient = successful

Overcoming time barriers and minimising time costs of actions improves their success. Conversely negotiating complexity takes more time. Initiatives that minimised the time that they take by (a) simplifying and shortening procedures, (b) helping people combine healthy behaviours with other priorities, or (c) providing time savings in the form of meals, transport, or scheduling, showed far better uptake and sustainable behaviour change. Furthermore initiatives that relied on time poor people to deliver them, either voluntarily or in addition to other (full) workloads (e.g., walking school buses which were based on parent or teacher volunteers) struggled to succeed. Those which resourced additional personnel were much more likely to succeed. Similarly planning neighbourhoods so that services and destinations were within five to 10 minutes walk delivered multiple social, environmental and economic benefits. Providing healthy food at workplaces, schools and childcare, for example, not only increased healthy eating in the population, it reduced time pressures on significant numbers of people, which they can reallocate.

- > Actions are more able to achieve and sustain health, environmental and social goals if they minimise or offset time costs.
- > Any additional cost of designing actions to be simpler, easier, quicker or build-in time offsets are likely to be balanced by the improved outcome.
- > Interventions which directly save time, such as providing healthy foods in workplaces, schools and childcare, or urban developments that are walkable, achieve multiple health, environmental, economic or social goals.

#### 5. Enable active transport time

Designing public transport that is time effective, locating services within five and 10 minute zones from where people work or live are practical ways to enable more active time. Enabling active time also involves paying attention to the quality of time (safety, comfort, pleasantness, and sociability are key dimensions). When people have time for activity also matters; sufficient daylight hours are especially important. Workplaces also have an important role in enabling active time, with long or inflexible hours major barriers to active living.

- > Active living actions include measures that are explicitly designed to enable active time. These measures target quality as well as quantity of time.
- > Workplaces are encouraged and rewarded for initiatives that enable employee's to use time to be more active (flexibility, reduced hours, healthy activity built into work time).
- > Reducing commute time through quick and accessible public transport not only increases city liveability and reduces emissions, it supports better health and quality of life.

#### 6. A smart city can save time

The imperative to save time has been a keynote theme in Smart City consultations and actions. For some Smart Cities time saving has become their most important KPI. Many have used technology to enable people to access services, work, live, travel and consume much more time efficiently. Addressing time in Smart City initiatives offers cities a way to innovate and differentiate in terms of their liveability, productivity, citizen wellbeing and quality of life. Finding new ways to reduce time costs and save time is also likely to be a key ingredient for business innovation and start up success.

- > Saving time a criteria in Smart City innovation agendas.
- > Government partnerships with entrepreneurs to invest in and develop businesses or services to save or minimise time costs, with the potential to be scaled up.
- > City liveability and marketing include time savings as a key indicator.

## ABOUT TIME

### WHY IS TIME A PROBLEM?

Time imposes a limit on health, sustainability, liveability and productivity that has not been fully factored into how cities are designed and services delivered. Everyone has only 24 hours each day, and when pressure is placed on this limit, trade-offs in capability and opportunity occur.

For example, in September 2018, National Australia Banks's (NAB) team of economists published the NAB Australian Wellbeing Index (NAB Index) report on Australian's wellbeing which used four questions covering life satisfaction and meaning, happiness and anxiety. Home ownership, relationships, feeling safe and a comfortable standard of living were key drivers of positive wellbeing for Australians. More surprising was what was problematic. To quote NAB "Australians tell us that the single greatest detractor of their wellbeing is a lack of time, ahead of issues such as domestic violence, substance use/abuse, retirement funding, and buying, selling or finding a home." This problem echoes findings for healthy living. The drivers of the world's disease burden, causing nearly two thirds of premature deaths, are almost entirely preventable. These diseases (e.g., diabetes, cardiovascular illnesses, and many cancers) are not due to injury or infection but caused by how people live, exercise and eat. Most people know what they need to do to keep healthy, yet when asked why they don't exercise or eat healthy food, the main reason they give is lack of time (1, 2).

Time scarcity refers to the experience of not enough time, particularly free time (1, 3). It is linked to changes in working life, with longer fulltime work hours (Australia is currently ranked 9th in the OECD for the proportion of employed adults working more than 50 hours per week) and faster work pace. The compression of free time is most acute for families (4). In Australia, more than half of all women with children are in the labour force, a change that has transformed family time. For example, US data shows that in 1970, the combined work hours of couples with children was about 45 hours per week because in most families only one person was in paid work. However in 2000 the combined work hours was closer to 82 a week because now both parents work (5). This is somewhat lower in Australia (our own calculations place it at about 72 hours per week) but still represents a major transformation in the time resources of households.

What is meant by time, however, is much more than hours and minutes — time involves intensity and speed, schedules, rhythms and control, and this multi-dimensional nature explains why it is so powerfully and pervasively shaping lives, health and inequality. Not everyone has the same time, nor is everyone's time granted the same value. Different demands on time both reflect and shape social status and choice. Time is increasingly equated with money, and saving time is equivalent to making a profit, creating a continuous motivation to frame actions and costs in terms of efficient use of time in the workplace and outside of it.



Technological advances have also changed time, by enabling people to do things at an order of magnitude faster. This offers opportunities for time saving (see for example the 100 hour per year time KPI for Smart Cities) but also creates expectations and pressures; workloads can be delivered digitally and at any time of day. Now many activities and tasks can— and are expected to — occur faster. There is less ‘down’ time and rising expectations to do more in less time and this leads to people rushing (6). Modernity is thus reshaping people’s lives through time as well as income; a temporal flip side to inequality that is absent from most initiatives to improve health or quality of life or design cities. If time is viewed as a both a valuable and inherently limited resource, then increasing demands on people’s time (for example, urban sprawl requiring long journeys, time taken to access services) will ‘take’ time from health, working, caring, leisure, sleeping or other activities. The changing pressures on, experience of, and valuing of time is the context within which actions and services to improve social equity, health and productivity now occur. Initiatives that can reduce time pressures or offset time costs offer a major new opportunity.

## TIME AND EQUITY

Like income, scarcity of time can also lead to inequities. Time spent in family care restricts women’s paid work (and therefore income), structuring both gender inequity in opportunity and vulnerability to poverty in the developed and developing world. The Gates Foundation, whose aim is to help address deep poverty in the developing world, writes “Poverty is not just about a lack of money. It’s about the absence of the resources the poor need to realize their potential. Two critical ones are time and energy” (7). Time scarcity is known to be linked to gender, class, life course, household composition and role status, among other social differences (8-15). Our own research in Australia shows that time poverty (measure by hours or by feeling time pressured and rushing) is socially patterned and a core dimension of gender inequality. In Australia women spend more time doing unpaid work and caregiving, and are increasingly expected to dedicate more time to the labour market. They are also more likely than men to rush. Women therefore, face greater time commitments in total, more intensified time, and proportionally more of their time will be unrewarded by income. On the other hand, men dedicate long hours to the labour market, time which is fixed, rigid and increasingly intensified, and they are reporting high rates of work-family conflict. Using HILDA data we find that being employed and having resident children remained strongly associated with time poverty measured in terms of hours per day (over 80 hours per week on committed activities such as paid and unpaid work, childcare). There was a ninefold increase in the odds for employed people experiencing time poverty, compared to those not in the labour force, and a six and eightfold increase, respectively, with having one and two or more resident children, compared to no children. Having elder or disabled carer responsibilities was also associated with an odds ratio of 2.5 for time poverty. Women are more likely to rush (measured as often or always feeling time pressed) than men (39% vs 32%) and carers more likely to rush than non-carers (43% vs 35%). Employment and presence of children showed strong associations with rushing (as they did for time poverty), markers of economic advantage (income) were unrelated, while markers of social disadvantage (lone parenthood) and gender (women) were associated with elevated odds for rushing. Further, those reporting health-related restrictions were also more likely to feel rushed (16).

Time can be therefore be considered another dimension to disadvantage and poverty (17, 18) and it also has the potential to compound other dimensions, especially income and location. Many people live in outer suburbs because they cannot afford to live closer to workplaces, services and recreation. The income driven housing choices means they then face longer commutes to work and poorer access to services, including those essential to good health such as shops selling fresh foods (19). US and Australian cities are marked by such socio-economic cleavages in location and access to transport. Living in the more affordable outer



areas of major metropolitan centres increases car dependency, locking in a sedentary lifestyle (a health risk) with the expense of running a car and the time costs of longer commutes (20-22). Our own research shows that one in 10 Australians aged 25-60 face significant constraints on both their income and time, which the planning and design of cities, transport systems and services could ameliorate (19-22).

## TIME AND PRODUCTIVITY

Becker (23) was one of the first to develop an economic approach to time that includes both work and non-work time, showing how, like money, time drives consumption and behaviour. The full cost of an activity includes its market price and the forgone value of the time it uses. Furthermore if people earn more for their time – it becomes more valuable. Similarly, like money, as time becomes scarcer, its relative value also increases (24-26). Thus both affluence and scarcity linked to adding work to care, for example, drive up the value of time and its importance to decision making. For example the September 2018 National Australia Bank (NAB) Report published by NAB's behavioural economics team found the average Australian would pay \$68 for just one more hour of time in a day but among those most affected by time stresses (young women) an extra hour was worth \$131 (27).

In Becker's theory households are producing units and utility maximisers (23). They combine time and market goods to produce more commodities, e.g. cooking a meal involves purchasing food and the time involved in choosing the meal, shopping for ingredients, preparing the food, eating it and then clearing up (28). The financial costs are mainly evident at the point of shopping, but time is the key ingredient in almost all aspects of household production and consumption. Households choose the best combinations of income, time and goods to maximise other things that they can produce and consume and so maximize their happiness. This theory however does not really grapple with the value and imperative people place on time for care, nor does it account for time for health and rest (which is largely considered under the umbrella term leisure) (29).

From an economic point of view, actions to save time will also boost productivity, and conversely, an increase in time costs will erode it. Thus commuting to and from work can be viewed as time lost to the economy as well as to health (30). The median travel time for commuters who travel from home to work during peak time in 24 Australian metropolitan and regional cities was the longest in Sydney (35 minutes), followed by Melbourne, Brisbane and Gold Coast (30 minutes), Newcastle, Queanbeyan, Perth, and Adelaide (25 minutes), Canberra (23 minutes), Sunshine Coast, Geelong, Wodonga, Toowoomba, Townville and Launceston (15-16 minutes), and the shortest in Albury, Geraldton, Greenough, Alice Springs and Mount Gambier (9-12 minutes) (31). These numbers were observed in 2011, and it is likely that increased congestion is increasing commute times. The Bureau of Infrastructure, Transport and Regional Economics estimate the commute time and congestion costs in Australia were \$16.5 billion in 2015, and without major policy changes, congestion costs are predicted to reach between \$27.7 and \$37.3 billion by 2030 (32). Thus time and time costs can be viewed as indicators of productivity, quality of life, and social disadvantage and as a dimension to social inequality.



## TIME AS A RESOURCE FOR HEALTH

*“...in health terms, time is almost like a prescription...like two fruit, five veg...and thirty minutes of physical activity”* (Health intervention designer, (33)).

The World Health Organization (WHO) considers lack of exercise a global pandemic, increasing the risk for several cancers, cardiovascular disease, obesity, diabetes Type 2, and cognitive decline. Lack of physical activity is the fourth leading risk factor for global mortality, and current guidelines set as a minimum 150 to 300 minutes per week of moderate to vigorous activity to reduce health risks. Yet less than one-half of adults meet these guidelines (34). Similarly increased intake of fresh fruit and vegetables could help reduce heart disease and a range of cancers by between 12% to 31% (35). These chronic diseases and unhealthy behaviours continue to rise despite decades of policy action and campaigns. According to the AIHW the impact on disease burdens for inactivity is comparable to the impact from smoking (36). If Governments could help people manage an extra 15 minutes of physical activity a day they could reduce the future burden of disease by 13%.

Most people know what they need to do to stay healthy, the problem is finding the time and opportunity to do so. Thus when people are asked why they don't exercise or eat healthy food, the most important reason they give is lack of time (6, 16, 33, 35, 37-40). One in five experts on obesity ranked time pressure as the single most important social trend underlying its rising rates (38).

Time can be therefore thought of as a basic health resource; people need time to access health services, build close relationships, exercise, work, play, care, rest and consume and all these activities are fundamental to health. Time has been incorporated into some wellbeing frameworks and indices, including that by Taylor (41) and the OECD Better Life Index (42). These frameworks argue that having leisure time is important for wellbeing (41, 42). In the OECD Better Life Index, time is incorporated through the Work-Life Balance indicator with measures for time devoted to leisure and personal care. Surveyed Australians reported that work-life balance was the most important aspect of their life; however, of all the indicators in the OECD Better Life Index, Australia has received the lowest score in work-life balance, with Australian workers devoting slightly less time than the OECD average on personal care and leisure and 13% of employees working very long hours (43).

Research led by ANU scholars has uncovered the following ways time and time constraints influence health. Lack of time (defined as time commitments of 70 hours per week, including work, commutes and caring duties) is as important as lack of income for increasing the risk for physical inactivity, eating foods high in fat, sugar or salt and eating out (39). For either lack of time or money, five per cent of people who were otherwise healthy moved into high-risk inactivity and eating habits within a year. Further, one in 10 Australians were experiencing a combination of time and income scarcity, and this more than doubled their risk of inactivity. Time also affects health (physical activity, self-rated health and mental health) via the experience of rushing, a problem particularly widespread among lone parents, women and people who combine employment with a health disability, additionally revealing one way time is connected to social disadvantage (16). ANU has also been leading the analysis of how employment-related time is shaping health, especially across generations and between genders. This research was the first to discover and explain why time conflicts linked to combining work with care (40, 44, 45) and working at unsociable times (weekends, evening and nights) is disrupting family relationships (46). These analyses have shown that the health consequences are reaching beyond employed mothers and fathers, and shaping the health and wellbeing of children.



## HEALTH IN THE ACT CONTEXT

Relative to the rest of the country people living in the ACT seem well resourced. Median household income is higher \$2070 (Australian median is \$1438), as is educational attainment, with 37% of ACT residents holding a Bachelor or higher degree compared with the national average of 22%. This is not the case for all resources, especially when it comes to time. In the week before the 2016 census 45% of the ACT labour force worked more than 40 hours a week (the Australian average is 43%) and ACT residents are more likely to do unpaid domestic work, care for children and engage in voluntary work (47). The number of families with two parents employed full time is nearly 10% higher than the Australian average, indicating that there are significantly higher rates of households under extreme time stress, based on Australian averages (48).

Young Australians are another population group under time stress, Australia has the third highest rate of tertiary students who combine full time study with jobs, expanding their 'work' week to an average 60 hours (49). Nearly one in nine people in the ACT is engaged in tertiary study, considerably higher than the Australian population average. The ACT is therefore a busy community, with significant proportions of its residents facing time scarcity, often (for example, in the case of families or students) combined with income constraints. Not only is time stress and time inequality a dimension of gender inequality, it is an important dimension to quality of life and city liveability. Our own work also shows it is a major problem for prevention and healthy living and finding ways to save time or combine healthy activities into everyday time use could help reduce the unsustainable chronic disease burden linked to lack of physical activity and unhealthy eating. This report considers how the ACT Government via its services and planning might ensure that new initiatives seek to be cost effective and fair in terms of money and in terms of time.

According to the ACT Chief Health Officer's Report 2018 (37), more than half of Canberra's adults were overweight or obese (63.5%) in 2014-2015; 39.1% were overweight and 23.9% were obese. Surveys conducted over the past decade have reported that at least one in 5 children in the ACT are overweight or obese. While the latest figures for 2015-2016 suggest a downward trend, the decrease was not statistically significant. Despite their affluence and relatively high education attainment, large proportions of ACT residents do not eat healthy food or undertake enough physical activity to protect their health. Vegetable intake remains low in adults, with only around one in 10 adults consuming the recommended five serves of vegetables per day. Children eat more fruit, but vegetable intake is still low, with only one in 10 children aged 5-17 years consuming the recommended 5 serves of vegetables daily and only about one half of all Canberrans are meeting the minimum physical activity guidelines of 60 minutes of activity every day (children) or 30 minutes per day (adults). Like many other Australian communities, ACT is also car dependent, thus the vast majority of ACT residents use their car for travel to work (64% compared with 62% Australian average) and very few use public transport (6% compared with 12%). About 5% of ACT adult residents walk to work (Australian rate of 4%) and 16.4% uses some form of active transport. However more children are walking or riding to school, with an average increase of 1.6% per year between 2007 and 2016. In 2012-2016, 38.7% of children rode or walked to school.



# PROGRAMS, POLICIES, SERVICES AND ACTIONS TO ADDRESS TIME CONSTRAINTS

A standard literature review was conducted in August-October 2018 with the aim of identifying existing policies and actions that aim to overcome time barriers to healthy living. We specifically searched for programs, policies, services, and actions that address environmental/social planning, regulation and legislation, fiscal measures, communications/marketing, and service provision, in line with Michie et al (50).

The search strategy involved first identifying peer-reviewed evaluations and publications. Search terms were entered into bibliographic databases including Scopus and Google Scholar. We then searched the grey literature through relevant government websites and through Google searches. Search terms included the areas detailed above, “time”, “schools”, “workplaces”, “paperwork” “parent education”, “mass media”, “social marketing”, “active travel”, “urban planning”, “urban design”, and “smart cities”. Papers and documents discussing policies and actions that consider time barriers were included. If the paper or document was not published in English and could not be translated using Google Translate, it was excluded.

A descriptive review of the programs, policies, services and actions identified in the literature review, and how they address time constraints, is provided in the next section, and a tabulated at the end of the document (Table: Case Studies).

## ENVIRONMENTAL, TRANSPORT AND URBAN PLANNING ACTIONS

### Smart Cities

Smart Cities are an example of an action that aims to make cities more liveable, sustainable and healthy and one strategy is to directly address time costs. They use technology and data to improve urban infrastructure while minimising both financial and time costs, to drive economic activity, foster innovation, and sustainably manage energy, resources and services in order to improve the quality of life for the population (51, 52). Smart cities began to emerge as cities (in Europe in particular) realised that “to become healthier they have to go digital” (53). As well as promoting health through promoting healthier environments, incorporating technology into healthcare and wellbeing services, technologies employed in smart cities play a significant role in reducing costs associated with health hazards and healthcare (52-54). Smart services offered in smart cities also improve quality of life by increasing efficiency in daily life. Juniper research group argues that the most important outcomes for citizens is saving time and an improved quality of life (55). They conducted a study of smart city initiatives to evaluate their achievements on these counts. They calculated that if smart city technology was used, cities could save citizens 125 hours, or 15 days, or three working weeks of time every year (Figure 2). Better transport and transport synchronisation could save 60 hours via smart parking, traffic systems and public transport, and an additional 35 hours of time savings from reduced disruptions due to crime or accidents. They argue there are productivity benefits directly flowing from simpler, more efficient administrative processes when citizens engage with services that amount to 21 hours, while health care apps could save time by reducing visits to health services and streamline waiting times when people do. Juniper’s publication lists in detail the types of initiatives used by Smart Cities to achieve these sorts of time savings.

The motto in Kalasatama, a smart city district of Helsinki, is 'One More Hour a Day', as smart services aim to save one hour of resident's time every day (56). For this report we interviewed the Finnish Forum Virium Development Manager of the Smart Kalasatama Project in August 2018. Her firm has worked closely with the Helsinki health services when the decision was made to revamp and rebuild the Kalasatama district to make it a smart city area. They ran seven workshops with residents and companies to form a common vision and it was from these workshops that the vision for saving an hour a day developed. Citizens wanted more time and help to reduce time costs of travelling or navigating services while services and business saw time savings as helping lower costs. There was consensus on this as a KPI for the development, although their performance has not been evaluated.

Pedestrian time matters as well as public transport. Recent evaluation in New Zealand assessed the delays pedestrians faced at one inner City intersection in Auckland, estimating these to be totalling 161 hours a year overall (57). They further showed how such time losses then reduced productivity including retail sales, job density and business transactions in the CBD, at a cost to the city of \$13 in terms of travel time, and up to \$200 million a year in productivity.

The smart city designers consulted with health professionals, seeking to achieve health gains from improving citizen mobility and active transport. For example, they are currently running two pilots to make healthy eating easier (and quicker). A new app developed by the initiative advises on recipes and what to buy to reduce time spent in healthy food planning and provisioning.

Since 2015 several of the 21 agile piloting projects have focussed directly or indirectly on time savings. The everyday mobility pilot aimed to bring different transport modes together to make mobility as easy and quick as using a car. Rent a park apps enabled people to find parking spaces quickly when those who owned them were not using them and they in turn were able to earn income. They note under lessons learned that residents do not want and were unwilling to participate in any technological solutions that do not deliver them a time, money or social benefit.



## HOW IS TIME GIVEN BACK?

Citizens are given back three\*\* working weeks worth of time, thanks to technology used in four distinct sectors.

### SAVE 60 HOURS WITH MOBILITY EFFICIENCIES

With smart traffic systems and open data platforms, citizens can efficiently navigate throughout their cities.



### SAVE 35 HOURS WITH PUBLIC SAFETY EFFICIENCIES

Using machine learning to predict crime and traffic and to expedite routes reduces emergency response time.



### SAVE 9 HOURS WITH HEALTHCARE EFFICIENCIES

By using mobile apps instead of physically visiting the doctor, both drive and wait times are reduced.



### SAVE 21 HOURS WITH PRODUCTIVITY EFFICIENCIES

By breaking down traditional silos, ongoing information sharing between government departments speeds up request processing time.



To learn more about the benefits of smart cities and how their citizens experience a better overall quality of life, read the full case study here. <https://newsroom.intel.com/news/smart-cities-iot-research-125-hours/>

\* Source: <https://apnews.com/40b530cc84ab4931874e1f7efb411a22>

\*\* Source: Juniper Research

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\*Other names and brands may be shown as the property of others.



Figure 2: An excerpt from Time savings with Smart Cities infographic by Intel and Juniper Research (58):



## Urban design

While the built environment can facilitate or constrain physical activity, the way it does this through time costs or savings has not been well accounted for (59). Urban design and planning can be used to reduce the time burdens of everyday life, thereby mitigating one key barrier to improving health and wellbeing.

Western Australia's **Liveable Neighbourhoods: Community Design Code (LN)** provides time-related tools for policy makers, as well as precedent for considering time in urban design and planning, with strong links to population health due to its consideration of physical activity, sustainability and access to services.

LN was introduced in 1997 in Western Australia as part of the state planning strategy for sustainability. Currently in its fourth edition (60), LN offers an alternative, more integrated assessment criteria for development proposals from the district to subdivision scale. Based on principles of new urbanism, the LN policy aims to see urban development that promotes walking and creates sustainable, local communities with higher levels of employment and service accessibility (61). LN uses Enquiry by Design workshops to integrate public consultation and participation into both LN and conventional planning (62).

Time is an indirect focus of the LN policy. However time-related tools are used to achieve LN goals. In the planning of an urban structure, LN focuses on using a walkable catchment technique, which involves clustering compact and well-defined walkable neighbourhoods and activity centres, with five and 10 minute walking catchments (400 and 800 metres on the street network) used to bound neighbourhood and public transport catchment areas (Figure 3) (62). LN also encourages street designs to have high pedestrian amenity, efficiency, legibility, and safety, which can help make pedestrian trips as short and pleasant as possible, thereby directly reducing time costs for active choices well as improving the quality of time when active (62). LN considers the time needs of a range of physical capabilities and needs, focussing on accessibility for people with disabilities, prams, and the elderly.

While the walkable catchment technique aims to make walkable neighbourhoods, the assumptions used about how far and fast people can, or are willing to, walk to certain services may be inaccurate or misleading (63). The Enquiry by Design workshops provide an opportunity for workshop participants to consider the time costs of different development and design options for different population groups.



Figure 41: Conventional subdivision around a neighbourhood centre.

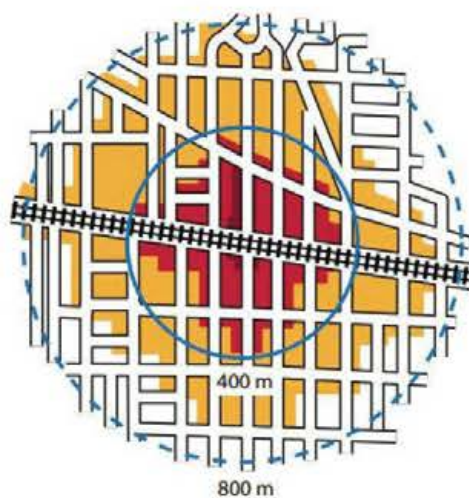


Figure 42: A walkable neighbourhood around a neighbourhood centre and transit station

Figure 3: Image of the walkable catchment technique from the Liveable Neighbourhoods Draft 2015 policy (61).



The Residential Environments (RESIDE) study has evaluated the impact of the LN policy on health and wellbeing of Perth residents. While one study found that there was no significant difference in walking behaviour between people who moved into a liveable neighbourhood development and people who moved into other types of developments (64), several other studies have found that living in highly walkable neighbourhoods or living closer to attractive open spaces is associated with increased walking and cycling, as well as reduced sitting time (women only) (65-68). In a report on the impact of the policy overall, RESIDE found that for every 10% increase in LN policy compliance, participants were 53% more likely to do any walking within their neighbourhood, 40% less likely to feel unsafe from crime, and 14% more likely to have better mental health (69).

**Cautionary note:**

Research in Victoria investigated how design and planning of a new housing development could *improve* the health and wellbeing of residents. **Selandra Rise** is located in the south-east growth corridor, 52km from Melbourne CBD. Key design features of the development included early delivery of public transport, access to green space within 300m for all residents, and walking and cycling paths (70, 71). Although these design features (living within 0.5 km or 5 minutes' walking time of green space and improved walking and cycling conditions) have been shown to have direct health benefits through increasing physical activity (72, 73), and 42% of residents reported increased physical activity levels on moving to Selandra Rise, the long commute to work (usually undertaken by car) for many residents resulted in less time for exercise (70). Commute time was associated with weight gain for some residents, with 52% of residents who commuted over an hour each way reporting a weight increase (Figure 4).



Figure 4: Work commute travel time results from research in Selandra Rise, Victoria. Image from VicHealth Report (70).



## Active transport

**Active transport programs**, which encourage less reliance on private cars and more on active alternatives like walking, cycling and public transport (74), are increasingly being implemented in order to increase physical activity and improve environmental sustainability. Active transport, and policies that encourage active transport, have been shown to have significant public health benefits through both increasing physical activity and indirect outcomes such as improved social capital and diet (73, 75-77). Not all studies though have considered time spent and distance travelled when examining associations with health (76). Travel time is an important competing benefit to active travel, as travelling by private car can save time and is the largest variable cost for many trips in cost-benefit analysis (73). A valuation of public transport time relative to car travel time found that it is necessary to have faster, frequent, and accessible services with measures to reduce or compensate the high value attached to bus time in order to tempt car users to change to public transport (78). An ACT Government Report acknowledges that increasing the uptake of active transport to work may be a challenge as only 8% of respondents said travelling to work was the most convenient time to be exercising (79).

However, active travel was found to be time-competitive over distances less than 5kms in congested urban areas, and under favourable walking or cycling conditions, travel time costs “tend to be low or even negative (time spent walking or cycling can be considered a benefit rather than a cost)” (73). In addition, by building physical activity into daily life, active travel “makes physical activity achievable for people who don’t have time...” and active travel reaches “population groups that are less likely to participate in leisure-time activity”(73).

In Australia, many state, territory, and council governments have implemented active transport policies. The ACT Government is committed to promoting walking and cycling through offering bike share, bike stops, Canberra Walk & Ride week, Park & Pedal, the ACTiveLog Smartphone App, and the Active Travel Office (80). The city of Gold Coast has a 10-year active transport plan, which includes designing and delivering infrastructure that promote active transport and result in time savings for pedestrians and cyclists (81). In 2017 in NSW, more than 150 walking and cycling projects received \$62 million in funding to encourage access to safe active transport options (82).

In a report examining the cost and health benefits of active transport in Queensland, there is a summary and critical analysis of studies and tools used to quantify and monetise the benefits of active travel (73). One of these tools is the **Active Transport Tool (ATT)**, a computer-based tool that local councils could use to evaluate active transport initiatives developed by the International Council for Local Environmental Initiatives (ICLEI) and co-funded by VicHealth. The ATT quantified time costs and savings in order to market health and environmental initiatives by calculating the time, health, financial, and environmental benefits of active transport (33). The ATT included a calculator for the potential time savings for parents if children walked to school (33).

The **TravelSmart** program (Australian Government-funded initiative) promoted sustainable transport. TravelSmart considered how users could save time and improve the quality of travel time, as well as promoting the health benefits of active transport (33). “Despite taking a socio-structural understanding of time barriers, the material produced by TravelSmart was directed at individual behaviour change. However the focus was on pragmatic ways to save time with little emphasis on choice or changing perceptions. For example, leaflets (e.g. Time is of the essence brochure) presented strategies to save travel time by planning ahead, trip chaining (each travel trip serving multiple tasks) and phoning in advance to see whether appointments were running to schedule” (33).



In Cremona, Italy, the Italian Law 53/2000 saw the creation of both a Territorial Timetable Plan and Time Office. Time policy was further enshrined by the Lombardy Regional Act 28/2004, which enacts and provides for financial support for Italian urban time policy. One aspect of Cremona's "**Wellness in the City**" (**BiC Project**) rethinks mobility to try to reduce pollution and transport time. In order to improve sustainable mobility and reduce car pollution, the project aims to provide alternate means of transport to people working in the city centre (83). Initiatives include running a flexible, small-scale bus service that runs on the request of users, encouraging the use of bicycles and adding additional bike racks in the city, organising education sessions on sustainable mobility and flexible transport systems, and restricting motor vehicle access to the historical city centre while enlarging walkable areas (83). Through changing working times, changing habits, and providing incentives for collective transport (including reducing transport time), the BiC Project looks to modify travel demand. Limited evaluation of initiatives has been published on the municipality website in Italian.

**Parents are a particularly time poor demographic group and this can have a flow on effect for children's physical activity. Active school transport** is a program that aims to improve daily physical activity levels, body composition, and cardiovascular fitness in children. A systematic review found that in the majority of studies, active school transport programs lead to increases in physical activity, but there was conflicting evidence on the associations between active school transport and body composition and cardiovascular fitness (84).

Examples of active school transport initiatives include the **Walking School Bus, Ride2School Victoria, Active School Travel Program (Brisbane), and Auckland School Travel Plans**. The Walking School Bus (WSB) demonstrates how time savings or shifting time can be incorporated into a program with benefits for population health. In a WSB, groups of children regularly walk together to and from school along safe routes, under the supervision of adult volunteers (85). The WSB has been implemented by local councils in Victoria and other Australian states, as well as internationally. It has been promoted for its health, environmental and social/community benefits and gone through several rounds of evaluation.

WSB aims to increase the amount of physical activity in school children by substituting car trips with walking trips to and from school, to equip children to safely navigate their local areas and to forge stronger community ties and cooperation between families, schools and local government (85). It has been shown to increase children's daily moderate-to-vigorous physical activity (86, 87). While Australian studies have found that the WSB program is not an effective or cost-effective measure in primary schools to reduce childhood obesity (88, 89), not all social and health benefits from the WSB may have been measured (90).

The WSB can give time to parents (save them time) by relieving them of the need to escort children to school (91-93). However, the WSB is reliant on the donation of time by the school (particularly by a school contact officer), adult volunteers and external partners (including council staff), all of whom may already be under time pressure (94). Employing a WSB coordinator to do much of the organisational and promotional work, catering to the time requirements of those involved (e.g. scheduling volunteer induction around school start or end times) (85) can help to minimise the time burdens on these groups.

WSB routes are also designed to fit in with children's, volunteers' and schools' time requirements, through relatively short route duration (usually around 30 minutes (94)) and stops scheduled so that the WSB arrives on time (95). The number of WSB routes run per week relates to demand for routes and the time resources volunteered by adult supervisors (94). Recently, a mobile app has been shown to be helpful in managing a WSB by registering children's participation and providing parents with real-time information on the group's location and safe arrival at the destination (96).



The provision of ongoing and sufficient time for both organising and running the WSB are crucial to sustaining WSB success (94). High turnover in schools and the variability of time demands on parents may mean that there is a long term and extensive organisational commitment of time needed to sustain the WSB (97). Given both the importance and scarcity of reliable volunteers for the WSB, it may be advisable to pay WSB adult supervisors (96). Alternatively, other community members who tend to have greater time resources available to them could be engaged (e.g. retirees) (85). Either way, defining real or significant time barriers is important to identify targeted measures to address the time costs of participation (33).

Barriers to successful WSB programs include parents' lack of time or unwillingness to change established routines and the time burden of training volunteers, and inadequate 'green-man' time for a group of children to safely cross the street (85, 94). While one study found that WSB may increase the number of children walking to school among urban, low-income students, another study concludes that WSB may be more successful at schools in wealthy neighbourhoods, rather than disadvantaged ones (98). The WSB does not tackle urban form and influence on walking, rather social and normative context. The Greenlight project, which aims to improve the cross-ability of intersections (99), creates impetus for changes to urban form.

## REGULATORY AND LEGISLATIVE ACTIONS

Extensive or complex paperwork required by citizens can be a barrier to service access, particularly for at-risk groups (100, 101). In Australia, **Regulatory Impact Assessments (RIA)** and **Regulatory Impact Statements (RIS)** are used to ensure that regulations, or other policy actions, provide the greatest benefit to the community, relative to overall costs imposed (102, 103). RIA and RIS explicitly consider time as a cost of a regulation or policy; however generally only in the context of legal obligations of businesses (102). While the Triple Bottom Line Assessment Framework seeks to identify and integrate social, environmental, and economic factors into policy development, time costs and benefits are not explicitly considered in this framework and would be likely to be welcomed by business (104). Considering time costs and benefits to all citizens and strategies to minimise redundancy and co-ordinate the gathering of information would be one key strategy to address the time burdens of regulation.

### Cautionary note:

In the United States, the cumulative burden of paperwork is estimated at 11.6 billion hours. While the **Paperwork Reduction Act** aims to make the information collection more efficient (105), one study found that the Act generates more paperwork by "creating bureaucracy that does paperwork on paperwork" (106). Another evaluation found that the paperwork burdens were not lower following the implementation of the Act, with compliance burdens estimated to cost small businesses \$111 billion (107) (note time cost estimates of citizens were not undertaken). Proposed reform options include monetising the costs of paperwork collection, meeting targeted reduction goals from Congress, and moving more reporting requirements online (107). This evaluation was only from the perspective of small businesses though, and further evaluations of the Act from other perspectives are needed.



## WORK CONDITIONS

Work-time leave, flexibility, and shorter working hours have been implemented or trialled to improve workers' health and gender equality, while maintaining or improving productivity. In Australia, in the early and mid-1800s, work hours were long, often as long as 14 hours six days a week (108). In 1855, the Stonemasons started a campaign to work an eight-hour day with no loss of pay. While the right to the eight-hour day was established in the building industry by 1858, it was not achieved nationally by all workers until it was legislated in 1948, based on arguments that long working hours were detrimental to workers' health (108). Today, long working hours (usually > 45 or 50 hours per week) have been associated with poor health outcomes, including coronary heart disease, cardiovascular disease, and stroke (109-111). Currently, at least one quarter of all employed Australians work past the National Employment Standard recommendation of 38 work hours weekly. One in eight employed Australians work longer than 50 hours per week.

### Leave and Flexibility

Time constraints, including unpaid care, can impact people's (particularly women's) labour force outcomes, such as labour force participation, wages, and job quality, and therefore increase income poverty (17, 112). In Australia, between 1992 and 2006, levels of employment rose, mothers had high rates of part-time employment, men's employment involved long hours and childcare costs increased, resulting in increasing time-costs of parenting, particularly for mothers (113). Work-time leave, flexibility, and other family-friendly policies in the workplace can help reduce employees' time pressures (114). Family-friendly policies are not only important for mothers, but also for fathers, who have reported more psychological distress when working long hours, night shifts, or inflexible working hours (115).

Annual work leave entitlements have been shown to be beneficial for health (116-118). In 2011 in Australia, 80.1% of employees had leave entitlements, although only 76.2% of female employees had leave entitlements compared to 83.4% of male employees (119). Some Australian companies have instituted an unlimited paid leave policy, allowing employees to decide how much time off they would like to take (120). A consultancy company Inventium found that after two years of having an **unlimited leave policy**, the average leave taken was 27 days (five weeks and two days) (120). In an article written by the founder of Inventium, she explains that it is fundamentally unfair that work hours are not capped, but annual leave is (121). Although some companies that have trialled unlimited leave policies found that staff actually took less leave for fear that they would be judged for taking too much leave, the founder of Inventium believes it has been successful for them because she set a minimum amount of leave to take, modelled it from the top down, commended people publically for taking a 'Rebalance day' and did not create a set of instructions for the policy, but launched it with clear intent (121). While anecdotally unlimited paid leave policies have improved work-life balance and happiness (120), there has not been a formal evaluation of the effects on health and wellbeing.

**Paid parental leave** has been associated with both parent and child health (45, 115, 122, 123). The Australian national 18 week paid maternity leave scheme has been shown to universally benefit mothers' health, although it does not redress health inequalities (124). While access to parental leave is important for wellbeing, encouraging parents to use the leave is also imperative. One study found that fathers' access to parental or other forms of leave was not associated with work-family conflict, enrichment or mental health, but the study did not have data on actual use of the leave (115). A more recent study found that workplace demands undercut fathers' capacity to use family-friendly initiatives and engage with their children (45).



Work flexibility can also improve wellbeing through reducing time constraints. In a survey on flexible working arrangements in Queensland in 2010, an estimated 58% of employed people used some form of flexible working arrangement (125). People in families with children used a higher proportion of all the flexible working arrangements (125). Approximately 44% of males and 40% of females did not make use of flexible work arrangements, however females did report almost twice the use of ‘working shorter hours for an agreed period of time’ (125). In the USA, the workplace initiative **STAR (Support. Transform. Achieve. Results.)** is designed to promote control over work time for employees and greater supervisor support for employees’ work-life balance (126). In a group-randomised field trial, over 12 months, STAR reduced burnout, stress levels, and psychological distress, as well as increasing job satisfaction (126). These findings suggest that a program such as STAR, which supports flexible time in the workplace can improve health and wellbeing.



**Figure 5: Results from Perpetual Guardian’s trial of the 4 day working week.** Image from Perpetual Guardian’s website (<https://www.4dayweek.co.nz/background/>, 134).

In Sweden, private companies and publicly funded health services have trialled six hour working days (with no change to salary) to try to improve work-life balance and gender equality. The six hour working day is meant to give people more time to spend with their families, to learn new things, or to exercise more (127). To keep up efficiency six hour working days involve job sharing, when not all jobs can be cut into six hour shifts, hiring more staff (128). The trials have found that employees had decreased stress levels, better sleep, took fewer sick days, were more active, and found leisure time more satisfying while maintaining or boosting productivity (128-130). However it is unknown whether these effects would be long lasting (128). There are fears that a six hour working day would be costly to employers from increased salary costs of new hires (131). While the trial in Gothenburg added 17 new jobs costing the city approximately 1 million euros, it also reduced national costs for unemployment (128). A full cost benefit analysis for the six hour working day is needed to assess the costs and savings of the policy in terms of salary, productivity, and health benefits.

In March 2018, a New Zealand company Perpetual Guardian ran a six week trial of a four day (paid five day) working week with its 240 office workers. Evaluations of the trial found that productivity targets were met (and in some cases exceeded) (132, 133). In addition, employees felt more engaged and empowered, reported an increased level of collaboration and teamwork, improved work life balance, and lower stress levels (Figure 5) (132-134). While few people who participated in the trial evaluation reported challenges or concerns, some individuals reported increased stress to complete work tasks in a shorter amount of time or concerns that the level of skill variation with a team made it difficult for some to act in more complex roles or tasks (132).



## Shorter working hours

**Breastfeeding friendly workplace initiatives.** Breastfeeding is fundamental to the wellbeing of infants and it relies on maternal time. Exclusive breastfeeding to 6 months is recommended by the World Health Organisation and the National Health and Medical Research Council. Employed women are less likely to breastfeed, and exclusive breastfeeding is lower among full time employed women in Australia. Women who receive paid maternity leave and, on return to work, lactation breaks or flexible work times, have higher rates of exclusive and ongoing breastfeeding. These policies, paid maternity leave and flexible work-time on return to work, are good examples of how policies can consider time to achieve health outcomes. Several ACT government departments are 'breastfeeding friendly' as accredited by the Australian Breastfeeding Association, a particularly high number compared with other states and territories. The three key elements of the scheme are: dedicated facilities, dedicated work time, and support from employers and colleagues.

## COMMUNICATION AND SOCIAL MARKETING ACTIONS

Over the past decade, there have been several mass media and social marketing campaigns in Australia encouraging people to increase their physical activity and live healthier lifestyles. These include **Find Thirty®. It's Not a Big Exercise** (2002-2005 WA; 2008-2011 Tasmania), **Find Thirty® every day** (2007-2011 WA; 2011-2014 Tasmania), **Measure Up** (2008-2011 Australian Government Initiative), **Swap it Don't Stop it** (2011-2013 Australian Government initiative), LiveLighter (started in 2012 in WA, extended to Victoria and the ACT in 2014 and the NT in 2015), and Sport Australia's **Find your 30** campaign (launched in 2018).

The **Find Thirty®** campaign had a clear time dimension, as it asked people to find at least thirty minutes a day for moderate exercise (135). After a literature review and focus groups following the It's Not a Big Exercise campaign found that time was a major barrier to physical activity, the second wave of the campaign, **Find Thirty® every day**, reframed time spent exercising as a way of meeting valued priorities, such as spending time with families, rather than competing or changing those priorities (33). This is in line with a review of evidence-based actions in physical activity, which found that a key step for effective action is to empower people to achieve recommended levels of physical activity where they live, work, and learn (77). In an evaluation of **Find Thirty® every day**, it was shown to increase awareness (almost 50% after two years) and intention to exercise, specifically in women and in the low-SES group (136). In addition, significant increases in self-reported walking, vigorous, and total physical activity (adjusted odds ratio 1.22, 1.00-1.48 between baseline and follow up two) were reported in the WA campaign (136). In Tasmania, 22% of respondents reported that the campaign had prompted them to change their level of physical activity, with women, those under 55 years, and those with no disability more likely to express the campaign had influenced their level of physical activity (137).

The **Measure Up** and **Swap it Don't Stop it** campaigns emphasised how people might change their lifestyle behaviours to make healthier choices through small changes (138, 139). While the Measure Up campaign asked people to find more time to exercise and eat healthy, **Swap it Don't Stop it** suggested ways to use the time that people were spending doing one activity to do a healthier one. While both campaigns increased awareness (to varying degrees), there were no significant changes in reported fruit and vegetable intake nor in physical activity from the Measure Up Campaign and only a limited association with campaign-related behaviours from **Swap it Don't Stop it** (138, 139).

One of the more recent campaigns, **LiveLighter**, advocates for healthier choices and healthier environments. The campaign presents graphic images of visceral fat to illustrate negative health effects of being overweight, as well as recommending alternatives to obesogenic behaviour (140). The campaign



addresses time barriers by helping participants save time in meal planning and preparation by providing free quick recipes, meal plans, and shopping lists through an online platform. Participants can also keep a food diary, track their activity, and track their weight. An evaluation of the campaign found that 54% of people were aware of the campaign, with recall higher among overweight adults and parents, but equal between socio-economic groups (140). Increases were seen in self-referent thoughts about the health-harms of being overweight and physical activity intentions (140). There was no significant behaviour change observed, although authors believe this may be because the evaluation was conducted too early for behaviour change to register (140).

A systematic review of physical activity mass media campaigns found that less than 50% (7/15) reported significant improvements in physical activity, with few examples of sustained behaviour change (141). Surprisingly, despite time being the key barrier reported by people, time was not considered in this review nor in the behavioural theory approaches used to testing campaign messages (141).

## SERVICE PROVISION

Accessing services can be time intensive, with people having to give up work and/or leisure time in order to receive care (140). Location of services, travel times, wait times, opening hours, and costs have been found to be important barriers to accessing services (142, 143).

Through free telehealth and digital services, **Healthdirect Australia** provides access to healthcare information and advice to users with minimal time, monetary, or geographic restrictions (144, 145). Healthdirect overcomes scheduling time barriers through services such as the Afterhours GP Helpline, which gives access to doctors in the evenings, weekends, and public holidays, and their Pregnancy, Birth and Baby service, which provides video call access to maternal child health nurses so that parents do not have to leave their home or travel for face-to-face access to a health professional (144).

There have been a number of programs, policies and actions to try to **reduce wait times** for services. One example is efforts to reduce wait times for consultations at primary care and at emergency departments. A systematic literature review of actions designed to reduce wait times for primary care appointments found that open access scheduling, and other patient-centred actions such as telephone calls for follow-up consultations, presence of nurse practitioners on staff, and email consultations, were effective in reducing wait times (146). Actions in emergency departments including adopting a team-based model of care, improving technology for registration, triage, identification, and recording, ambulance diversions, and reducing admitted patient boarding times have shown to be successful at reducing waiting times (147-150). In the ACT, patient time is potentially saved with live emergency department waiting times posted online (151) (Figure 6).

There have also been efforts to reduce wait times for government customer and regulatory services. In the ACT, wait time was found to be a key driver of satisfaction for people with Access Canberra service and contact centres (152). To improve satisfaction, the report recommends dedicating additional resources to reducing wait time, or better managing perceptions around wait times – including promoting online platforms (152). The Access Canberra website provides an indication of waiting times in each location and encourages people to “Save time and do it online!” with over 300 transaction options available on their website (153). Access Canberra does not consider however, how much time it may take the customer to perform transactions online.



In 2015, the Australian government established 30 **Primary Health Networks (PHNs)** to replace Medicare Locals, which aim to increase “efficiency and effectiveness of medical services for patients, particularly those at risk of poor health outcomes” and improve the “coordination of care to ensure patients receive the right care in the right place at the right time” (154). There is no evidence though on whether PHNs save people time by integrating health care services, and while PHN funding may be positive for equity, there is no evidence yet for positive effects of PHN implementation on equity of access (155).

Offering **vaccination at schools and workplaces** has been shown to increase vaccine uptake and save people time from having to visit traditional health services to receive their immunisations. In a study in Israel, significantly more people who were offered the influenza vaccine at work were vaccinated than those who were not offered the vaccine at work (156). An Australian study found that school-based adolescent vaccination programs were more effective compared to general practitioner based programs (157). Providing routine childhood immunisations during home visits were particularly effective in Aboriginal and Torres Strait Islander communities (158).



Figure 6: Screenshot of the ACT Health website showing live emergency department waiting times (<https://www.health.act.gov.au/emergency-department-waiting-times>, 151)

The time it takes to complete health care-related paperwork can affect access to health care, with several studies from Australia and overseas finding that the amount of time doctors and other health care providers need to spend on paperwork acts as a barrier to access and services (159-162). **Healthcare information technology** can help in reducing the amount of time health care providers have to spend on paperwork; however, concerns regarding these IT systems from health care providers and health consumers must be taken into account (163-165).

### Parent education programs

Research on enrolment and engagement in preventative parenting education programs have found that lack of time and scheduling conflicts are the top barriers to participation and retention (167, 168). One



study found that mothers who reported the lowest levels of time constraints were approximately three times more likely to enrol in a program than those who reported the highest time constraints (168).

The program **Raising Successful Children Program**, an eight session preventative parent program designed for high-risk minority parents from low-income-inner city communities, considered time-related barriers to attendance by scheduling sessions at times convenient to parents, providing transport to families to and from the session, providing meals for all family members, and providing child care (169). The participation rate for this program was 70%, much higher than in comparable projects. The **SafeCare® Dad to Kids (Dad2K)** program found that having a home-based program with flexible scheduling meant employed and unemployed fathers were equally able to prioritise program participation (170). The **Success Through the Incredible Years Program**, a five-year study of relatively low-cost behavioural programs for young children at risk of long-term conduct problems, incorporated measures to reduce time-related barriers to success (171). Time-costs accounted for 5-20% of total cost of the parenting program (171). While program costs could be reduced by not offering time-saving options (e.g. child care and meals), this would likely affect the participation rate, and authors warn that ignoring non budgetary time costs can lead to bad policy decisions (171). While offering monetary incentives for attending parenting programs was found to increase enrolment, they were less effective in retention (172, 173).

### Healthy meals in workplaces, schools, and child care

Meal preparation can be time consuming. Offering healthy meals at workplaces, schools and child care centres helps relieve some of the time pressures from food preparation for working adults and parents and can improve dietary intake in both adults and children. There are a number of precedents demonstrating that healthy meals offered in workplaces is an effective way to improve healthy dietary intake (including increasing fruit and vegetable intake, lowering fat intake, and/or lowering caloric intake) in the short and long term (174-180). One study in Brazil showed that **workplace canteens** not only improve dietary intake, but also lower blood pressure and prevalence of hypertension (181). In Denmark, **workplace canteen healthy takeaway meals**, which are ready-to-heat meals that can be brought home for employees' families, was found to lower caloric intake and increase vegetable intake (182). In a willingness to pay study on these canteen takeaway meals, women and high educated individuals had a lower willingness to pay (183). While a study in Scotland found that it can be difficult to engage workplace catering teams to change or label food choices (184), another study found that technological solutions could help workplace caterers to help save time by managing and providing dietary information for food options (185). In the ACT, the **healthy food and drink choices policy** aims to increase the availability of healthy food and drink choices for staff, volunteers, and visitors to ACT Public Sector workplaces, facilities, activities, and functions (186). The latest evaluation of the ACT Healthy Weight Initiative found that healthier foods are now more available in workplace vending machines and a healthy choices catering providers list provides staff with a list of healthy menus making it easier to order catering. However there has not been an evaluation of the effects on improving the dietary intake of ACT Public Sector employees (187).

There are also examples of how healthy meals in childcare centres and schools and can promote healthy diets in children. Healthy meals at childcare and preschool have been shown to reduce saturated fat content and overall fat content in pre-schoolers' diets, increase fruit and vegetable consumption, and help children maintain a healthy body mass index percentile (188, 189). Not only is there evidence that healthy school meals can improve dietary intake and contribute to healthy eating habits (175, 190), but they have also been shown to lower arterial pressure, lower cholesterol, improve educational outcomes, and reduce the number of absences from school (191, 192). In Australia, state and territory initiatives, such as the **ACT Public School Food and Drink Policy** and the NSW Health School Canteen Strategy aim to improve the



availability of healthy foods in school canteens (187, 193). While these policies and strategies have made more healthy foods available in school canteens (187), there have not been evaluations on other outcomes. One study of the NSW Health School Canteen Strategy found that implementation can be influenced by local context, school type, canteen management practices, meal type, and the students.

### Access to physical activity resources

Availability and accessibility of physical activity assets are important for people to maintain regular physical activity (194). Availability and accessibility is often inequitable, with reduced access for individuals from lower socioeconomic areas (194, 195). As time pressures can be a further barrier to accessing physical activity resources (33, 196-198), reducing travel time to resources is one potential action to address this barrier. In the UK, **Doorstep Sports Clubs**, “informal sports clubs that operate at the right time, for the right price, in the right place and in the right style”, is an example of a program that aims to address the time and income barrier by providing accessible and affordable sporting opportunities to young people aged 14-25 years in areas with high deprivation (199). In 2016/17, Doorstep Sports Clubs had over 100,000 participants in over 1,000 different clubs across the UK (200).

### Workplace health promotion

The workplace can be an ideal place to offer activities and programs that support employees’ health and wellbeing (201). However, time constraints can be a major barrier for employers and employees participating in workplace health promotion (WHP) activities (201). In one study, workers in small and medium sized enterprises struggled to participate in WHP during work hours and were reluctant to use time outside of their work hours to participate (201). The study concludes that time should be considered explicitly and thoughtfully in WHP design (201).

The ACT **Healthier Work** service, as part of the Healthy Weight Initiative, is one example of a WHP initiative that has considered time costs as well as monetary costs in initiating and running programs (202). Healthier Work encourages workplaces to allow time for healthy activities during work and provides case studies of business benefits (202). The service offers examples of low-cost strategies, as well as providing a link to a workplace health savings calculator, which estimates total annual savings from workplace health promotion programs (202, 203).

## LIMITATIONS

This is the first report, to our knowledge which has systemically canvassed actions possible to address time constraints, save citizens time and potentially improve citizen health and productivity, and in the case of active transport, reduce environmental impact. A summary of all actions, policies, strategies or interventions reviewed are presented. One limitation of this review is that several actions, programs, or policies we identified have not formally been evaluated or evaluations were not peer-reviewed. Where possible we referred to the scientific literature to consider likely outcomes, however for those actions that were not formally evaluated we could not assess with any confidence their efficacy.

Another limitation is that we were unable to access peer-review papers or evaluations that were not published in English. For example, we were only able to identify a student thesis on the six hour working day in Sweden and were able to translate parts of this using Google Translate. It is likely that there are other time-focussed interactions and actions underway in other countries which we did not include as they were not available in English.

# KEY FINDINGS

## CITY PLANNING AND INFRASTRUCTURE TO SAVE TIME

*Whole of city initiatives can be designed to save time.* Smart Cities aim to make cities more liveable, sustainable and healthy, and they show that they can achieve these goals through initiatives to address time costs. They use technology and data to improve urban infrastructure as well as minimising both financial and time costs for citizens to access services, including transport, parking, and health care. Time savings is a key marketing feature of many Smart City innovations, because their research indicates it has become one of the most prominent citizen needs.

The motto in Kalasatama, a smart city district of Helsinki is 'One More Hour a Day', as smart services aim to save one hour of resident's time every day. Citizens wanted more time and so they aimed to help to reduce time costs of travelling or navigating services. Kalasatama services and business welcomed these time savings because it helped them lower costs and improved customer access. On the website this initiative notes that residents did not want and were unwilling to participate in any technological solutions that did not deliver them a time, money or social benefit.

*The way neighbourhoods are planned and new developments designed can make them time affordable and enjoyable for people to be active.* Western Australia's Liveable Neighbourhoods: Community Design Code (LN) provides time-related tools for policy makers, as well as precedent for considering time in urban design and planning. LN focuses on using a walkable catchment technique, which involves clustering compact and well-defined walkable neighbourhoods and activity centres, with five and 10 minute walking catchments (400 and 800 metres on the street network) used to bound neighbourhood and public transport catchment areas.

Cautionary tale: In Selandra Rise, long commute time was associated with weight gain for some residents and so urban planning initiatives must be in the context of a whole of city infrastructure masterplan in which time costs and benefits are estimated.

*Travel time is an important competing benefit to active living, saving time could be a key benefit identified in travel actions, and a business focus for future city innovation.* In Canberra, like most Australian cities, travelling by private car can save time compared with public transport, and time taken for travel is the largest variable cost for many trips in cost-benefit analysis. A valuation of public transport time relative to car travel time found that it is necessary to have faster, frequent, and accessible services with measures to reduce or compensate the high value attached to bus time in order to tempt car users to change to public transport. Active travel done well can reach population groups that are less likely to participate in leisure-time activity. The Italian BiC Project sought to modify travel time through changing work times, changing habits, and providing incentives for boutique collective transport (which reduced transport time).



## SERVICE AND ACTION DESIGN TO SAVE TIME

*Government actions could apply already developed principles and processes to minimise impacts on all citizens from regulatory or other actions.* In Australia, Regulatory Impact Assessments (RIA) and Regulatory Impact Statements (RIS) are used to ensure regulations, or other policy solutions, minimise any costs imposed. Both time and financial costs are calculated, they must be justified, and these criteria and processes could be deployed in other action design and evaluation, beyond those that are targeting business.

We also documented several actions to reduce wait times for government services now being developed. In the ACT, wait time was found to be a key driver of satisfaction with Access Canberra service and contact centres.

Healthdirect overcomes time barriers due to conflicts with other time commitments such as work, through services such as the Afterhours GP Helpline, which gives access to doctors in the evenings, weekends, and public holidays, and their Pregnancy, Birth and Baby service, which provides video call access to maternal child health nurses so that parents do not have to leave their home or travel for face-to-face access to a health professional.

Evaluations show open access scheduling, and other patient-centred actions such as telephone calls for follow-up consultations, presence of nurse practitioners on staff, and email consultations, were effective in reducing wait times. Offering vaccination at schools and workplaces has been shown to increase vaccine uptake and save people time from having to visit traditional health services to receive their immunisations. In the ACT, patient time is potentially saved with live emergency department waiting times posted online.

## STRATEGIES THAT TARGET THE TIME POOR

*Walking school buses (WSB) that properly resource time (of parents or school staff) are more sustainable.* Employing a WSB coordinator to do much of the organisational and promotional work, catering to the time requirements of those involved (e.g. scheduling volunteer induction around school start or end times) can help to minimise the time burdens on parents and teachers (both time poor groups). Recently, a mobile app has been shown to be helpful in managing a WSB by registering children's participation and providing parents with real-time information on the group's location and safe arrival at the destination.

*Interventions and services for families are more successful when they address time costs.* Research on enrolment and engagement in preventative parenting education programs have found that lack of time and scheduling conflicts are the top barriers to participation and retention. The Raising Successful Children Program, an eight session preventative parent program designed for high-risk minority parents from low-income-inner city communities, considered time-related barriers to attendance by scheduling sessions at times convenient to parents, providing transport to families to and from the session, providing meals for all family members, and providing child care. The participation rate for this program was 70%, much higher than in comparable projects. Designing the program to address time barriers was more effective for retention than monetary incentives.

*Taking the time cost out of healthy eating.* In Denmark, workplace canteens provide healthy takeaway meals, which are ready-to-heat meals that can be brought home for employees' families, saving time needed for planning, procuring and preparing meals. This initiative was found to lower caloric intake and increase vegetable intake. Evaluations also show that healthy school meals for children can improve dietary

intake, contribute to healthy eating habits, lower children's arterial pressure and cholesterol, improve educational outcomes and reduce the number of absences from school.

*Healthy behaviour change occurs when healthy time complements other key priorities.* Find Thirty® every day campaign reframed time spent exercising as a way of meeting other valued priorities, such as spending time with families. This was an alteration of the message (and tips) to simply find time, to avoid competition between time dedicated to being healthy with time with family or for work. This re-messaging aligns with a review of evidence-based actions in physical activity, which found that a key step for effective action is to empower people to achieve recommended levels of physical activity where they live, work, and learn.

*Workplaces are powerful allies in healthy and active living.* Many people spend the majority of their waking time at work. Work flexibility is one strategy to improve wellbeing through reducing time constraints. Approximately 44% of males and 40% of females did not make use of flexible work arrangements when they had them, and encouragement from workplaces may improve use of flexibility. We reviewed a US program termed STAR, which demonstrated how flexible time in the workplace directly improves health and wellbeing, both physical and mental while preserving business productivity.

Shorter working hour initiatives also show some promise as actions to improve time for health, however full evaluations are not yet available. Evidence to date shows clear benefits to employee wellbeing and some costs of additional hiring to employers offset by lowered use of services and government social safety nets, with no evidence of lower productivity. A full cost benefit analysis for the six hour working day is needed to assess the costs and savings of the policy in terms of salary, productivity, and health benefits.



## TABLES: CASE STUDIES

Environmental, Transport and Urban Planning Actions			
Program title	Program description	Time implications	Evaluations/Key references
Smart Cities	Using technology and data to improve urban infrastructure	Smart services in smart cities aim to make life more efficient and save people time.	Juniper research group calculated that smart city technology can save citizens 125 hours, or 15 days, of time every year (55). In Helsinki, time is a KPI for smart city development, although performance has not been evaluated.
Liveable Neighbourhoods (LN)	Community design code	LN focuses on using a walkable catchment technique, which involves clustering compact and well-defined walkable neighbourhoods and activity centres.	The Residential Environments (RESIDE) study has evaluated the impact of the LN policy on health and wellbeing of Perth residents and found that for every 10% increase in LN policy compliance, participants were 53% more likely to do any walking within their neighbourhood, 40% less likely to feel unsafe from crime, and 14% more likely to have better mental health (69).
Selandra Rise	Suburb that included health in the planning and design	All residences are within 300m to a green space and nearby walking and cycling paths. There was early delivery of public transport to promote active travel.	While 42% of residents reported increased physical activity levels on moving to Selandra Rise, the long commute to Melbourne CBD and to work for many residents resulted in less time for exercise (71).
<b>Active transport</b>			
Active transport programs	Encourage walking, cycling, and public transport for everyday commuting and travel	Time-competitive in distances less than 5kms in congested urban areas. Active transport programs combine travel time with physical activity time.	Active travel initiatives have been implemented by many Australian state, territory, and council governments (80-82). Evaluations of active travel policies and programs have found that it has significant public health benefits (73, 75-77).
Active Transport Tool (ATT)	A computer-based tool that local councils could use to evaluate active transport initiatives	The ATT quantified time costs and savings in order to market health and environmental initiatives by calculating the time, health, financial, and environmental benefits of active transport. The ATT helps to combine travel time with physical activity.	The tool was available at no cost as an online tool and was straightforward to use, but it has not been evaluated and only considers some health effects (73).
TravelSmart	Promotion of sustainable, active transport	Focused on pragmatic ways to save time. Aimed to improve the quality of travel time.	While TravelSmart used consistent methodology to evaluate cost-benefits of active travel time (73), it is not ongoing.
BiC Project	Provide alternate means of transport to people working in the city centre	Reduces transport time.	Limited evaluation of initiatives has been published on the municipality website in Italian.
Walking School Bus	Active school transport where groups of children walk together to and from school, under the supervision of adult volunteers	Parents share time burden of 'driving' the Walking School Bus. The Walking School Bus enhances children's travel time as they are learning and interacting while exercising.	The Walking School Bus has been shown to increase children's daily moderate-to-vigorous physical activity (86, 87). Barriers to successful WSB programs include parents' lack of time or unwillingness to change established routines and the time burden of training volunteers, and inadequate 'green-man' time for a group of children to safely cross the street (85, 94).

## Regulatory and Legislative Actions

Program title	Program description	Time implications	Evaluations/Key references
The United States' Paperwork Reduction Act	Legislation aiming to make the collection of information more efficient	Reduce the amount of paperwork required.	The Act generates more paperwork by "creating bureaucracy that does paperwork on paperwork" (103, 104).
Regulatory Impact Assessments and Regulatory Impact Statements	Process to ensure that regulations, or other policy solutions, provide the greatest benefit to the community, relative to overall costs imposed	Explicitly consider time as a cost of a regulation or policy.	There have been no formal evaluations of time considerations in Regulatory impact assessments. While these assessments explicitly consider time, it is generally around legal obligations of business (105).

## Work conditions

Program title	Program description	Time implications	Evaluations/Key references
Unlimited Leave Policy	Employees have access to unlimited paid annual, personal, or sick leave	Reduce the time spent working, freeing up time for other things like spending time with family or exercise.	There have been no formal evaluation on the effects of unlimited leave on health and wellbeing. Articles in The Sydney Morning Herald discuss some of the advantages and disadvantages to unlimited leave policies (120, 121).
Paid Parental Leave	Paid maternity and paternity leave	Allows new parents to spend time with their families.	Paid parental leave has been associated with both parent and child health (45, 115, 122, 123).
STAR (Support. Transform. Achieve. Results.)	Promote control over work time for employees and greater supervisor support for employees' work-life balance	Allows employees to be more flexible with their work time.	In a group-randomised field trial, over 12 months, STAR reduced burnout, stress levels, and psychological distress, as well as increasing job satisfaction (126).
Shorter working hours	Shorter working hours with maintained pay	Gives people more time to do other things, including spend time with their families, learn new things, or exercise more.	Trials in Sweden and New Zealand have found that shorter working hours improved health and work-life balance, while maintaining productivity (128-130, 132, 133).



**Communication and Social Marketing Actions**

Program title	Program description	Time implications	Evaluations/Key references
Find Thirty® It's Not Big Exercise	Mass media campaign to promote physical activity	No time component. Physical activity as a time cost.	A literature review and focus groups following the campaign found that time was a major barrier to physical activity (33).
Find Thirty® every day	Mass media campaign to promote physical activity	Reframed time spent exercising as a way of meeting valued priorities such as spending time with families.	An evaluation of the WA program found there were positive significant changes from baseline to follow up for walking, moderate, vigorous, and total physical activity (136). In Tasmanian, 22% of respondents reported that the campaign had prompted them to change their level of physical activity (137).
Measure Up	Mass media campaign to reduce lifestyle-related chronic disease risk	No time component. Physical activity as a time cost.	An evaluation of the campaign found that there were no significant changes in reported fruit and vegetable intake or in physical activity (138).
Swap it Don't Stop it	Mass media campaign to encourage Australians to make changes in lifestyle-related behaviours	Suggested ways to use time people were spending doing one activity to do a healthier one.	The campaign achieved limited effects on behaviour change, with 16% of survey respondents reporting swapping behaviour in the previous 6 months. The majority of those who reported swapping behaviour reported only one swap (14%) (139).
LiveLighter	Mass media campaign to promote healthy eating and physical activity	Helps save time in meal planning and preparation by providing free quick recipes, meal plans, and shopping lists through an online platform. Participants can also keep a food diary, track their activity, and track their weight.	There has been no evaluation of the effect of the campaign on behaviour change. An evaluation of campaign awareness found that 54% of people were aware of the campaign, with recall higher among overweight adults and parents, but equal between socio-economic groups (140).

**Service Provision**

Program title	Program description	Time implications	Evaluations/Key references
Healthdirect Australia	24/7 telehealth and digital health services	Patients do not have to travel or wait for nurse or GP consultations.	Healthdirect ED referrals had a similar level of appropriateness than self-referrals, and more than half of healthdirect-referred patients attended the ED despite a contrary recommendation (204). A systematic review of telephone triage and advice services found that the available evidence does not provide definitive answers to questions about the quality of care provided, access and equity of the service, its costs and outcomes (205).

**Service Provision**

Reducing wait times	Access to primary care services	Patients accessing primary care save time through flexibility in scheduling, reducing face-to-face services where possible and use of nurse practitioners.	Actions designed to reduce wait times for primary care appointments were found to be effective in reducing wait times (146).
	Treatment in emergency departments	Team-based model of care and increased use of technology for administration and patient management in emergency departments.	Actions to reduce waiting times in emergency departments have been shown to be successful (147-150).
	Access to government customer and regulatory services	Real-time wait time for emergency available online for ACT. Over 300 transactions for government services available online through Access Canberra (150).	Measurement of time saving through online wait times for emergency departments in the ACT has not been assessed, but could save time. Wait times have been found to be a key driver of customer satisfaction for accessing ACT Government services, with additional resources, promotion of online platforms and better management of perceptions around wait times recommended to improve satisfaction (151).
Primary Health Networks	Models of funding and delivery of health and medical services to improve the coordination of patient care	Patients save time through increased efficiency and effectiveness of medical services.	There is no evidence on whether Primary Health Networks save people time.
School and workplace vaccination programs	Vaccine delivery at schools and workplaces	Saves people time by bringing a vaccine provider to their school or workplace.	School-based adolescent vaccination programs were found to be more effective than general practitioner based programs in one Australian study (156). In another study, significantly more people who were offered the influenza vaccine at work were vaccinated than those who were not offered the vaccine at work (155).
Healthcare information technology	Technology systems to manage health information	Can reduce the amount of time health care providers spend on paperwork.	Resistance to healthcare information technology systems by health care providers must be taken into account (163-165). It takes time to learn how to use and to interact with the systems.

**Parent education programs**

Program title	Program description	Time implications	Evaluations/Key references
Raising Successful Children	An eight session preventative parent program designed for high-risk minority parents from low-income-inner city communities	Provided transport to and from the session, provided meals for all family members, provided child care.	The participation rate for the program was 70%, much higher than in comparable projects (169).
SafeCare®	Evidence-based child maltreatment prevention program	Program sessions are held at the participant's home.	A home-based program with flexible scheduling meant employed and unemployed fathers were equally able to prioritise program participation (170).
Success through the Incredible Years	Five-year study of behavioural programs for young children at risk of long-term conduct problems	Incorporated measures to reduce time-related barriers to success.	An economic analysis of this program finds that the time costs that arise in participating in the program are large and the implications for public policy should be considered (171).



## Healthy meals

Program title	Program description	Time implications	Evaluations/Key references
Workplace canteens and takeaway meals	Healthy meals in the workplace and to takeaway for after work	Helps save time spent on meal planning and preparation.	Evaluations have found that healthy meals or healthy food labelling in workplace canteens are an effective way to improve dietary intake in the short and long term, as well as lowering blood pressure and prevalence of hypertension. Workplace canteen healthy takeaway meals were found to lower caloric intake and increase vegetable intake (174-180).
Healthy meals in school and childcare	Healthy food and meals available in schools and child care centres	Helps save time spent on meal planning and preparation.	Not only is there evidence that healthy school meals can improve dietary intake and contribute to healthy eating habits (175, 190), but they have also been shown to lower arterial pressure, lower cholesterol, improve educational outcomes, and reduce the number of absences from school (191, 192).

## Access to physical activity resources

Program title	Program description	Time implications	Evaluations/Key references
Doorstep Sports Clubs	Informal sports clubs targeted at disadvantaged youths	Improving availability and accessibility of sports by having clubs in convenient locations at convenient times.	The impact of Doorstep Sports Clubs have not formally been evaluated in peer-review, but there are over 100,000 participants in over 1,000 different clubs across the UK (200).

## Workplace health promotion

Program title	Program description	Time implications	Evaluations/Key references
Healthier Work initiative	Supporting employers to develop health and wellbeing initiatives in the workplace	Allowing work-time to be used for health promotion.	Healthier Work encourages ACT workplaces to allow time for healthy activities during work and provides case studies of business benefits (202).  A study of work health promotion initiatives in small and medium sized enterprises found that employers struggled to participate in WHP during work hours and were reluctant to use time outside of their work hours to participate (201). The study concludes that time should be considered explicitly and thoughtfully in WHP design (201).

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**ACT**  
Government

Chief Minister, Treasury and  
Economic Development

Reference: ANU\_2018

Professor Rae Frances  
Dean  
College of Arts and Social Sciences  
Australian National University  
CANBERRA ACT 0200

Dear Professor Frances

Thank you for the letter from Professor Marnie Hughes-Warrington of 6 November 2018 about the ANU Extension Program - Music H Course. I provide the following response to you as the contact point for communications regarding the Community Outreach Program. I apologise for the delay in response. I have included a timeline and key correspondence on the decision process as it may be useful.

artsACT met with the ANU on the 20 December 2016 to commence discussions on the new Community Outreach Program (the Program) where it was articulated that the ACT Government was seeking a new methodology for the program. artsACT subsequently wrote to the ANU confirming that the Program needed to align to the ACT Arts Policy and be more accessible across the community.

The proposal received from the ANU on 27 April 2017 was the same Program as previous years. artsACT therefore wrote a further letter on 1 June 2017 outlining that we were seeking a new Program with broader access across the community and away from a focus on ACT school students. artsACT met with the ANU School of Art and Design and the School of Music in June 2017 to further discuss a new Program. The meetings were mutually positive in considering a suite of new program possibilities for the community.

While the revised Program received from the School of Music on 19 June 2017 included a range of new programs that engaged more broadly with the community, it continued to include programs focused on ACT school students and teachers.

The revised Program from the ANU was then assessed by artsACT with input from national peers in music and visual arts. The funding decision was made by the ACT Government. artsACT met with the School of Music on 24 November 2018 indicating that the new suite of programs had been agreed by government; however, it was unlikely that the Music Engagement Program or the Music for College program would be a priority for the arts portfolio.

This was then confirmed in our letter of 18 December 2017 where the Music Engagement Program was not successful in funding, and that the Music for College (Music H Course) would be transitioned off arts funding after 2019. There is no current arts funding avenue for the Music H Course after 2019.



As discussed at our meeting of 12 December 2018, the revised program and budget for 2019 can include an alternative model for the Developing Musicians Program within the overall budget allocation for the new Community Outreach program of \$511,248 per year. Should a revised model be presented, it would need to align with the principles of the ACT Arts Policy and not be part of any education curriculum or ATAR.

The letter of 18 December 2017 also included an offer to discuss alternate delivery models for the Music Engagement and Music for Colleges programs. In a subsequent meeting with the ANU and ACT Education on 14 February 2018, this was further discussed and the ANU indicated that these were not core priorities for the School of Music and therefore there was no interest in considering alternate delivery models.

Since the Government's announcement of the funding outcome, consistent messaging has been provided. This messaging has been that:

'The decision to cease arts funding of the Music H Course was part of refocussing of all the programs delivered by the ANU, resulting in a shift away from supporting students in the school environment, to supporting members across the whole community to access music programs and develop their skills. This shift is also in line with arts funding agencies across Australia where the priority is to support practicing artists and arts organisations that already find it a challenge to develop and present work. The Government considers that the suite of new music programs delivered through School of Music better align to the aims of the 2015 ACT Arts Policy and the Social Inclusion in the Arts: 2017 Plan.'

The funding to the School of Music is intended to provide broad access to musical opportunities for all members of the community. The changes have resulted in a range of activities which have better reach into the wider community, including for people experiencing disadvantage, women and Aboriginal and Torres Strait Islanders.

Canberra students have a number of other ways to access music programs including through Government funded music programs at Music For Canberra, and music engagement activities by the Canberra Symphony Orchestra. Canberra students have access to a number of other opportunities to engage with music through the Government's Instrumental Music Program, as well as many ACT schools providing music programs as part of their curriculum. There are also a number of community organisations that provide in school music programs.'

As you are aware, there has been community interest in the Music H Course, culminating in a petition lodged in the ACT Legislative Assembly by Ms Caroline Le Couteur MLA on 29 November 2018. The Minister for the Arts and Cultural Events is required to provide a response within three months of the petition lodgement.

Should the ANU wish to wait until the petition has had a response before submitting the revised program and budget, this would be acceptable noting that the January 2019 funding instalment cannot be released until after the revised program and budget for 2019 has been accepted.

I hope this clarifies the process and discussion with the ANU including on the Music H-Course. I would be happy to meet with you to further discuss the Community Outreach Program.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Sam Tyler', written in a cursive style.

Sam Tyler  
Director  
artsACT

14 January 2019



# From Sensors to Solutions Report 2 2017

## ***Intention of Project:***

See Report 1 for project description.

## ***Items completed in Report 1 (first half of the project term):***

- Item 1 – establishment of steering committee
- Item 2 – Initial Workshop with ACT Government

## ***Item 8 Key Performance Indicators:***

- Item 1 part 1
- Item 2
- Item 3 part 1

## ***Aspects of initial Deed of Grant No longer Applicable:***

***Item 3*** - Airbus Data into the Data cube.

In the second term of this project Geoscience Australia and the CRC-SI had to drop out of the project & steering committee due to time and resource limitations. This aspect combined with the evolving nature of the project meant that we no longer were able to – and did not have a project objective - to put the processed Airbus data into the Data Cube (digital Earth Australia Platform)

***Item 6*** – Funding for potential collaborations into the future:

This project was a pathfinder for new collaborations and scoping user applications. However due to the limited funding and resources available, the direct funding of new follow-on projects was not possible, and activities in this area were restricted to scoping potential new applications for geospatial data e.g. in the Entrepreneurship Workshop.

However collaborations have developed during the course of the project, including between ANU, CSIRO and UNSW Canberra. These have been successful in attracting other sources of funding (directly from the universities, CSIRO, the Defence Materials and Technology Centre, and collaborating SMEs) to develop geo-spatial payloads and applications.

Item 6 has been facilitated - but not directly achieved - through the *Sensors to Solutions* project.

## ***Aspects Completed in the Second Term of this Project:***

**Item 4** – Entrepreneurship Workshop to facilitate collaboration between the research and entrepreneur communities to stimulate new business ideas.

This Item was achieved in September of this year at the Canberra Innovation Networks Premises in Canberra City. The day was centred around the use of geospatial data in our modern world and had invitees from around Canberra’s education, academia, government, and private industry there to explore what we use spatial data for in our everyday lives and new ways we can apply this.

This exercise took its form in a short “Hack-a-thon” where we gave the group (split into 6 teams) some basic parameters and the problem of improving or creating new ways of monitoring our fixed assets and infrastructure in the ACT. In this case it was the same parameters that we were given in the Sensors to solutions project, i.e. Airbus data capture at least every month in both 1.5m resolution imagery and 50cm resolution imagery. Teams were also told they had access to the two solutions developed during the project if they wanted to incorporate these into their ideas. The group was then given 2 hours to discuss and “hack” away at the problem using geospatial data to deliver the results.

The workshop generated several good ideas ranging from *Event management for Emergency Services*, to water monitoring and dam use, using satellite imagery to see abnormal readings in the health of grass in drought conditions and water restrictions and many more. (Please find pictures from the event in the appendix at the end of this report).

At the end of the workshop we asked the group if they had learned some new ways of using geospatial data and then if they would consider turning to geospatial methods for problem solving in the future. This was met with a resounding “Yes” from the group. A number of the participants who had no prior experience with geo-spatial data were enthusiastic about its potential for delivering increased efficiency in their sector. These included people from Law firms for their demographic and social analysis, and health for determining social and physical populations of different diseases and health issues.

## ***Other items completed through this workshop:***

**Item 5** – new collaboration opportunities:

Thanks to the success of this workshop and the partnership through CBRIN and our group, we have decided to plan more of these sessions in the future in order to really showcase the potential of geospatial data.



## ***Delivery of the Project:***

Aside from the written reports delivered by the ANU and CSIRO regarding their respective applications, this section describes what was delivered through theirs and the Steering committee's work.

## ***Tangible Aspects of this Project:***

### *Airbus Data Available:*

~6000km<sup>2</sup> of SPOT 6/7 1.5m imagery was made available in kind to the project if required at a RRP value of ~\$50,000 AUD

>15 000Km<sup>2</sup> of Pleiades 50cm Imagery was made available in kind to the project if required at a RRP value of >\$450,000AUD

### *ANU and CSIRO Applications:*

See their reports on application development and explanation of what was delivered.

Due to the timing of the project delivery, the physical delivery/presentation of the project applications will not take place until early 2018 when the respective ACT government representatives will be available for a workshop with the respective researchers. The project researchers have agreed to subsequently provide informal feedback to the Steering Committee on their workshop with the ACT government representatives, and feedback from end-users.

## ***Intangible Aspects of this project:***

Due to the nature of this project, there is very significant value in the intangible outcomes - in addition to the physical delivery of the applications back to the ACT government. This project brought together ANU, UNSW, CSIRO, CBRIN, GA and CRC-SI (noting that these last two participants had to drop out of the project due to resource and time constraints), and Airbus into one project.

Academia, research institutions, and industry all worked together. This allowed two applications to be developed through the cooperation established between the Steering Committee members, and facilitated additional collaborations between the entities and helped foster an environment that is likely to generate more activity in the future.

*Appendix 1: Entrepreneurship Workshop Photos:*







7

### SOLUTION CONCEPT WORKSHEET

**Name this solution / service:**  
 Tunable deceleration of this solution / service

**Who is the user / customer / beneficiary? (be specific - give examples!)**  
 Government  
 political parties

**What is the problem that needs to be solved? (Describe from customer's point of view)**  
 Don't have demographic intelligence to inform urban planning  
 - especially our cities  
 ex. water and roads      water quality (drinking)  
 roads of old cities      water use  
 older of houses      influence  
 when to spend money!

**What is the solution? (How can we add value to customers better than anyone else?)**  
 pay-per-action  
 ex. dynamic pricing of features  
 - dynamic  
 - granular

**Stakeholder map - Who should be leading / collaborating on this? Who do we need to partner with outside the ACT?**  
 - Government - all levels  
 - AGS  
 - energy / water companies

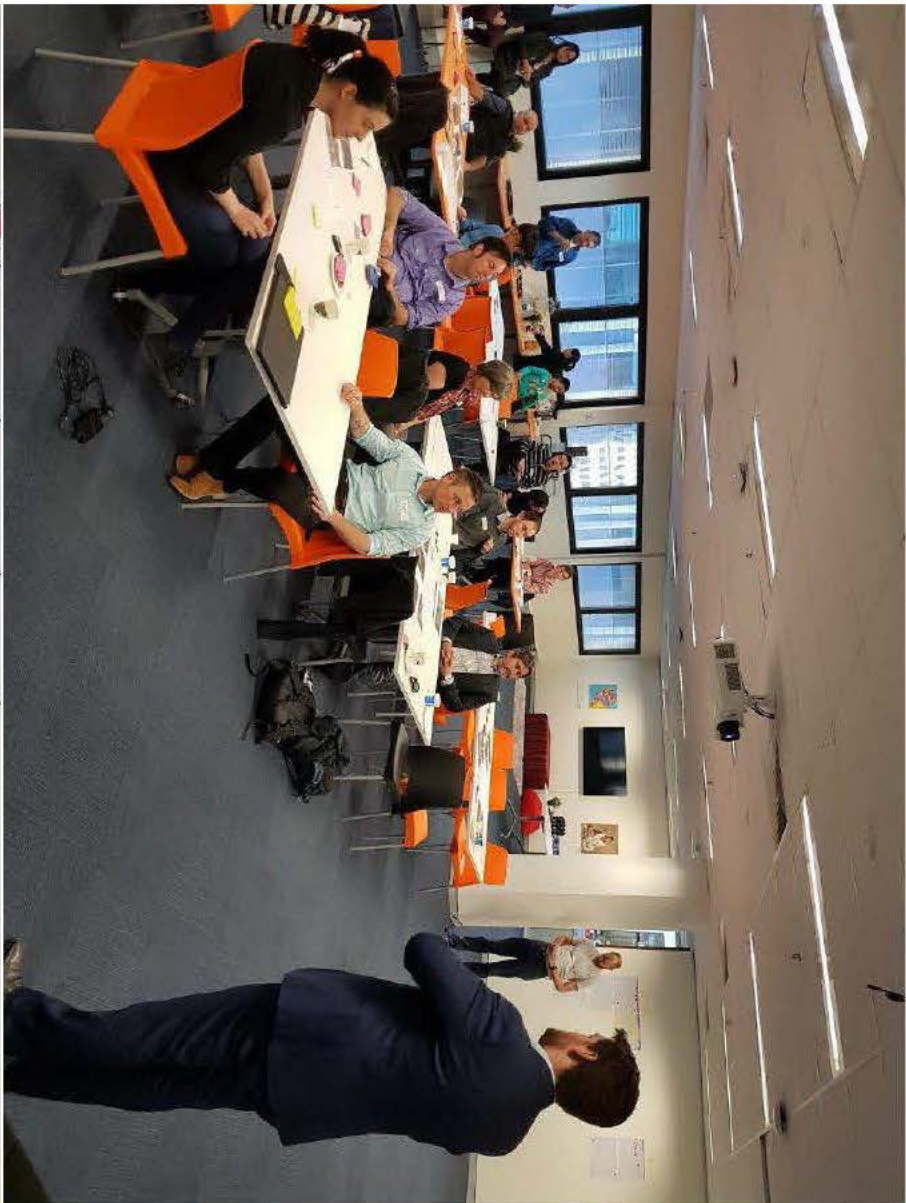
**What are the actionable next steps? (Who should do what by when?)**  
 - Developer needs to work on back  
 - they provide data -> get data  
 - who data provider -> get data  
 - Review of customer

**What are the risks related to this project / concept / solution?**  
 - data not updated  
 - access to data of history

PAGE 1

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PAGE 2





2.

### SOLUTION CONCEPT WORKSHEET

Who is the user / customer / beneficiary? (be specific - give examples)

What is the problem that needs to be solved? (Describe from customer's point of view)

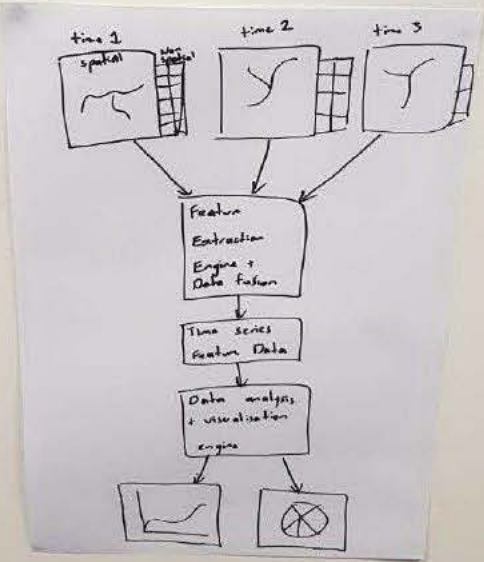
What is the solution? (How can we add value to customers better than anyone else?)

PAGE 1

What are the actionable next steps? (Who should do what by when?)

What are the risks related to this project / concept / solution?

PAGE 2



4.

**SOLUTION CONCEPT WORKSHEET**

Name: [redacted] Title: [redacted] Project: [redacted] Date: [redacted]

Two-sentence description of the solution/service: [redacted]

Who is the user / customer / beneficiary? (be specific - give examples)

- Students
- Academics
- Potential future users
- Parents
- Planners - Govt & Trade
- Environmentalists
- Specialists - researchers
- Service providers - related

What is the problem that needs to be solved? (Describe from customer's point of view)

There are many things to consider with the ACI

- Need to understand the real world use of water in the ACI
- How to integrate the ACI with the existing water management system
- How to integrate the ACI with the existing water management system

What is the solution? (How can we add value to customers better than anyone else?)

- We can provide app based to provide data to the general public
- We can provide data to the general public to help them make better decisions
- Data to be collected
- Real-time data collection
- User interface
- Location of ACI

PAGE 1

**Stakeholder map - Who should be leading / collaborating on this? Who we need to partner with outside the ACI?**

- ACI Council - ACI Implementation
- Water providers - Academics
- Researchers in ACI
- Environmentalists
- Planners - Govt & Trade
- Computer providers - Academics
- Specialists - researchers

What are the actionable next steps? (Who should do what by when?)

- Develop a map of the real world use
- Develop a water management system
- Integration of the ACI with the existing water management system
- Integration of the ACI with the existing water management system

What are the risks related to this project / concept / solution?

- The data does not support the claim
- Data is not integrated
- People already did it
- High uncertainty, then system complexity
- Unintended consequences

PAGE 2

3.

**SOLUTION CONCEPT WORKSHEET**

Name: [redacted] Title: [redacted] Project: [redacted] Date: [redacted]

Two-sentence description of the solution/service: water restriction apply to all?

Who is the user / customer / beneficiary? (be specific - give examples)

Government Regulator in water policy  
Water Management Authority, Academics

What is the problem that needs to be solved? (Describe from customer's point of view)

inefficient water restriction policy

- Understanding the household / private use of water in general
- detail
- Related to water management
- application of water management regulation & management

What is the solution? (How can we add value to customers better than anyone else?)

- Real-time water usage
- Property identification maps
- Correlate data to analyse whether water usage is being wasted
- Targeted water policy interventions

PAGE 1

**Stakeholder map - Who should be leading / collaborating on this? Who we need to partner with outside the ACI?**

- Utility Companies (AGL)
- Universities
- Air Bus
- Governments
- Home Owner (residential / commercial)
- Farmer

What are the actionable next steps? (Who should do what by when?)

- Isolate test area using historical data
- Test algorithm
- Access to data
- Develop map
- Validate / refine / solution

What are the risks related to this project / concept / solution?

- User doesn't want - status quo
- Access & privacy issues - data
- Ability to do accurate spatial analysis

PAGE 2



6.

**SOLUTION CONCEPT WORKSHEET**

Name this solution / service: CEP - Canberra Event Planner

Feasible description of this solution / service

Who is the user / customer / beneficiary? (be specific - give examples)

- Emergency services (Ambulance, police, hospitals)
- Infrastructure planners (National capital authority)

What is the problem that needs to be solved? (Describe from customer's point of view)

How many ambulances do we need at events?  
How should we plan for evacuations?

What is the solution? (How can we add value to customers better than anyone else?)

Use data on historical events (emergency) to derive density maps to build an "agent-based" model

PAGE 1

Stakeholder map - Who should be leading / collaborating on this? Who we need to partner with outside the ACT?

The General Public

single...  
high...  
- financial...

PAGE 2

AIRBUS

MODIS

keeping continuous time series - regional networks (short scale)

PLEAIDES

high resolution - 50m resolution - specific networks

super massive cloud compute

Planning Data

tree

tree

NDVI  
volume  
height  
value

PHASE 1:

- right now assessment of the state of trees - of interest

PHASE 2:

- predicting likely tree states given condition sets

PHASE 3:

- 4+ dimensional trees:
  - volume / health
  - change / time
- 5 dimensions:
  - x
  - y
  - z
  - t
  - analytics / insight

**Green Eye**

An eye on every tree in the ACT

- Tree Health
  - leaf colour
  - water content
  - leaf volume
 What can I do to take care of my tree?
- Tree Risk
  - Is my tree a hazard?
  - What are the odds it'll fall over... next time.
- Tree Value
  - How much CO<sub>2</sub> does my tree suck up?
  - What is the total value of my tree?
  - What does the future hold?

Sch 2 2.2(a)(ii)

Table	Surname	First Name	Company
7			Australian National University
2			ACT Govt
6			Geospatial Intelligence Pty Ltd
5			Adcockstone
4			ANU
3			University of Canberra
6			Centre
4			University of Canberra
5			ACT Government
1			University Canberra
1			Australian National University Advanced Instrumentation and Technology Centre
4			TEK Limited
1			ANU Research School of Astronomy & Astrophysics
2			Standard Data
3			UX
1			UX
5			ANU
3			Innovate Canberra
3			Australian National University
3			The Creative Element
6			Spectral
7			Geospatial Intelligence
7			Surmology Pty Ltd
1			ECS/ANU
7			ATI
2			University of Canberra
1			ACTPCS
6			ANU
4			Purdon Planning
2			ANU/NCI
6			University of Canberra
5			ANU RSAA
2			ANU
6			National Computational Infrastructure
4			City Renewal Authority
1			NCI
5			AGContext Pty Ltd
3			Individual
1			Australian National University
7			Consultant
2			Penton

Stakeholder map - Who should be leading / collaborating on this? Who we need to partner with outside the ACT?

Users

- Emergency services
- Planners (buildings)

Experts

- UE
- Arch
- CS/RS

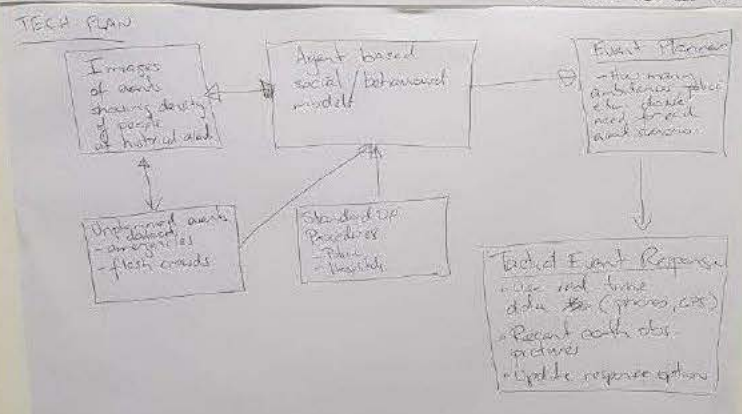
The General Public

What are the actionable next steps? (Who should do what by when?)

- Get stakeholder interest and commitment
- Build expert collection
- Build prototype

What are the risks related to this project / concept / solution?

- Misuse - people might die
- Privacy people may not like the thought of being monitored / tracked













Project Title	Summary	Development of Priority Sectors (10)	Development of National & International Competitiveness (10)	Attraction & Facilitation of Investment (10)	Collaboration between government, industry & Higher Education & Research Institutions (10)	Leveraging co-investment of ACT Government Funding (5)	Measurable Outcomes (5)	Total Score
	Overall: Very few applications addressed the goals of the RCA funding outlined in the application process, in particular: a) identification of how the application would catalyse the development of the priority sectors including the development of national and international competitiveness; b) how they would attract investment to the ACT; c) how they would promote collaboration or leverage co-investment.							
1 ACT Centre for Entrepreneurial Agri-Technology (CEAT) - ANU	High quality application which aligns with the recommendations around development of the plant and agricultural sciences precincts outlined in the ACT Investment Attraction Framework. In particular it demonstrates a further refinement of the partnership between ANU and CSIRO to connect the ANU's research strength in plant sciences with CSIRO's national footprint, building CSIRO's relationships with relevant MNCs and developing new regional education offers (and potentially global partnerships) as part of a world-class precinct. It should be noted that there is a difference between collaboration partners and entities that perform development work as subcontractors and /or users of the facility who would pay fees.	Fit's well with the Government's Investment Attraction Framework and recommendations from the Glover report. Builds on the ACT's R&D strengths and reputation in this sector.	Brings a strong partnership of national institutions, research organisations & potential international partners who have credibility and networks. Will build on the proponents existing reputation and capabilities.	Indicate they will target international partners for both R&D collaboration and investment. Also investment in future career opportunities for agri-tech researchers and students. International partners with potential investment opportunities to be built over time!	Strong representation of these partners and committed investment. Looking to build a commercialization pathway for start-up companies.	\$250K requested. ANU-\$1.25K (over 5Yrs) CSIRO \$600K (in-kind)	Clearly articulated outcomes and KPI's linked to outcomes.	
2 Enabling Industry Access to Australia's National Space Test Facility - ANU	A strong case presented with identified sector development outcomes and strong support from UNSW Canberra. Strong opportunity for investment attraction. A project that gives greater access to local companies, attracts interest from interstate and possibly international companies & would seem to be a win for the ACT Space & Spatial Information sector. The opportunity to leverage further off the ACT's MOU's in this sector would be enhanced an additional bargaining chip for engagement with the Federal Government and it's commitment to significantly fund the space sector over	A strong fit with the ACT's focus on this sector and the desire to build capability & capacity. Good opportunities to leverage off existing infrastructure and build the ACT's reputation.	The partnership between two key Australian institutions with strong local & international reputations & networks makes this a good story and worthy of support. Opportunities to leverage of the Federal Government's commitment to the space sector.	Proponents & partners have the capacity to draw international attention with potential investment as part of this Advanced Space Testing facility. Strong financial commitment from proponent.	Collaboration between two key Australian institutions with the opportunity to engage their established national & international networks. The proposal highlights the opportunities that will be available to SME & space industry to access the facility.	\$250K requested. \$250K matched funding \$50K (in-kind)	Clearly outlined objectives with KPI's defined.	4 38
		8	8	7	8	4	4	38
3		8	7	7	7	3	3	35

# Out of Scope

4

5





Fund No: S41080Q2  
Project: ACT Government Economic Development Directorate - ACT Centre for Entrepreneurial Agri-Technology

Donor Ref:  
Chief Investigator: **Sch 2 2.2(a)(ii)**

**DRAFT STATEMENT OF INCOME AND EXPENDITURE  
For the Period 01 July, 2018 to 30 September, 2018**

	Movement (Actuals + Financial) \$	Adjustments \$	Current Period \$
<b>Unspent Balance as at 01 July, 2018</b>	0.00	0.00	0.00
<b>Add</b>			
9004 ACT Government Grant	500,000.00	0.00	500,000.00
<b>Other Income</b>	<b>500,000.00</b>	<b>0.00</b>	<b>500,000.00</b>
7001 Transfer from another Ledger	250,000.00	0.00	250,000.00
<b>Transfer from other</b>	<b>250,000.00</b>	<b>0.00</b>	<b>250,000.00</b>
7901F Trf from Strategic Reserve	250,000.00	0.00	250,000.00
<b>Internal Allocations</b>	<b>250,000.00</b>	<b>0.00</b>	<b>250,000.00</b>
<b>Total Income</b>	<b>1,000,000.00</b>	<b>0.00</b>	<b>1,000,000.00</b>
<b>Total Available Funds Before Expenditure</b>	<b>\$1,000,000.00</b>	<b>\$0.00</b>	<b>\$1,000,000.00</b>
<b>Less</b>			
5002 Salary Research Assts - Cont	32,905.83	2,810.31	35,716.14
5004 Salary Admin Staff - Cont	2,907.31	0.00	2,907.31
5007 Long Service Leave - Levy Pool	1,196.08	98.36	1,294.44
5022 Super Research Assts - Cont	5,594.00	477.75	6,071.75
5024 Super Admin Staff - Continuing	484.81	0.00	484.81
5032 W/Comp Rsch Assts - Cont	658.09	56.21	714.30
5034 W/Comp Admin Staff - Cont	57.02	0.00	57.02
5042 P/Tax Research Assts - Cont	2,637.27	225.23	2,862.50
5044 P/Tax Admin Staff - Cont	228.56	0.00	228.56
<b>Salaries &amp; Related Costs</b>	<b>46,668.97</b>	<b>3,667.85</b>	<b>50,336.82</b>
5672 Rental Lease and Hire Charges	120.00	0.00	120.00
<b>Utilities &amp; Maintenance</b>	<b>120.00</b>	<b>0.00</b>	<b>120.00</b>
5400 Domestic Travel - Airfares	935.08	0.00	935.08
5410 Domestic Travel - Conf Fees	166.91	0.00	166.91
5420 Domestic Travel - Accommodatio	1,498.44	0.00	1,498.44
5430 Dom Trvl-Other Surface Tport	206.47	0.00	206.47
5431 Intrnl Trvl-Other Surface Tport	158.11	0.00	158.11
5450 Domestic Travel - Other	14.36	0.00	14.36
<b>Travel Field &amp; Survey Expenses</b>	<b>2,979.37</b>	<b>0.00</b>	<b>2,979.37</b>
5828 Consultancy Fees	1,993.60	0.00	1,993.60
<b>Consultancies</b>	<b>1,993.60</b>	<b>0.00</b>	<b>1,993.60</b>
5312 Consumables Tele excl Mobile	67.13	0.00	67.13
5312M Consum Telephone Mobile/Data	1,199.69	0.00	1,199.69
5362 Cons Comp Software and Licence	11.25	0.00	11.25
5365 Consum Internet/N'work Service	9.05	0.00	9.05
8504 IntPurch-Print/Pub/Adv/Publics	256.00	0.00	256.00
<b>Consumables</b>	<b>1,543.12</b>	<b>0.00</b>	<b>1,543.12</b>
5602 Light Meals Non - FBT	1,757.00	0.00	1,757.00
5829 Advertising and Marketing	5,463.20	0.00	5,463.20
5830 Staff Recruitment Expenses	260.00	0.00	260.00
<b>Other Expenses</b>	<b>7,480.20</b>	<b>0.00</b>	<b>7,480.20</b>
<b>Total Expenditure</b>	<b>60,785.26</b>	<b>3,667.85</b>	<b>64,453.11</b>

**Unspent Balance as at 30 September, 2018**

**\$935,546.89**



# Centre for Entrepreneurial Agri-Technology

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Working together for a better farming future

Progress Report 1 July - 30 September 2018





## Purpose

The purpose of this report is to provide a summation of progress relative to stipulated deliverables under the Establishment of the ACT Centre for Entrepreneurial Agri-Technology Deed of Grant between the ACT Government and The Australian National University. Under this Deed, reporting is required

quarterly against 15 deliverables (refer to page 32 of Deed). This report is the first quarter report, covering the period 1 July 2018 - 30 September 2018.

In addition to narratives and data presented to evidence progress, a quarterly income and expenditure report is provided in Attachment 2.

## Context

The world is looking for smart ways to double food production by 2050, which is no easy task with an increasingly variable and changing climate. Meeting this challenge requires innovation and technology. But it also requires a significant shift in how we fund and do research, and how research institutions and universities work with industry and farmers in Australia. To address this challenge, the Centre for Entrepreneurial Agri-Technology (CEAT) has a vision to enable a better farming future by creating a thriving community of innovators working across sectors, borders, and disciplines.

The Centre for Entrepreneurial Agri-Technology is being established within the ANU-CSIRO National Agricultural

and Environmental Sciences Precinct (NAESP). This CSIRO-ANU precinct is home to:

- world-leading fundamental and applied plant and agricultural sciences, which identify traits that improve the resilience and yield of our food crops;
- deep expertise in agri-environment landscape ecology, hydrology, soil science, and human ecology;
- leading-edge engineering and computer science capability in robotics and digital innovation.

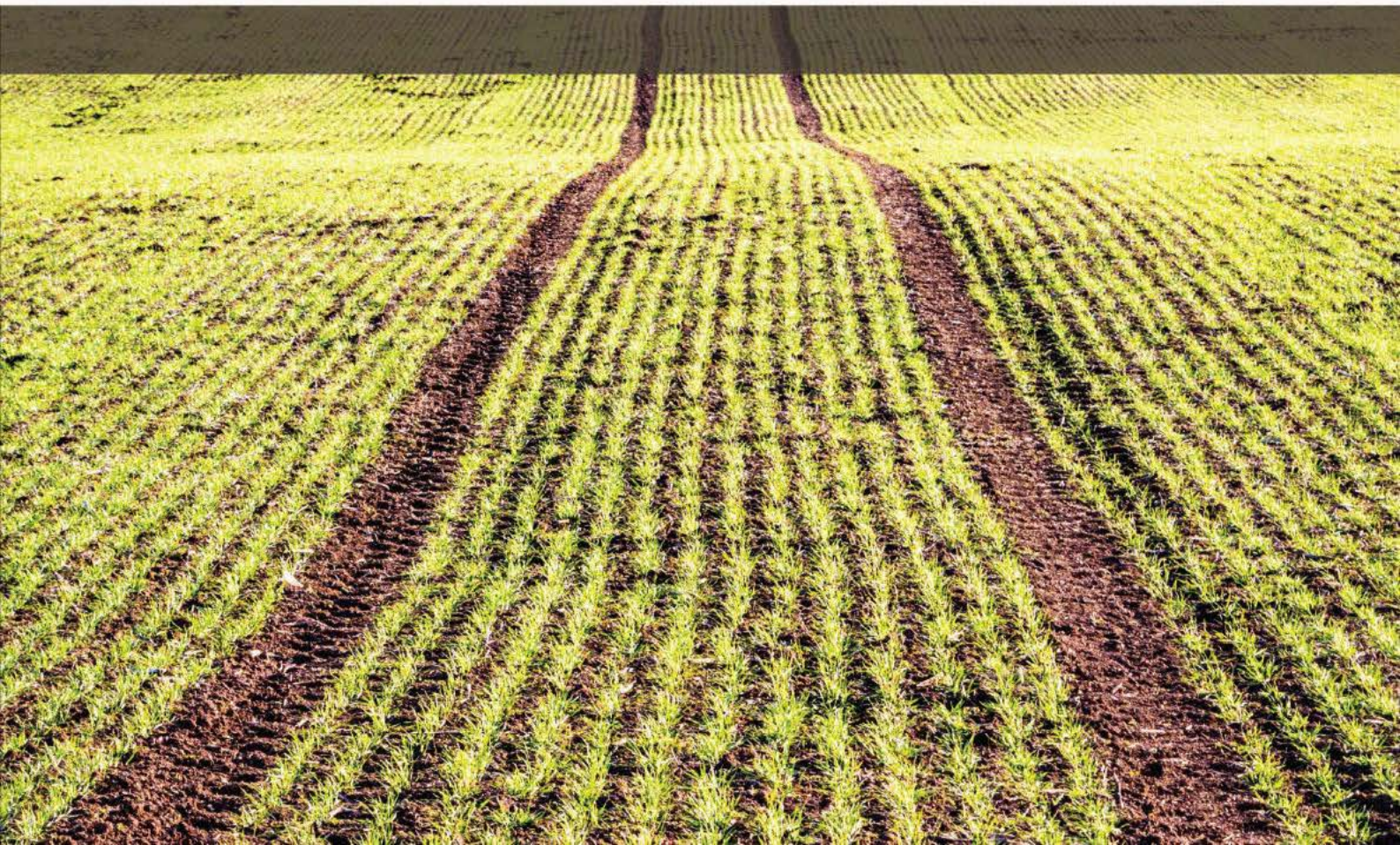
The creation of CEAT via the ACT-ANU Deed is a significant step towards the ACT Chief Minister realising his ambition - for Canberra to become a global hub for food security research and industry innovation.





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# Executive Summary

The world is experiencing an unprecedented rate of rapid change as a result of human development. To sustain wellbeing, and to maintain competitive advantage in our export-driven agricultural industry, we need smarter ways to produce food and fibre in Australia. Meeting this challenge requires innovation, technological advancement, and significant structural and culture shifts in how we fund and undertake research and development in Australia. To help address this challenge, the ACT Government, ANU and CSIRO have established the Centre for Entrepreneurial Agri-Technology (CEAT).

This Centre was incepted in July 2018 from a \$500,000 (GST exclusive) investment under the ACT Government's Key Capability Area (KCA) program, with matched funds from ANU, and an in-kind investment from CSIRO.

The establishment of CEAT within the ACT, if sustained for years to come, has the potential to transform the ACT into a global hub for transformational agriculture. This report provides a summation of first quarter (1 July-30 September 2018) progress towards CEAT's establishment relative to the deliverables stipulated in the funding Deed. In addition to the narratives and data presented, a quarterly income and expenditure statement is provided.

The first quarter report evidences the commitment and goodwill surrounding CEAT's establishment. An enormous amount of activity has been undertaken in a short period of time. It also reflects the challenges of 'doing things differently' as ANU adapts to support and meet the needs of CEAT in the first quarter. This is most evident in the challenges of recruitment, resulting in only one CEAT staffer starting in the reporting period. Despite these challenges, the report tells a story of high energy and activity, and strategic thought. The first quarter priority has been workforce planning and recruitment; establishing a known presence; and initiation of the CEAT workshop series. The second quarter will see priorities shift to finalisation of recruitment, formalisation of governance structures, legal frameworks, enhanced regional engagement, and securing additional revenue. Expenditure in the first quarter was minimal at \$64,453.11. The rate of expenditure will increase significantly as staffing is completed for the establishment year. In all likelihood, based on progress to date, full staffing will not be achieved until the third quarter. CEAT's establishment, and delivery against all Deed Deliverables, is unlikely to be completed before 31 March 2020.

# Deed Deliverables

The following numbered sections of this report provide an update relative to each deliverable stipulated in the Deed.

- 1 CEAT is launched – major full day event for stakeholders showcasing capacity and vision

---

- 2 Governance and Industry Steering committees are formed, members have been appointed and there have been two meetings of the Governance Board and three meetings of Industry Steering Committee

---

- 3 CEAT Director, and staff are successfully recruited and have established CEAT and operationalised its three program areas

---

- 4 The CEAT brand has been developed and promotional materials and website have been produced;

---

- 5 Operational details and legal frameworks for industry partners have been formulated and implemented

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- 6 CEAT Director and Cluster Manager have undertaken a regional outreach program to introduce CEAT and its programs to: (a) Local industry and agricultural bodies; (b) Other educational and training providers; and (c) Other innovation hubs and incubators

---

- 7 CEAT Director and Cluster Manager have undertaken two visits to Singapore and to New Zealand to establish links with agri-tech industries and to promote new masters programs in this domain

---

- 8 CEAT Director, with support of Research School of Biology and Fenner School Directors has successfully negotiated project contracts and investment with several Rural R&D corporations that involve placements in industry, entrepreneurial training and build capability and industry-relevant outcomes

---

- 9 CEAT has conducted 17 workshops: 5 CEAT Agri-tech Career Conversations; 6 capability development-industry interface workshops; 2 international industry-related symposia; 4 agri-tech problem-addressing workshops in response to industry identified issues; Other educational and training providers; and Other innovation hubs and incubators.

---

- 10 Three SMEs have become Innovation Hub partners

---

- 11 A comprehensive program of entrepreneurial events and training has been undertaken in partnership with CSIRO's On Accelerate, Cicada Innovations and CBR Innovation Network

---

- 12 Eight researchers have completed entrepreneurial training

---

- 13 The industry placements framework for Masters and PhD students has been developed

---

- 14 Initial 10 student placement opportunities established Semester 2, 2019

---

- 15 CEAT Year 1 performance evaluation has been conducted and published





# Launch

The Centre for Entrepreneurial Agri-Technology (CEAT) officially launched on 24 August 2018. It was a momentous occasion which displayed the capability held within the National Agricultural and Environmental Sciences Precinct (NAESP), and showcased more broadly agri-technology within Canberra (refer Table 2). A highlight was the thoughtful and inspiring speeches from speakers (page 8). The launch event was led by Senior Project Manager, Emma Burns in consultation with a CEAT Launch Organising Committee that comprised officers from the ACT Government, CSIRO and ANU. The Organising Committee met at least weekly from late July to two days prior to the launch.

The launch provided a way to reach out to many members of the entrepreneurial community, media, high level industry representatives, State,

Territory and Commonwealth Government officials, members of the scientific community, and members of the international diplomatic community simultaneously. In total, over 300 stakeholders were identified and contacted in promoting the launch. A breakdown of attendees per sector is provided in Table 1.

The event showcased some of the many capabilities held within the NAESP of ANU and CSIRO, and the Canberra region ag-tech community, as summarised in Table 2.

The result of this effort has culminated in a considerable spike in web traffic, with 11 351 web hits in August 2018. Web visitors also opted in to receive further information about CEAT, with 61 new contacts registered in the first quarter.

**Table 1. Breakdown of attendees by sector.**

Organisation	Number
ANU/CSIRO/CBRIN	53
Agricultural industry	13
Business/Innovation	8
Other training organisations	2
Government	4
International officials	4
Total	84



Sch 2 2.2(a)(ii) speaking at the CEAT Launch, 24 August 2018. Image: Sharyn Wragg

Deed Deliverable 1 | CEAT is launched – major full day event for stakeholders showcasing capacity and vision



# Launch

Table 2. Displays at the Launch.

Display	Use
Thermal camera, Fluorocam and virtual reality test site	Staff from the Australian Plants Phenomics Facility (APPF) ANU node gave demonstrations of agricultural technology currently in use. Specifically the thermal camera - used to identify stress in plants, the fluorcam - used to measure photosynthetic activity, and a prototype virtual reality
Automatic Livestock medication system	Automed shows how effective technology can be in reducing challenges in Agriculture.
Global Root-zone moisture Analysis and Forecasting System (GRAFS)	This system integrates the latest satellite sensing technology within a simple modelling framework to provide root-zone soil moisture assessments across the globe. The creators are currently working on ingesting global rainfall forecasts to extend the soil moisture prediction capability up to 2-weeks into the future. Future research aims to use local geospatial knowledge to provide fine-scale prediction which could be useful for future agri-tech systems.
CSIRO	The CSIRO booth displayed agricultural food and wine products, which demonstrate their world-leading expertise in food science and food processing. These expertise enable the Australian food industry to compete in domestic and global markets and make food products for Australian consumers that are safe, sustainable and taste great. The products showcased by CSIRO at the launch demonstrate their advanced capability in developing cleaner, more energy efficient processes for the conversion of agricultural raw materials into high-value ingredients for the food, nutraceutical, industrial chemical, polymer and advanced material sectors.
Wildlife Drones organisations	Wildlife Drones is a local Canberra company that has developed an innovative animal radio-tracking system using drones. Our system can be applied to farmers and livestock managers who want an efficient and safer way to locate their animals quickly, particularly in remote and regional areas. Users can monitor their livestock's activity from the air and receive their live location, saving them on time and money.

Key speakers:

- ANU Vice Chancellor Professor Brian Schmidt
- Chief Minister Andrew Barr
- Sch 2 2.2(a)(ii), CSIRO
- Sch 2 2.2(a)(ii), Four Winds Vineyard
- Sch 2 2.2(a)(ii), ANU for CEAT

In addition to reaching out to external stakeholders, this event was an opportunity for the foundational

partners to join together in their first official capacity as the CEAT. Members from the Research School of Biology, Fenner School for Environment and Society, the ANU College of Engineering and Computer Science, CSIRO and ACT Government, the ARC Centre of Excellence for Plant Energy Biology and the ARC Centre of Excellence for Translational Photosynthesis all joined together in different ways to contribute to this important event.



ANU Vice Chancellor Professor Brian Schmidt speaking at the CEAT Launch. Image: Sharyn Wragg

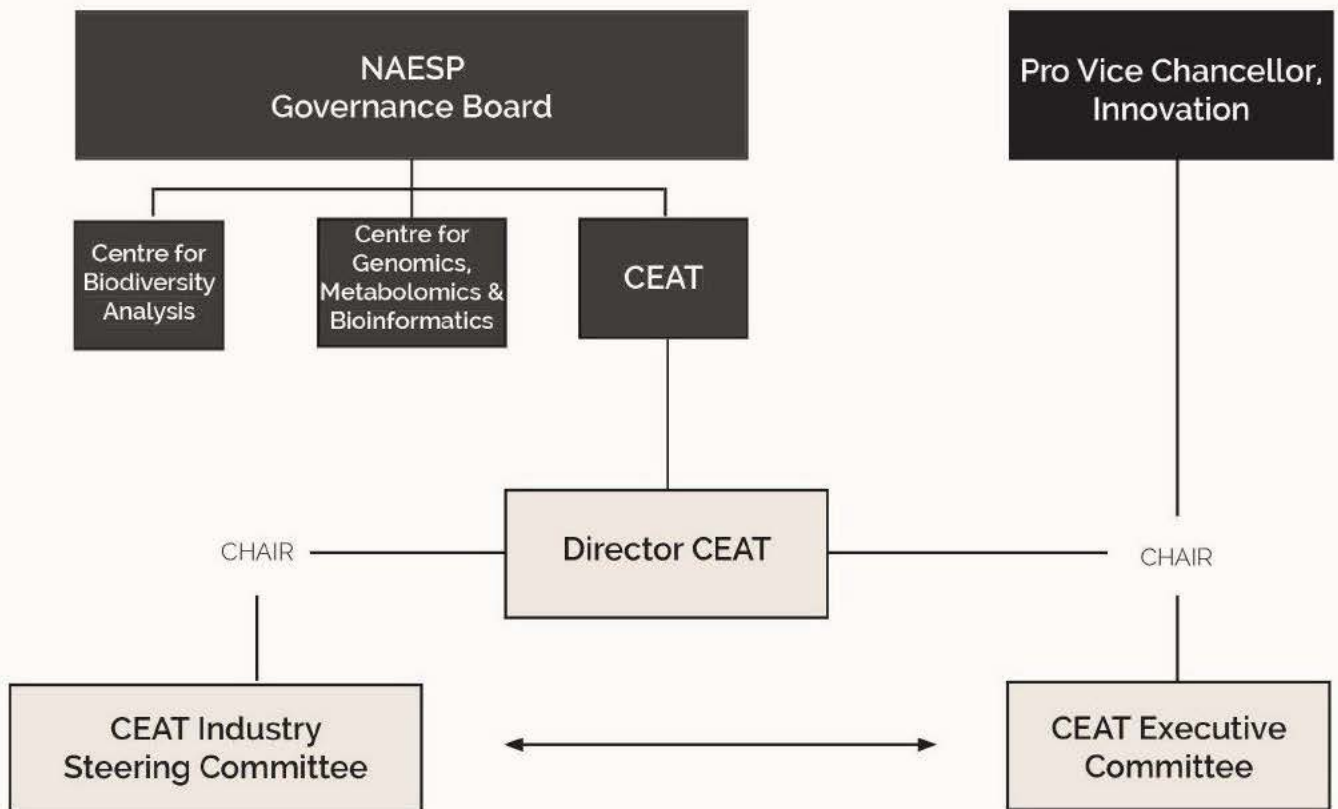


# Governance

In the first quarter, scoping discussions relative to governance have been held across ANU and CSIRO. A firm position has not been established; however, preliminary thinking would result in an adjustment to the originally proposed two-tiered system of a Governance Board and Industry Steering Committee. Instead, what would be pursued (subject to ACT Government endorsement) is enactment of a CEAT specific Executive Committee (to be formed and meet two times before 30 June 2019) and an Industry Steering Committee (to be formed and meet three times before 30 June 2019). In addition to these

governance structures, CEAT will become a formal member of the pre-existing NAESP Governance Board. This newly expanded NAESP Governance Board will meet at least once prior to 30 June 2019. A graphical overview of this proposed structure is provided in Figure 1. Note the Pro-Vice Chancellor Innovation mechanism shown in Figure 1 is being pursued to efficiently support the cross-College nature of CEAT and secure a dynamic dialogue between the CEAT Director and the ANU Senior Executive responsible for Innovation.

Figure 1. Governance Structure



In addition to internal NAESP talks, some industry engagement has been undertaken to, in part, seek suitable candidates for the CEAT Executive Committee and Industry Steering Committee. It is anticipated that the formation of these two structures will be finalised in the second

quarter. The formation of these Committees is the responsibility of the CEAT Senior Project Manager with support from the Senior Business Development Officer and Events and Industry Engagement Coordinator (Refer Attachment 1. Staff Accountability Framework).



# Staffing and operations

## Staffing and Recruitment

The recruitment of CEAT staff has proved challenging in the first quarter, reflecting, in part, delays within the approvals process at ANU. Considerable activity has been undertaken, but as of 30 September 2018, only one CEAT appointment has been made (Senior Project Manager, Dr Emma Burns). In addition to this appointment, salary expenditure was incurred via temporarily transferring support staff from within the Research School of Biology for the first quarter only (refer Attachment 2, for the first quarter Income and Expenditure Statement).

In the second quarter (1 July-31 December), three approved positions will start, and two recruitment campaigns will be undertaken. A summary of recruitment activity, and workforce planning, undertaken in the first quarter is provided below. A CEAT Staffing and Recruitment Working Party was formed prior to execution of the Deed and comprised members of the Research School of Biology (RSB, Professor Owen Atkin and Ms Denise

Higgins), the Fenner School of Environment and Society (FSES, Professor Saul Cunningham), and ANU Strategic Projects and Partnerships (SPP, Mr Robin Fieldhouse). To enable immediate traction in delivery of CEAT under the Deed (once executed), this Working Party sought to transfer for an initial 11 month period the (then) Sustainable Farms Director (Dr Emma Burns) from within the FSES to the RSB in a Senior Project Management capacity to oversee the implementation of CEAT, effective 2 July (refer Staff Accountability Framework for an overview of the roles and responsibilities of the SPM).

Prior to execution of the Deed, this Staffing and Recruitment Working Party also initiated discussions across ANU and CSIRO regarding the recruitment of a CEAT Director. In the first quarter, the Working Party, and CEAT Senior Project Manager, formalised: a Director Position Description (Refer Attachment 1, Staff Accountability Framework); developed a Candidate Pack for the recruitment campaign; and formed a cross-sector Recruitment Panel, as listed in Table 3.

Table 3. Director recruitment panel

Sector	ANU	ANU	CSIRO	Entrepreneur	Innovation
Name	Sch 2 2.2(a)(ii)				
Position	Head of Division, Plant Sciences, Research School of Biology, ANU	Strategic Projects and Partnerships, Life Sciences, ANU	Business Development Manager, CSIRO	Founder and CEO, GOTERRA	CEO, CBRIN

Sch 2 2.2(a)(ii)



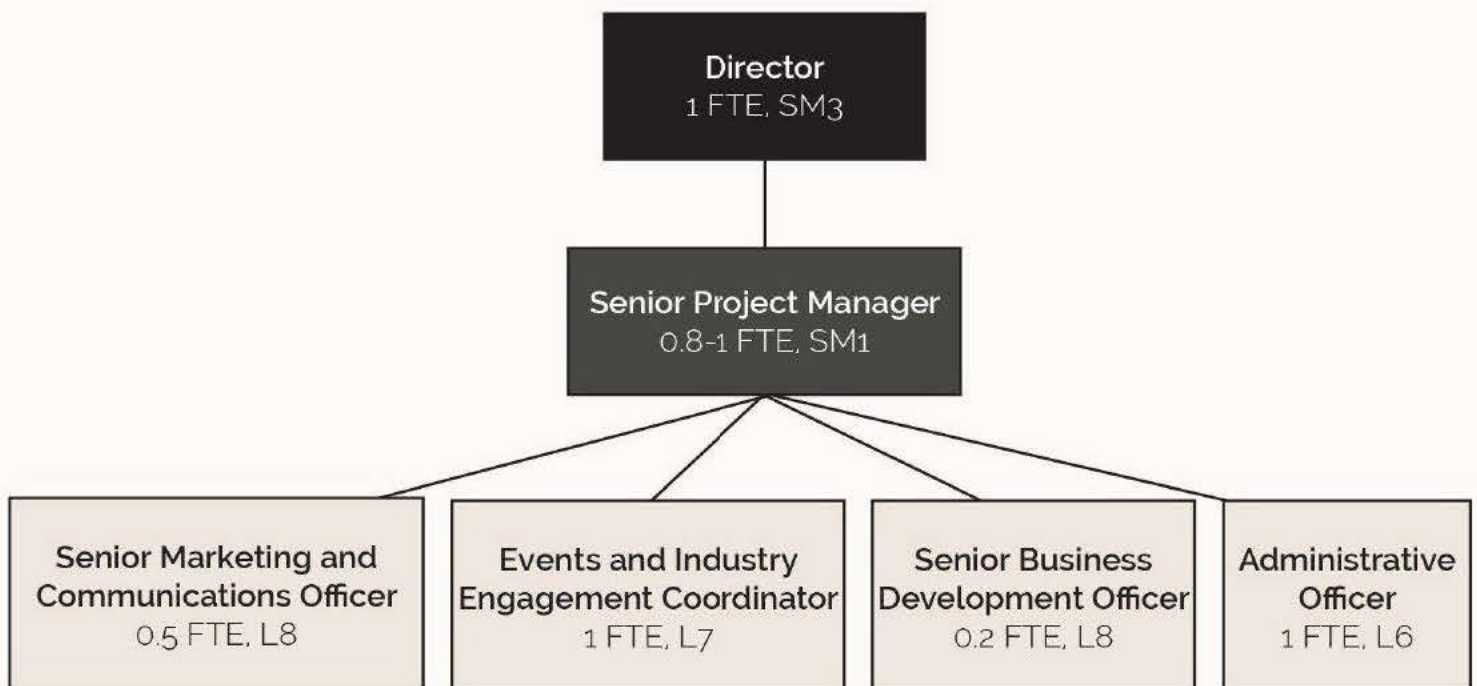
# Staffing and operations

The Director position was advertised on 27 August. A targeted 4 week marketing campaign then took place in print, online and face to face targeted interactions. The recruitment process closed in the first quarter on 23 September. Subsequent review of the 7 applicants by the Chair indicated strong applicants but no female candidates. The absence of female candidates failed to meet ANU recruitment standards for candidate short-listing. The ANU is committed to improving its gender equity profile, with gender and equity objectives forming a key component of the ANU Strategic Plan 2017-2021. As such, Recruitment Panels are required to shortlist 50% male and 50% female candidates for all advertised recruitment processes for Academic and Professional positions (excluding women-only appointment rounds). A

decision was therefore taken to formally have Professor Owen Atkin continue to act on an in-kind basis as the interim CEAT Director, and for an extended recruitment process to proceed with more targeted activity towards suitable females in the ag-tech sector

In the first quarter, the Senior Project Manager, in consultation with the Staffing and Recruitment Work Party, and College of Science Human Resources, undertook a review of position titles in the Deed relative to the Deed Deliverables within the context of a single financial year time-frame to support staffing. After careful consideration, a revised staffing structure was developed for the foundation year of CEAT, which is envisaged to be a multi-year capability.

Figure 2. CEAT Foundational Year (FY 2018-2019) staffing structure



Deed Deliverable 3 | CEAT Director, and staff are successfully recruited and have established CEAT and operationalised its three program areas

# Staffing and operations

The roles and responsibilities of CEAT staff, their (known or anticipated) start dates, and aligned Deed Deliverables are summarised in the Staff Accountability Framework at Attachment 1. This Framework also maps staff responsibilities relative to the original positions named in the Deed (refer page 52). Note, however, that roles such as the Program Placements Manager and Industry Producer Liaison Manager can only be pursued subject to securing additional funds for CEAT.

## Operationalise CEAT's three core program areas

The application of structured theory of change and/or program logic planning to inform the operationalization of CEAT, and the implementation of its three core programs, has not been undertaken in the first quarter. This is because foundational staffing needs to be completed before this can reasonably occur. Note, however, for the purposes of public engagement and recruitment, the three core programs have been communicated as:

### 1. TRANSLATE

A proactive support system for Centre members to address key gaps in the pipeline from intellectual idea to on-farm application.

### 2. INNOVATE

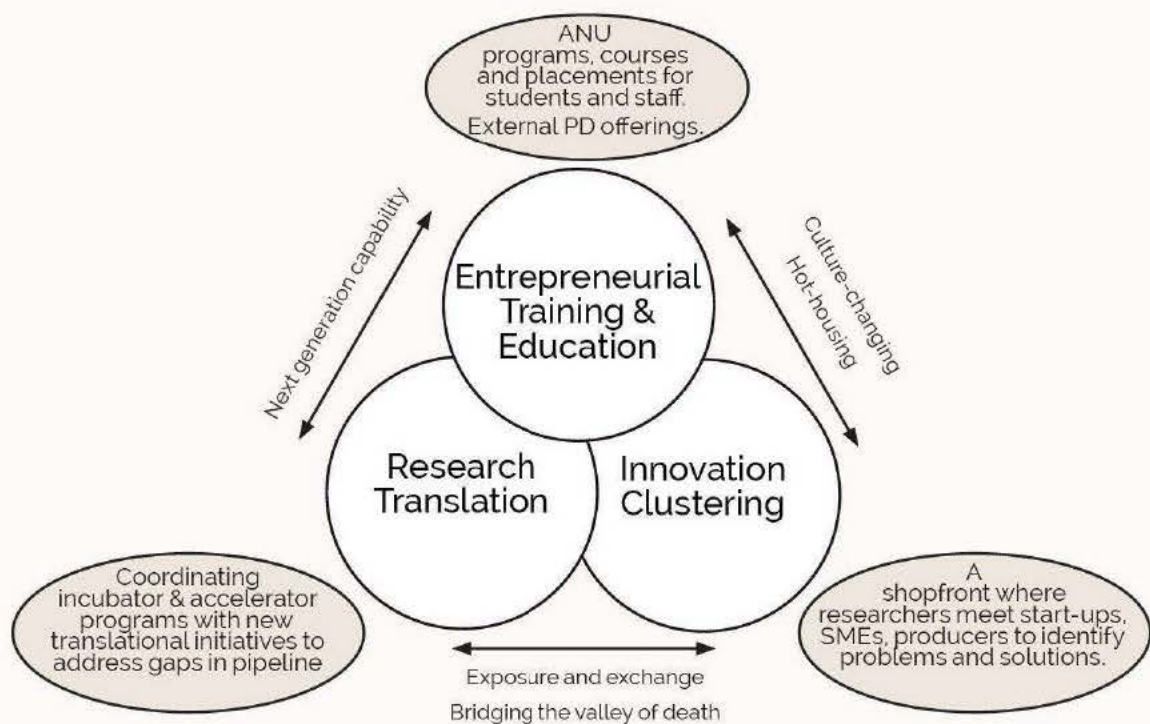
A collaborative workspace, where commercial enterprises co-locate with researchers in a connected environment, ultimately to foster transformative agri-outcomes.

### 3. EDUCATE

A series of entrepreneurial workshops, training and higher education programs aimed to align researchers with industry needs, and to bridge the gap between industry and research.

Graphically these programs, and their inter-relatedness, is shown in Figure 3.

Figure 3. CEAT Core program areas



Deed Deliverable 3 | CEAT Director, and staff are successfully recruited and have established CEAT and operationalised its three program areas



# Staffing and operations

- Progress toward Program 1 TRANSLATE has been limited due to staffing appointment delays. Critical to the success of this program, however, will be the development of an IP strategy, and some progress has been made in relation to this (refer Deed Deliverable section 5). Engagement with research, industry and other innovation capabilities are also needed and consultations have begun (refer Deed Deliverable sections 4, 6 and 9). In addition, one entrepreneurial idea is being progressed with the support of CEAT relating to the development of a simple open software interface to better enable farmers to operate (and maintain) multiple software systems.
- Progress toward Program 3 INNOVATE is captured in is captured in Deed Deliverables sections 5, and 10.
- Progress toward Program 2 EDUCATE is captured in Deed Deliverables sections 9, 11, 12, 13 and 14. In addition to these activities, to meet the changing capability needs in the agriculture sector going forward ANU (Fenner School driven) has been creating new Masters and courses that align with CEAT/NAESP activities. Their approach is founded on partnering with industry using a multi-disciplinary approach to the development and delivery of curriculum (covering agritech, agribusiness and transformational and sustainable agriculture approaches).
- These new programs are to be available to students in 2020, and will involve them in placements, projects and internships that apply transdisciplinary knowledge and skills to systematically address industry identified problems. Current issues that are being tackled are possible funding models for multi-disciplinary teaching support into the programs. Various industry representatives in CEAT contexts have been keenly interested and supportive of these new offerings. Work is continuing with CSIRO to work through their contribution to these programs.



Deed Deliverable 3 | CEAT Director, and staff are successfully recruited and have established CEAT and operationalised its three program areas



# Branding

The Senior Marketing and Communications Officer will be responsible for creating, implementing and overseeing the communications, media, and public relations strategy for CEAT (including web and social media, and delivery of high quality promotional materials (Staff Accountability Framework at Attachment 1).

This Senior Marketing and Communications Officer position was formalised in the first quarter but advertised in the second quarter. A link to the current advertised position is provided here (<http://jobs.anu.edu.au/cw/en/job/526733/ceat-senior-marketing-and-communications-officer>).

In the interim, to support the launch and enable first quarter impact, the CEAT Launch Organising Committee (Refer Section 1) developed a suite of branding and promotional materials. Critical to enabling this was the temporary transfer of the Education and Events Officer from the ARC Centre of Excellence for Translational Photosynthesis within the Research School of Biology. Sch 2.2.2(a)(ii)

Sch 2.2.2(a)(i) in consultation with the cross-sector CEAT Launch Organising Committee implemented a suite of interim branding and promotional materials, ahead of the full complement of core staff being recruited (refer Section 3, Figure 2). The materials were designed to show the cross

commodity and cross-discipline relevance of CEAT, namely to crop production, livestock management, and natural resource management to sustain farm productivity.

Critically, in preparation for the launch, a vision statement was workshopped and agreed, and this statement has been incorporated into other public engagement activities in the first quarter.

*To enable a better farming future by creating a thriving community of innovators working across sectors, borders, and disciplines*

Other key marketing tag lines developed for CEAT were: Translate, Innovate, Educate. Copies of material produced in the first quarter are provided below.

- A promotional postcard (refer Attachment 3)
- Four promotional banners (refer Attachment 4)
- A website landing page ([www.ceat.org.au](http://www.ceat.org.au))
- A Business card template (refer Figure 4)

A synthesis graphic conveying the resulting 'look and feel' of CEAT is provided below in Figure 5. Note, these materials will be reviewed by the future Director and Senior Marketing and Communications Officer on commencement.

Figure 4. Business card template

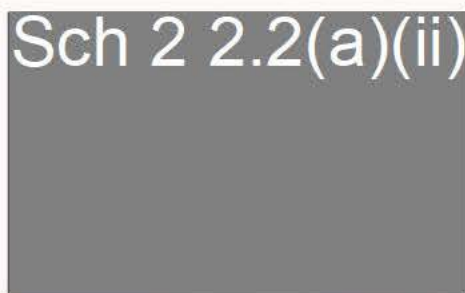
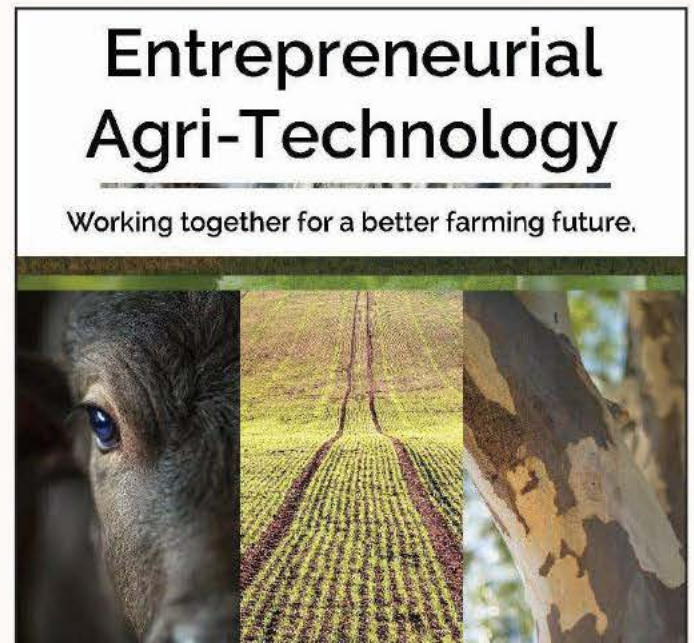


Figure 5. CEAT branding example



Deed Deliverables 4 | The CEAT brand has been developed and promotional materials and website have been produced



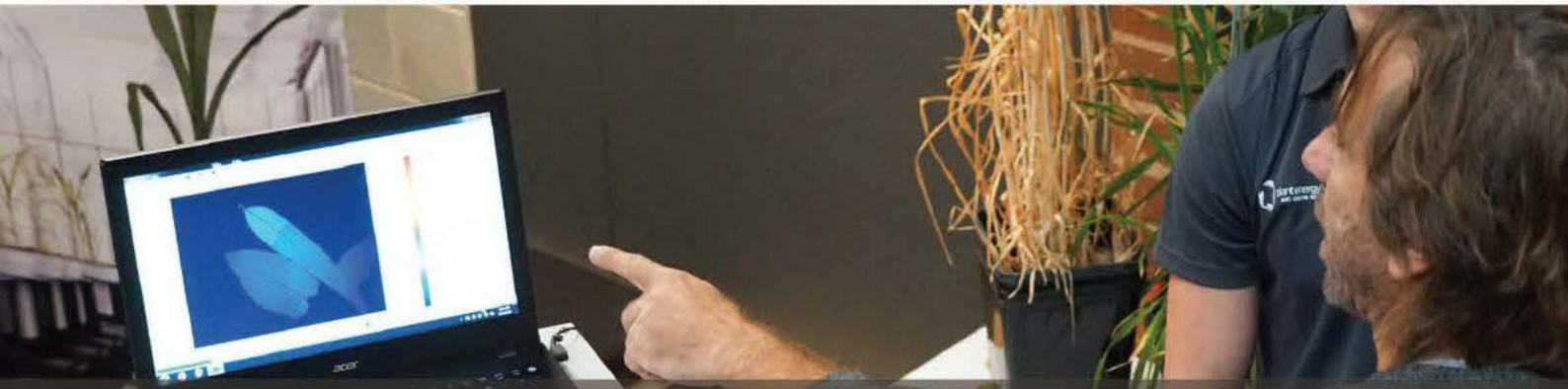
# Formal partnerships

The development of operational details and legal frameworks to enable CEAT are a second quarter priority, and subject to the commencement of the Senior Business Development Officer, **Sch 2 2.2(a)(ii)** on 5 November 2018. Post commencement, Aly will lead, for example, the creation and implementation of: collaborative IP arrangements and co-location agreements for Small-Medium-Enterprises (SMEs) (Refer Staff Accountability Framework at Attachment 1). This will be done in consultation with the Technology Transfer Office at ANU, and more generally, the governance structures established to govern CEAT. However, in the first quarter, a consultative information gathering exercise has been initiated. Internal ANU advice has been sought from the Technology Transfer Office, from our institutional partners at CSIRO, and externally across a broad range of institutional and industry partnership arrangements.

In relation to an IP Strategy, at this time, it is CEAT's intention to draw on the past success of bespoke project based Intellectual Property (IP) arrangements. This approach has previously successfully been enacted at Oxford and iPrep. In implementing this IP Strategy, the CEAT will seek for collaborative teams to decide on, and allocate a percentage contribution, to all contributing parties to each individual translational-project formed

within the CEAT. This will include a detailed analysis of the possible applications, pathways to impact, and how much background IP each member has contributed and more.

Development of these procedures and policies will be particularly essential for the successful delivery of the physical hub being created by CEAT within the Gould Building at ANU. This is where several Small-Medium-Enterprises will co-locate with researchers in a collaborative, connected environment to foster transformative agri-outcomes. They will also be formative in creating the research translation support system needed to build initiatives that address - with farmers and industry - key gaps in the research commercialisation pipeline that currently limit research-translation-commercialisation pathways in Australia.



**Sch 2 2.2(a)(ii)** from founding hub partner PSI demonstrates instrument functionality to other CEAT associates.

Deed Deliverable 5 | Operational details and legal frameworks for industry partners have been formulated and implemented



# Profile

## Regional engagement

In the first quarter, the interim Director, Professor Owen Atkin, and the Senior Project Manager, Dr Emma Burns, have had limited capacity to engage in regional-specific outreach. However, preliminary consultations have been undertaken with:

- the Bega Valley Shire - with Mayor Kristy McBain and Deputy Mayor Mitchell Nadin; Sch 2 2.2(a)(ii) from the new Bega Valley Innovation Hub; Sch 2 2.2(a)(ii) from 2pi Software; and beef farmer, small business woman and Eden-Monaro liberal candidate, Sch 2 2.2(a)(ii).
- the Yass Council (with Mayor Rowena Abbey and Yass Valley Councillor Ally Harker)
- the Canberra Region Joint Organisation (with Sch 2 2.2(a)(ii) - Director Government Relations & Strategy); and
- Regional Development Australia (with ACT Director, Sch 2 2.2(a)(ii)).

## Non-regional engagement

More generally, in the first quarter, the interim Director and the Senior Project Manager have engaged in non-regional targeted discussions with industry and agricultural bodies; educational and training providers; and innovation hubs and incubators. These include consultations with Canberra Innovation Network, CICADA Innovations, iAccelerate (University of Wollongong / Bega Innovation Hub partner), University of Canberra, Canberra Institute of Technology, National Farmers Federation, Cattle Council Australia, Meat and Livestock Australia, Sheep Producers Australia, and the Grains Research and Development Cooperation.

A synthesis of external stakeholder engagement activity undertaken in the first quarter is provided in Tables 4 and 5.



Sch 2 2.2(a)(ii)

meeting with Hon. Joel Fitzgibbons



# Profile

Table 4. Regional outreach for first quarter, International interactions

Interaction	CEAT	Date	Category
Meeting with Sch 2 2.2(a)(ii)	Sch 2 2.2(a)(ii)	12 June 2018	Local industry and agricultural bodies
Meeting with		12 June 2018	Local industry and agricultural bodies
Meeting with		15 June 2018	Local industry and agricultural bodies
Meeting with Ecospectral (Sch 2 2.2(a)(ii), CEO)		6 July 2018	Local industry and agricultural bodies

Table 5. Regional outreach for first quarter, Local interactions

(continued on next page)

Interaction	CEAT	Date	Category
Attendance at Canberra Innovation Network First Wednesday Connect	Sch 2 2.2(a)(ii)	4 July 2018	Other educational and training providers, Other innovation hubs and incubators
Met with Sch 2 2.2(a)(ii) Assoc VP, Director, CEO, Innovation UC; Sch 2 2.2(a)(ii) (Director, Business Growth & Transformation, CIT), Sch 2 2.2(a)(ii) (Director, Instit for Applied Ecology, UC), Sch 2 2.2(a)(ii) (Director, Technology Transfer ANU), Sch 2 2.2(a)(ii) (RA, Australian Centre for Robotic Vision, ANU), Sch 2 2.2(a)(ii) (Student Research Intern, ACRV, ANU), Sch 2 2.2(a)(ii) (Director, Diversity Array Technology Pty Ltd), Sch 2 2.2(a)(ii) (CEO, CBRIN)		23 July 2018	Other educational and training providers
Met with ANU Technology Transfer Office to discuss CEAT IP Strategy		23 July 2018	Other educational and training providers Other innovation hubs and incubators
Met with Sch 2 2.2(a)(ii) from ThinkPlace to discuss strategic alignments with CEAT		3 August 2018	Other educational and training providers Other innovation hubs and incubators
National Farmers Federation - Agribusiness Talking 2030		6 August 2018	Local industry and agricultural bodies

# Profile

Table 5. Regional outreach for first quarter, Local interactions (continued from previous page)

Interaction	CEAT	Date	Category
Attendance at CSIRO AgCatalyst	Sch 2 2.2(a)(ii)	15-16 August 2018	Local industry and agricultural bodies Other educational and training providers Other innovation hubs and incubators
Attendance at Discovery Translation Fund Showcase		17 August 2018	Other educational and training providers Other innovation hubs and incubators
Australian Beef Sustainability Framework Consultative Committee		21 August 2018	Local industry and agricultural bodies
Met with Sch 2 2.2(a)(ii) (Shadow Agriculture Minister), Sch 2 2.2(a)(ii) (Cathy McGowan MP office), Intern (Sch 2 2.2(a)(ii) MP office), Sch 2 2.2(a)(ii) (Senator Rex Patrick office, Correspondence Officer), Sch 2 2.2(a)(ii) (Director,		22 August 2018	Local industry and agricultural bodies
Discussions with Yass Council Mayor Rowena Abbey; Yass Valley Councillor Ally Harker; and Director Government Relations & Strategy Canberra Region Joint Organisation (with Sch 2 2.2(a)(ii)		29 August 2018	Local industry and agricultural bodies
National Press Club Address; Sch 2 2.2(a)(ii), National Farmers Federation Talking 2030		29 August 2018	Local industry and agricultural bodies
AusAg and Food Tech Summit		3 September 2018	Other innovation hubs and incubators
Met with Sch 2 2.2(a)(ii), Director Regional Development Australia ACT		24 September 2018	Local industry and agricultural bodies
Met with CEO CICADA Innovations, and Director ANU Technology Transfer Office		24 September 2018	Other innovation hubs and incubators
Bega AgTech Meetup		26 September 2018	Local industry and agricultural bodies
Meet with Mia Maize Bega Valley Innovation Hub		27 September 2018	Other innovation hubs and incubators
Meet with Sch 2 2.2(a)(ii), AgThentic		27 September 2018	Local industry and agricultural bodies
Meet with zpi Software		27 September 2018	Local industry and agricultural bodies
Austrade		28 September 2018	Local industry and agricultural bodies



Events and Industry Engagement Coordinator Alisha Duncan representing CEAT at AusAg Food Tech Summit 2018

Deed Deliverable 6 | CEAT Director and Cluster Manager have undertaken a regional outreach program to introduce CEAT and its programs to: local industry and agricultural bodies; other educational and training providers; and other innovation hubs and incubators



# International linkages

Prior to execution of the Deed, **Sch 2 2.2(a)(ii)** (Head of School Research School of Biology) undertook a visit to Singapore to promote the idea of a CEAT in Canberra. This visit occurred from 29 November – 2 December 2017. On this visit they met with Temasek Life Sciences Laboratories to discuss collaborations between ANU and Temasek, including the possibility of ANU students being offered industry placements at Temasek. Those conversations were promising.

A second visit to Singapore, by **Sch 2 2.2(a)(ii)** took place following commencement of the CEAT. This visit occurred between 5-10 July 2018, and was undertaken to establish links with agri-tech industries and to promote the planned agr-innovation masters programs. A synthesis of engagement activities is summarised in Table 5 below. No visit to New Zealand was undertaken in the first quarter. A visit in the second quarter is currently being planned in consultation with Mr David Saunderson from ACT Government.

Table 6. Singapore and New Zealand outreach, first quarter

Organisation/ event	Attendees	Intention
Temasek Life Sciences Ltd	<ul style="list-style-type: none"> <li><b>Sch 2 2.2(a)(ii)</b> (Head, Plant Transformation and tissue culture)</li> <li><b>Sch 2 2.2(a)(i)</b> (Senior investigator, Molecular Pathogenesis program)</li> <li><b>Sch 2 2.2(a)(i)</b> (PI, Associate Program Director)</li> </ul>	CEAT industry placements and their attendance at ANU-based workshop in Dec 2018. An in principle agreement was made ANU students to be offered internships and/or placements at Temasek, pending ANU developing its CEAT-based internship/ placement program.
Nanyang Technological University (NTU) staff	<ul style="list-style-type: none"> <li><b>Sch 2 2.2(a)(ii)</b> Exec Director, Nanyang Env &amp; Water Research Inst (NEWRI))</li> <li><b>Sch 2 2.2(a)(ii)</b>, Manager, Business Development NEWRI)</li> <li><b>Sch 2 2.2(a)(ii)</b> Director, Food Science and Tech Program, NTU) who are collaborators of Agilent</li> </ul>	The possibility of ANU students coming to NTU for placements and cross-overs between NTU/NEWRI and ANU, with possible links in membrane purification of water, all were open to ANU students to do placements in NEWRI, with CEAT to follow up.
Canberra Showcase Event run by ACT Govt, ANU Connect Ventures and Australian High Commission	<b>Sch 2 2.2(a)</b> attended the Showcase 'pitch' event on July 5th 2018 and attended the mixer at the High Commissioner's residence (6 July).	At those events, discussions were had with several of the presenters (e.g. Mullion Group, Ecospectral, Today's Plan, Mineral Carbonation International and Reposit Power) about their companies providing supervised industry placements for ANU biology, environmental science, engineering and
Teaching into a joint ANU-NTU tropical biology field course in the Bukit Timah nature reserve, alignments with CEAT	The course was initiated by ANU and NTU as part of a broader strategic partnership between NTU and ANU Plant Sciences that was initiated in November 2017 by the past President of NTU, <b>Sch 2 2.2(a)(ii)</b>	The field course involved ANU and NTU students working together to understand the ecology, physiology and biochemistry of tropical plants growing in Singapore, with technical equipment from ANU (e.g. six Licor 6400 portable photosynthesis systems) being shipped to NTU for use in the field course. NTU provided access to their facilities, including application of their biochemistry lab to investigate the capacity of tropical trees to fix atmospheric carbon dioxide.



Students learning how to use a Licor 6400 in Singapore. Image: Sch 2 2.2(a)(ii)

Deed Deliverable 7 | CEAT Director and Cluster Manager have undertaken two visits to Singapore and to New Zealand to establish links with agri-tech industries and to promote new masters programs in this domain

# Placements & investments

In the first quarter, a number of preliminary meetings have been held with Meat and Livestock Australia (MLA) and the MLA Donor Company (MDC) with respect to formal funding arrangements to support agri-tech entrepreneurial activity and innovation capacity building through the CEAT. This consultation process will continue in the second quarter and culminate in a written proposal for submission to the MLA Executive and MDC in the second quarter.

In the first quarter, discussions have also been held with the Grains Research Development

Corporation (GRDC) to discuss how the CEAT can help the GRDC address its strategic goals including the need for capacity building related to the grains industry. From those discussions, it was agreed that the ANU would put forward several problem-based proposals to the GRDC (e.g. dealing with drought, heat stress, frost) that include a CEAT-delivered capacity building component (e.g. GRDC-funded industry placements for MSc & PhD students and post-doctoral researchers).

# Sch 2 2.2(a)(ii)



# Workshops

The Events and Industry Engagement Coordinator will be responsible for creating, implementing and overseeing the workshop series (see Staff Accountability Framework at Attachment 1). In the first quarter, this position description was developed and endorsed, a job offer made and a start date of 8 October negotiated.

In the first reporting quarter, however, CEAT did commence its workshop series. On 4 September, CEAT hosted its first workshop. This Agri-Tech Innovation Ecosystem event was well attended, exceeding its initial target of 20 participants. There was diverse participation from across ANU, government and industry. In total there were 26 attendees.

An overview of the workshop is provided on the CEAT website (see [Workshop overview](#)). Speakers, **Sch 2 2.2(a)(ii)** took a broad look at the changing landscape of Agri-

Tech, offering insights into how innovation can be fostered, and provided an example of how an Agri-Tech ecosystem can add enormous value to the small business community. In the second quarter, the CEAT website host a copy of the talks given and key recommendations.

On 21 September, CEAT and the ARC Centre of Excellence in Plant Energy Biology (PEB) co-convened a seminar by featuring **Sch 2 2.2(a)(ii)**, who spoke on the pros and cons of moving to industry employment from an academic setting.

In addition to hosting these two events, organisation and promotion of an event planned for 9 October was undertaken. This event featured **Sch 2 2.2(a)(ii)** who spoke on Pathways to Impact: reflections on a career in translational plant biotechnology research.

# Sch 2 2.2(a)(ii)

# Hub partners

In the first quarter, building refurbishments of the Gould Building commenced. Completion of these works will occur in the second quarter. This will permit Small-Medium-Enterprises to locate within this Innovation Hub.

In the first quarter, CEAT entered into scoping discussions with three Small-Medium-Enterprises interested in having space within CEAT's Innovation Hub (i.e. the Gould Building). These were:

- Photon Systems Instruments (PSI), who have requested a lab and office space for two personnel

- Gondwana Genomics, who have requested 60m<sup>2</sup> of lab space and 50m<sup>2</sup> of office space

- WildLife Drones, who have requested office space to support at least 2-3 personnel.

The focus for the second quarter will be on implementing the policies, procedures and frameworks necessary to allow co-location to occur (Refer section 5). Note, request for meeting from other SME occurred in the first quarter but engagement occurred in the second quarter.

Deed Deliverable 10 | Three SMEs have become Innovation Hub partners

## Collaborative events & training

In the first quarter, entrepreneurial events attended included AgCatalyst 2018, Bega Ag-Tech meetup, and two CBR Innovation Network First Wednesday Connect. At the September First Wednesday Connect, Interim Director, [Sch 2.2.2\(a\)\(ii\)](#) gave a pitch to a large audience of around 280, to introduce the CEAT to members of local industry, investors and members of the innovation community.

In late 2018-early 2019, CEAT seeks to build on these initial interactions in a targeted program of tailored events over the duration of the funding period. A number of meetings and other communications have taken place in preparation for implementing this rolling series of entrepreneurial events.

# Sch 2.2.2(a)(ii)

Deed Deliverable 11 | A comprehensive program of entrepreneurial events and training has been undertaken in partnership with CSIRO's On Accelerate, Cicada Innovations and CBR Innovation Network



# Entrepreneurial training

Not progressed in the first quarter beyond some preliminary discussions with On Program management at CSIRO during AgCatalyst.

Deed Deliverable 12 | Eight researchers have completed entrepreneurial training

## Post-graduate placement framework

In the first quarter, a series of meetings and discussion have occurred to progress the development of a CEAT Industry Placements Framework for ANU Masters and PhD students.

Cross College meetings have been held between the College of Science (incorporating the Research School of Biology and the Fenner School for Environment and Society), the College of Engineering and Computer Science (CECS), and the College of Business and Economics (CBE). Initial meetings have focussed on:

- identifying the key education and learning outcomes the placement program is aiming to achieve;
- understanding the needs of industry and the potential benefits of placements within their organisations;
- meeting the expectations of both students and industry partners; and,
- how the program will be funded, credited, managed and administered.

The development of new transdisciplinary student project courses have been identified as a promising approach to developing student professional and project management skills prior to industry placement to ensure they are "job ready" for their placement. This has been identified as critical to ensure students can maximise the learning and professional development opportunities offered through a placement, and that industry partners have a good experience with the program.

Negotiations with Associate Deans Education (ADEs) in College of Engineering and Computer Sciences, and College of Sciences and College of Business and Economics, and with Deputy Dean

of Education for Joint Colleges of Sciences are in progress to also work through students internships (undergraduate and postgraduate) associated with CEAT. Three key issues are being negotiated:

- how to expand ANU's capacity for supervision of internships;
- funding disbursement from internships, (in science currently goes back to central College funds);
- model agreements for agri-tech external industry internships for course/program credit.

Colleagues from MLA and [Sch 2 2.2\(a\)\(ii\)](#) a board member of Photon Systems Instruments are advising CEAT on the development of its industry placement framework for postgraduate students at ANU in associated agri-tech disciplines.

A scenario based workshop on "Student Industry Agri-tech Experiences" involving key education and internships staff from CBE, CECS and CoS is scheduled for early November 2018 to address potential roadblocks to cross college collaboration and participation in various CEAT related offerings. The cases studies to be workshopped focus on team based interdisciplinary placements. The case studies have been developed by industry partners at Bega, PSI and MLA to reflect realistic project proposals.

Finally, existing placement agreements in place at ANU and from other institutions such as Cambridge STEM based placements are being used to draft example placement framework to inform CEAT decision-making in this area.



Deed Deliverable 13 | The industry placements framework for Masters and PhD students has been developed



# Placements

In the first quarter, a number meetings have taken place with MLA, NSW Department of Primary Industries, CSIRO and Peak Industry Councils (Cattle Council of Australia and Sheep Producers Australia) to identify opportunities for student placements in agri-tech research projects, or placements with commercial partners within their

networks. Through a range of regional, national and international visits, scoping conversations with business around student internships and placements have also occurred with organisations listed in Table

Deed Deliverable 14 | Initial 10 student placement opportunities established Semester 2, 2019

# Performance

In the first quarter, metrics to inform continuous improvement and Year 1 performance evaluation have not been progressed. Analytics and appropriate metrics will be determined in the second and third quarters.



Deed Deliverable 15 | CEAT Year 1 performance evaluation has been conducted and published

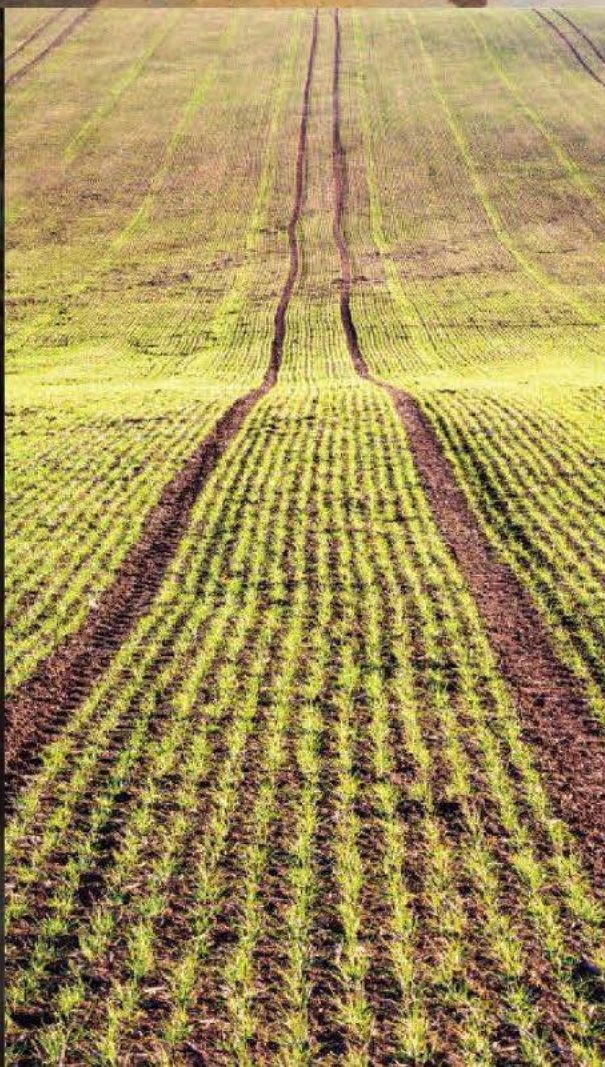




# Staff accountability framework

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## Attachment 1





# Staff accountability framework

Title	Roles and responsibilities	Grant deliverables	Successful candidate	Start date
Director	<ul style="list-style-type: none"> <li>• Develop and implement the vision, strategy and operational model for the Centre for Entrepreneurial Agri-Technology (CEAT) to become a global transformative agri-technology hub and innovation cluster.</li> <li>• Lead CEAT's business planning process, ensuring best-practice monitoring, reporting and evaluation capability is embedded in CEAT's culture and plans.</li> <li>• Drive and meet growth targets for CEAT's funding base to evolve programs, projects and capacity in line with its strategic goals.</li> <li>• Promote CEAT and wider National Agricultural and Environmental Sciences Precinct (NAESP) to relevant national and international stakeholders (including industry, government, farmers, technologists and international partners) and represent its interests in regional, national and international agricultural and related technological contexts.</li> <li>• Nurture and leverage high value national and international relationships and communication lines with key industry bodies, partners and stakeholders.</li> <li>• Steer CEAT's industry engagement program to build and maintain a strong understanding of the agri-technology sector in-house and to identify and respond to industry ideas, needs and challenges.</li> <li>• Develop CEAT's transdisciplinary capacity to form agile research teams able to effectively address agri-technology challenges through meshing science, technology, engineering and business expertise.</li> <li>• Power the next generation of agri-technology careers and expertise through an industry focused array of formal and experiential learning programs, mentoring and placements.</li> <li>• Provide effective day-to-day management and coordination of CEAT, ensuring financial, human and material resources are optimally managed.</li> <li>• Broker reciprocating agreements with the local and regional agri-tech innovation system and their programs to resource CEAT and to jointly address gaps in the translational pipeline.</li> </ul>	6, 7, 8, 10, 14, 15	N/A	N/A
Admin support	<ul style="list-style-type: none"> <li>• Act as the first point of contact for CEAT including responding to enquiries, providing high level advice on a wide range of policies and procedures and drafting communications and general correspondence with staff and stakeholders, as needed.</li> <li>• Coordinate the financial administration of CEAT including the accurate processing of financial transactions and running various periodic and ad-hoc reports, investigating and solving issues and ensuring compliance with University policies and procedures and local area protocols.</li> <li>• Coordinate the human resources administration, including the preparation of various paperwork for approvals, basic HR system processing, running reports and investigating issues, coordinating staff recruitment and appointments through ANU Recruit, including immigration and relocation support and local area induction, as needed, ensuring compliance with University policies and procedures and local area protocols.</li> <li>• Coordinate the provision of three monthly CEAT financial and progress reports and the collection and presentation of data for reporting purposes</li> <li>• Provide general administrative support on a range of other matters including, but not limited to: international and domestic travel coordination, providing assistance on the online Travel Approval process, committee support, business planning, event management, coordinating stationery orders, arranging access cards and IT access and appropriate maintenance of office space and equipment in accordance with University and local area protocols</li> <li>• Coordinate projects aimed at improving administrative processes, mapping new processes and liaising with stakeholders to ensure appropriate consultation is conducted and the envisaged outcomes are achieved timely and on budget. Including, but not limited to establishing electronic systems for milestone tracking, office records, image management, stakeholder management, and mailing lists.</li> </ul>	15	Sch 2 2.2(a)(ii)	16 October 2018

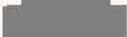


# Staff accountability framework

Title	Roles and responsibilities	Grant deliverables	Successful candidate	Start date
Senior Project Manager/ Cluster Manager	<ul style="list-style-type: none"> <li>Provide high-level strategic planning and oversight of CEAT establishment and support the strategic direction of its work program initiatives and driving the achievement of Year 1 CEAT milestones.</li> <li>Facilitate resources and integrate the strategies developed by the working parties into a coherent operational plan to inform the rollout of CEAT's programs and activities.</li> <li>Develop and manage successful end-to-end business relationships with industry, government, non-government and research institutions operating in the Agriculture, Agri-technology and Innovation sectors.</li> <li>Lead a multi-disciplinary team of industry specialists, technologists, researchers and administrative and technical professionals to scope, resource and strategise solutions to agri-tech sector needs.</li> <li>Design, implement and review CEAT infrastructure, governance and business processes to enable effective establishment and operation of the Centre.</li> <li>Represent CEAT initiatives at regional, national and international forums and foster partnerships with agri-tech industry and RDC bodies at a national and international level.</li> <li>Manage the CEAT operational budget, meet reporting obligations to relevant stakeholders and develop key strategies to secure funding and resources for further initiatives.</li> <li>Contribute to the growth of CEAT revenue in collaboration with the incoming CEAT Director and funding working party members.</li> <li>Devise a marketing and communication strategy that encompasses virtual outreach activities on multi-media platforms.</li> <li>Comply with all ANU policies and procedures and in particular those relating to work health and safety and equal opportunity.</li> </ul>	1, 2, 3, 6, 7, 8, 10, 14, 15	Sch 2 2.2(a)(ii)	2 July 2018
Events and Industry Engagement Coordinator/ Manager of Industry Placements	<ul style="list-style-type: none"> <li>Coordinate operational aspects and provide high level advice and services on a wide range of outreach and engagement matters, including the development of an events and industry engagement strategy that meets CEAT contractual requirements, while complying with the University's branding, advertising and publishing requirements and associated policies, procedures, guidelines and legal requirements.</li> <li>Coordinate the implementation of event and engagement strategies including advertising, publications, event and social media management, outreach initiatives and website content development. A component of this may also require oversight of the activities of student ambassadors and contractors.</li> <li>Research and prepare reports on key sector issues and undertake market research, competitor, statistical and trend analyses using branding, advertising and publishing principles and tools to exploit promotional opportunities that enhance engagement and event participation.</li> <li>Manage the Centre's reporting and key performance indicator data collection for events and industry engagement activities and coordinate the timely preparation and distribution of other periodic and ad hoc reports, ensuring accurate information and data presentation and recommendations to inform strategic decision-making.</li> <li>Contribute to new communication initiatives to develop and improve CEAT's engagement and events-based communications practices and processes, based on a commitment to continuous improvement and best practice in stakeholder engagement and user experience.</li> <li>Proactively liaise with communications and engagement staff across the University, CSIRO and the Canberra region to foster collaboration across the region to maximise the effectiveness of the communications, events and promotional activity undertaken.</li> </ul>	2, 3a, 3b, 3c, 6, 7, 9, 11, 12, 13, 14	Sch 2 2.2(a)(ii)	8 October 2018



# Staff accountability framework

Title	Roles and responsibilities	Grant deliverables	Successful candidate	Start date
Senior Marketing and Communications Officer	<ul style="list-style-type: none"> <li>Coordinate the provision of proactive and expert advice to the senior management team and staff on all matters relating to marketing and communications, ensuring compliance with the University's policies, procedures, guidelines and legal requirements.</li> <li>Manage the development, design and implementation of marketing and communications strategies. Develop strategic plans in advertising, branding, events and other outreach initiatives, web and social media management, digital publications, and participant-recruitment campaigns. This may occasionally require work outside of the ordinary span of hours and/or on weekends, and may involve domestic/international travel.</li> <li>Lead and manage CEAT reporting and key performance indicator data collection relating to marketing and communications activities. Provide ad-hoc reporting and market research on key marketing issues and undertake competitor analysis, campaign efficiency, statistical and trend analysis. Provide insightful recommendations and ensure uptake and inclusion of the recommendations in strategic planning to support CEAT objectives.</li> <li>Provide support in the management of the Marketing and Communications budget, including setting, planning, monitoring and reporting on campaign or project expenditure.</li> <li>Implement and manage various initiatives as requested by senior management, in accordance with strategic plans and/or aimed at improving current practices and processes, with a commitment to continuous improvement.</li> <li>Produce high quality media and social media releases, promotional material, editorial and other written communications to profile CEAT expertise and research.</li> <li>Represent and promote CEAT, ensuring that CEAT activities are informed by collaborative relationships with marketing and communications staff across the University and CSIRO, sharing best practice and identifying and capitalising on opportunities for shared advertising, events and other marketing activities.</li> </ul>	3a, 3b, 3c, 4, 10, 15	Advertised 22 October 2018	N/A
Senior Business Development Manager	<ul style="list-style-type: none"> <li>Coordinate bespoke operational procedures, policies and contractual frameworks for industry partners co-located with CEAT which meet business objectives whilst complying with University's policies, procedures, guidelines and legal requirements.</li> <li>Proactively liaise with the agri-tech industry to attract Small-to-Medium Enterprises to the Cluster, as well as to liaise with stakeholders across the University, CSIRO and the Canberra region to foster collaboration across the region to maximise the effectiveness of the Cluster.</li> <li>Provide high level advice and prepare briefings and/or reports on key sector issues, competitor strategies, and trend analyses relevant to cluster management.</li> <li>Provide high level advice and support services to establishment of the CEAT Governance Board.</li> </ul>	2, 5, 14	<div style="border: 1px solid black; padding: 2px;"> <small>Sec 2.2.2(a)(i)</small>   </div>	5 November 2018



# Income & Expenditure Statement

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Attachment 2





Fund No: S41080Q2  
Project: ACT Government Economic Development Directorate - ACT Centre for Entrepreneurial Agri-Technology

Donor Ref:  
Chief Investigator: **Sch 2 2.2(a)(ii)**

**DRAFT STATEMENT OF INCOME AND EXPENDITURE  
For the Period 01 July, 2018 to 30 September, 2018**

	Movement (Actuals + Financial) \$	Adjustments \$	Current Period \$
<b>Unspent Balance as at 01 July, 2018</b>	0.00	0.00	0.00
<b>Add</b>			
9004 ACT Government Grant	500,000.00	0.00	500,000.00
<b>Other Income</b>	<b>500,000.00</b>	<b>0.00</b>	<b>500,000.00</b>
7001 Transfer from another Ledger	250,000.00	0.00	250,000.00
<b>Transfer from other</b>	<b>250,000.00</b>	<b>0.00</b>	<b>250,000.00</b>
7901F Trf from Strategic Reserve	250,000.00	0.00	250,000.00
<b>Internal Allocations</b>	<b>250,000.00</b>	<b>0.00</b>	<b>250,000.00</b>
<b>Total Income</b>	<b>1,000,000.00</b>	<b>0.00</b>	<b>1,000,000.00</b>
<b>Total Available Funds Before Expenditure</b>	<b>\$1,000,000.00</b>	<b>\$0.00</b>	<b>\$1,000,000.00</b>
<b>Less</b>			
5002 Salary Research Assts - Cont	32,905.83	2,810.31	35,716.14
5004 Salary Admin Staff - Cont	2,907.31	0.00	2,907.31
5007 Long Service Leave - Levy Pool	1,196.08	98.36	1,294.44
5022 Super Research Assts - Cont	5,594.00	477.75	6,071.75
5024 Super Admin Staff - Continuing	484.81	0.00	484.81
5032 W/Comp Rsch Assts - Cont	658.09	56.21	714.30
5034 W/Comp Admin Staff - Cont	57.02	0.00	57.02
5042 P/Tax Research Assts - Cont	2,637.27	225.23	2,862.50
5044 P/Tax Admin Staff - Cont	228.56	0.00	228.56
<b>Salaries &amp; Related Costs</b>	<b>46,668.97</b>	<b>3,667.85</b>	<b>50,336.82</b>
5672 Rental Lease and Hire Charges	120.00	0.00	120.00
<b>Utilities &amp; Maintenance</b>	<b>120.00</b>	<b>0.00</b>	<b>120.00</b>
5400 Domestic Travel - Airfares	935.08	0.00	935.08
5410 Domestic Travel - Conf Fees	166.91	0.00	166.91
5420 Domestic Travel - Accommodatio	1,498.44	0.00	1,498.44
5430 Dom Trvl-Other Surface Tport	206.47	0.00	206.47
5431 Intrnl Trvl-Other Surface Tport	158.11	0.00	158.11
5450 Domestic Travel - Other	14.36	0.00	14.36
<b>Travel Field &amp; Survey Expenses</b>	<b>2,979.37</b>	<b>0.00</b>	<b>2,979.37</b>
5828 Consultancy Fees	1,993.60	0.00	1,993.60
<b>Consultancies</b>	<b>1,993.60</b>	<b>0.00</b>	<b>1,993.60</b>
5312 Consumables Tele excl Mobile	67.13	0.00	67.13
5312M Consum Telephone Mobile/Data	1,199.69	0.00	1,199.69
5362 Cons Comp Software and Licence	11.25	0.00	11.25
5365 Consum Internet/N'work Service	9.05	0.00	9.05
8504 IntPurch-Print/Pub/Adv/Publics	256.00	0.00	256.00
<b>Consumables</b>	<b>1,543.12</b>	<b>0.00</b>	<b>1,543.12</b>
5602 Light Meals Non - FBT	1,757.00	0.00	1,757.00
5829 Advertising and Marketing	5,463.20	0.00	5,463.20
5830 Staff Recruitment Expenses	260.00	0.00	260.00
<b>Other Expenses</b>	<b>7,480.20</b>	<b>0.00</b>	<b>7,480.20</b>
<b>Total Expenditure</b>	<b>60,785.26</b>	<b>3,667.85</b>	<b>64,453.11</b>

Unspent Balance as at 30 September, 2018

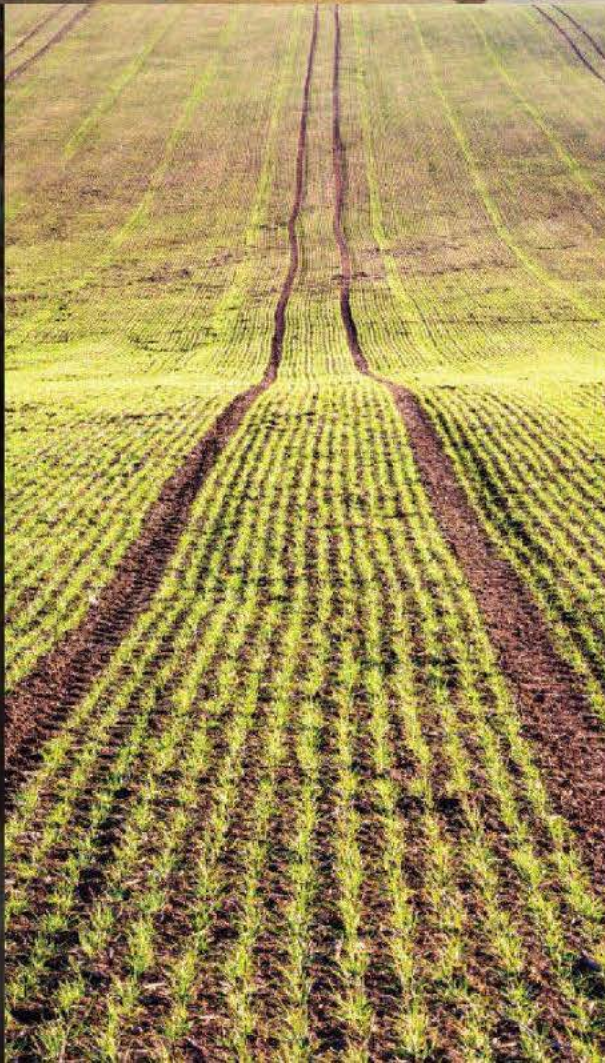
**\$935,546.89**



# CEAT Promotional Postcard

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Attachment 3





**TRANSLATE**

Building translation initiatives that address key gaps in the pipeline linking research with product development and customers.

**INNOVATE**

Members of industry co-locate with researchers in a collaborative, connected community of future-focused innovators.

**EDUCATE**

Fostering a culture of innovation in agri-technology through industry aligned seminars, training and placements.

**CONNECT**

Email: [CEAT@anu.edu.au](mailto:CEAT@anu.edu.au)  
Phone: +61 2 6125 1737



Australian  
National  
University



**ACT**  
Government



CANBERRA





Join a thriving community of innovators working across sectors,  
borders and disciplines to create a better farming future.

# The Centre for Entrepreneurial Agri-Technology

Get connected.  
Be the change.  
[www.CEAT.org.au](http://www.CEAT.org.au)



# Four Promotional Banners

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## Attachment 4





# Centre for Entrepreneurial Agri-Technology

Working together for a better farming future



# Centre for Entrepreneurial Agri-Technology

Working together for a better farming future



# Centre for Entrepreneurial Agri-Technology

Working together for a better farming future



# Centre for Entrepreneurial Agri-Technology

Working together for a better farming future



Translate | Innovate | Educate  
[www.CEAT.org.au](http://www.CEAT.org.au)



Translate | Innovate | Educate  
[www.CEAT.org.au](http://www.CEAT.org.au)



Translate | Innovate | Educate  
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Translate | Innovate | Educate  
[www.CEAT.org.au](http://www.CEAT.org.au)





# Directors Recruitment Pack

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## Attachment 5







Australian  
National  
University



INFORMATION FOR CANDIDATES  
FOR THE POSITION OF  
**DIRECTOR, CENTRE FOR  
ENTREPRENEURIAL AGRI-TECHNOLOGY**

Applications close: 23 September 2018



# CONTENTS

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# INNOVATION AT ANU

*“ANU researchers are working every day on technology to help solve some of the great problems facing the world while developing the ideas and innovation that will drive the industries and jobs of the future.”*

Professor Mick Cardew-Hall

As Australia’s national university, ANU has been at the forefront of building links with industry and supporting start-up ventures to emerge from the University’s students and researchers. The Innovation Portfolio at ANU is fostering a holistic eco-system to provide pathways and support for smart innovations to become commercial success stories.

The Innovation Portfolio’s key roles include oversight of policy on commercialisation, intellectual property management, development funding, industry engagement, international commercial partnerships and collaborations, and business liaison. Our team also coordinate innovation and advancement strategies to ensure that the ANU brand is appropriately managed and develop strategies for institutional positioning and fundraising.

The current Strategic Plan for the University embeds a new direction focused around stronger engagement with industry and fostering entrepreneurial capability across the university. Professor Brian Schmidt, our Vice Chancellor, believes that a *“contemporary national university should lead the charge in how universities and industry work together”*.<sup>1</sup> In pursuit of this, we are promoting new interdisciplinary approaches to solve the challenges our nation faces and to develop the skills that our graduates require to pursue careers that are less and less discipline-bounded.

In seeking to more actively engage with business and industry and encourage and reward entrepreneurial activity the position of Director of the Centre for Entrepreneurial Agri-Technology (CEAT) represents a new cross cutting role in the Innovation area. The Director will work closely with Schools and Colleges across the university, build strong and enduring partnerships with external organisations (both nationally and internationally) to grow the Centre and create new funding opportunities to support research translation and real world impact.

We are looking for an exceptional individual who can bridge academia, industry and government. The successful candidate will have a deep understanding of the needs of agricultural businesses and industry, of research commercialization and translation, and a broad experience base to disrupt and innovate organizational cultures.

We invite you to join us in writing the next chapter of our history.

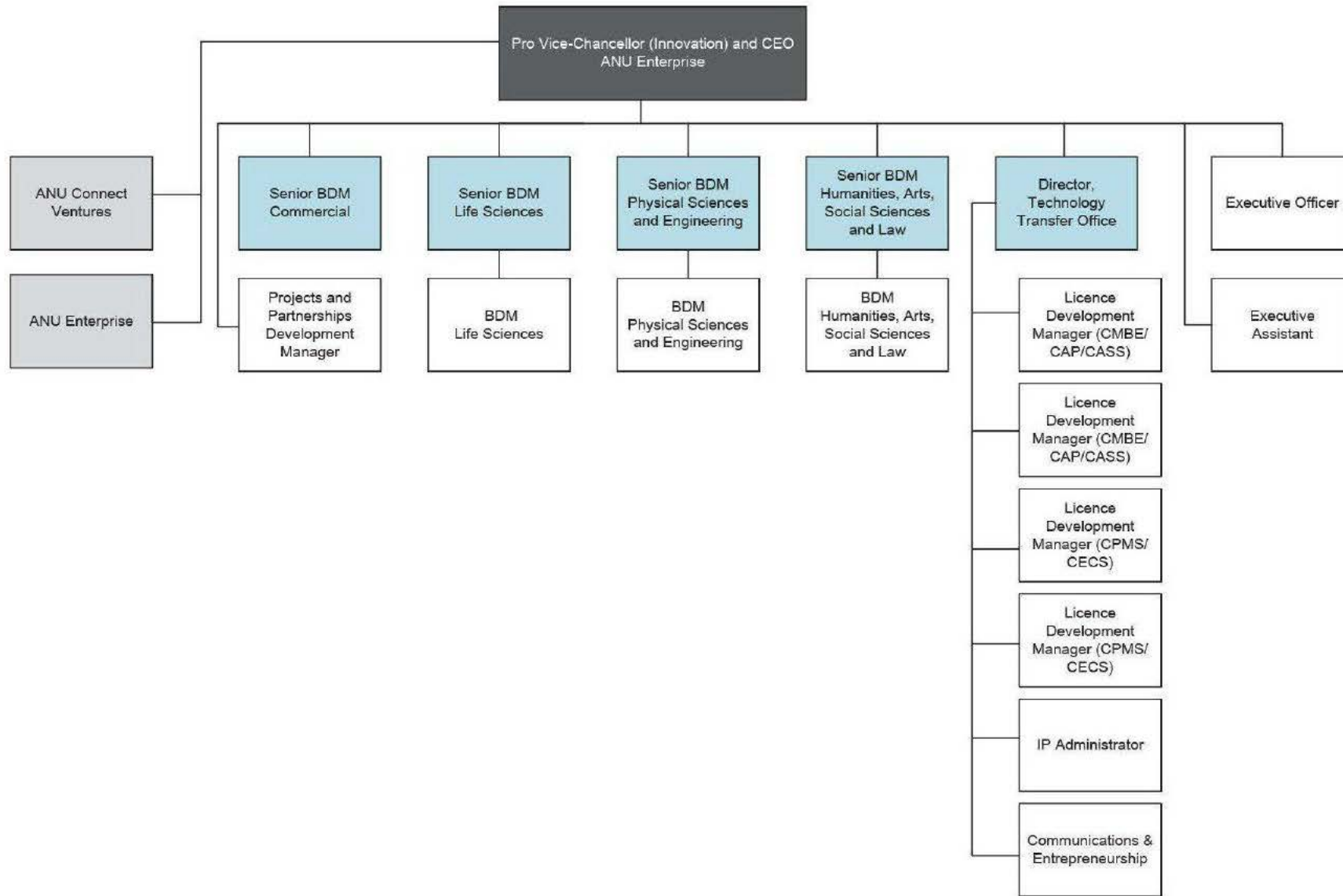


Professor Michael Cardew-Hall  
Pro Vice-Chancellor (Innovation)

<sup>1</sup> <http://www.anu.edu.au/news/all-news/anu-and-business-leaders-to-boost-collaboration>



# INNOVATION PORTFOLIO



# THE UNIVERSITY

The Australian National University (ANU) is one of the world's foremost research universities. Distinguished by its relentless pursuit of excellence, the University attracts leading academics and outstanding students from Australia and around the world.

Further information about ANU can be found at: <http://www.anu.edu.au/about>.

## History

The University was established by the Commonwealth Parliament in 1946 specifically to lead the development of the intellectual capacity of the nation through research and research training in line with the best international standards. It is the only Australian university established by a Commonwealth Act of Parliament. In 1960, the University accepted responsibility for undergraduate education along with an expectation that the highest standards of education would be achieved.

## Scale

The University has 4,300 staff, 10,286 undergraduates and 6,925 postgraduate students. Its annual revenue exceeds \$1.0 billion and consolidated assets are worth \$2.5 billion

## Partnerships

The University has strong links with leading research institutions in Australia and overseas. It is a founding member of the International Alliance of Research Universities, a co-operative network of 10 eminent international research-intensive universities which includes:

- > University of Cambridge
- > University of Oxford
- > University of California, Berkeley
- > Yale University
- > Peking University
- > National University of Singapore
- > University of Tokyo
- > University of Copenhagen
- > ETH Zurich



## Research-intensive education

As the specially-chartered national university, the University conducts research at the highest levels in all of its colleges, and offers a unique research-led education to undergraduate and postgraduate students as well as postdoctoral fellows.

The University advances the national intellectual and creative capacity in three key ways:

1. Through broad-based research and research-intensive education in the disciplines fundamental to all knowledge: the humanities, the sciences and the social sciences,
2. By supporting research and research-intensive education in a spectrum of professional disciplines, and
3. By studying Australia in its various contexts.

It is the aim of the University to achieve its objectives by creating an inspirational working environment for all its staff, students and visitors.

In each of its endeavours, the University strives to achieve at the levels of the world's great universities.

## Location

The University campus has over 200 buildings and occupies 145 hectares adjacent to the city centre of Canberra. The University also has a number of smaller campuses:

- > Mount Stromlo Observatory (west of Canberra)
- > Siding Spring Observatory (near Coonabarabran, western New South Wales)
- > North Australia Research Unit (Darwin, Northern Territory)
- > Kioloa (coastal campus near Bawley Point, on the New South Wales South Coast)
- > ANU Medical School – The Canberra Hospital campus
- > ANU Medical School – Calvary Hospital
- > Health Facilities in South East New South Wales



# UNIVERSITY COLLEGES

ANU has seven colleges, each made up of the research and education schools and centres that contribute to the various broad disciplines.

The ANU Colleges link research and teaching at undergraduate, postgraduate and higher degree levels. They undertake world-class research, and provide education programs at the highest standards. The University recognises the need to strengthen strategic planning, align administrative support with these plans and ensure consistency of policy and procedure. The aim of the college structure is to promote and formalise cooperation among the different contributors to disciplines in ANU and to remove barriers in their path.

[anu.edu.au/admin/ANUColleges/index.php](http://anu.edu.au/admin/ANUColleges/index.php)

## ANU College of Asia & the Pacific

The ANU College of Asia and the Pacific (CAP) hosts the largest assembly of scholars dedicated to working on Asia and the Pacific in the English-speaking world. Organisationally the College comprises three large Schools - the School of Culture, History and Language (CHL); the School of International, Political and Strategic Studies (IPS); and the Crawford School of Public Policy - and two Research Centres: the Regulatory Institutions Network (RegNet) and the Australian Centre on China in the World.

» [asiapacific.anu.edu.au](http://asiapacific.anu.edu.au)

## ANU College of Arts & Social Sciences

The ANU College of Arts and Social Sciences (CASS) is the research and education college for the broad disciplines of the creative arts, humanities and the social sciences. The College has two research schools and an Institute – a Research School of Social Sciences; a Research School of Humanities and the Arts; and the Australian Demographic and Social Research Institute – that cover the main disciplines to deliver leading research and degree programs.

» [cass.anu.edu.au](http://cass.anu.edu.au)

## ANU College of Science

The College consists of the Research Schools of Physics and Engineering, Earth Sciences, Chemistry, Astronomy and Astrophysics, and Biology, plus the Fenner School of Environment and Society, the Mathematical Sciences Institute, and the Australian Centre for the Public Awareness of Science. Academic staff within the ANU College of Science undertake world leading research and deliver research-led education on issues of global importance, supported by extensive international networks and world class facilities.

» [cos.anu.edu.au](http://cos.anu.edu.au)

## ANU College of Business & Economics

The ANU College of Business and Economics (CBE) seeks to advance knowledge through high quality teaching and research in the closely related areas of accounting, actuarial studies, business information systems, econometrics, economic history,

economics, finance, international business, management, marketing and statistics. It endeavours to do this through the provision of a range of undergraduate and graduate programs, and through its research, publications and contributions to the associated professions, commerce, industry and government.

» [cbe.anu.edu.au](http://cbe.anu.edu.au)

## ANU College of Engineering & Computer Science

The ANU College of Engineering and Computer Science (CECS) comprises the Research School of Engineering and the Research School of Computer Science. It offers undergraduate degrees in engineering, information technology and computer science along with masters and doctoral postgraduate programs. The College undertakes basic and applied research in information and communications technologies, materials and manufacturing, formal methods and logic, machine learning and vision, robotics and energy systems.

» [cecs.anu.edu.au](http://cecs.anu.edu.au)

## ANU College of Law

The ANU College of Law (CoL) is Australia's national law school, committed to legal education and research at the highest level, and to striving for continuous improvement in the law for the benefit of national and international communities. The College offers LLB and LLB (Graduate) degrees, a Graduate Diploma in Legal Practice through the Legal Workshop, and postgraduate research and coursework degrees.

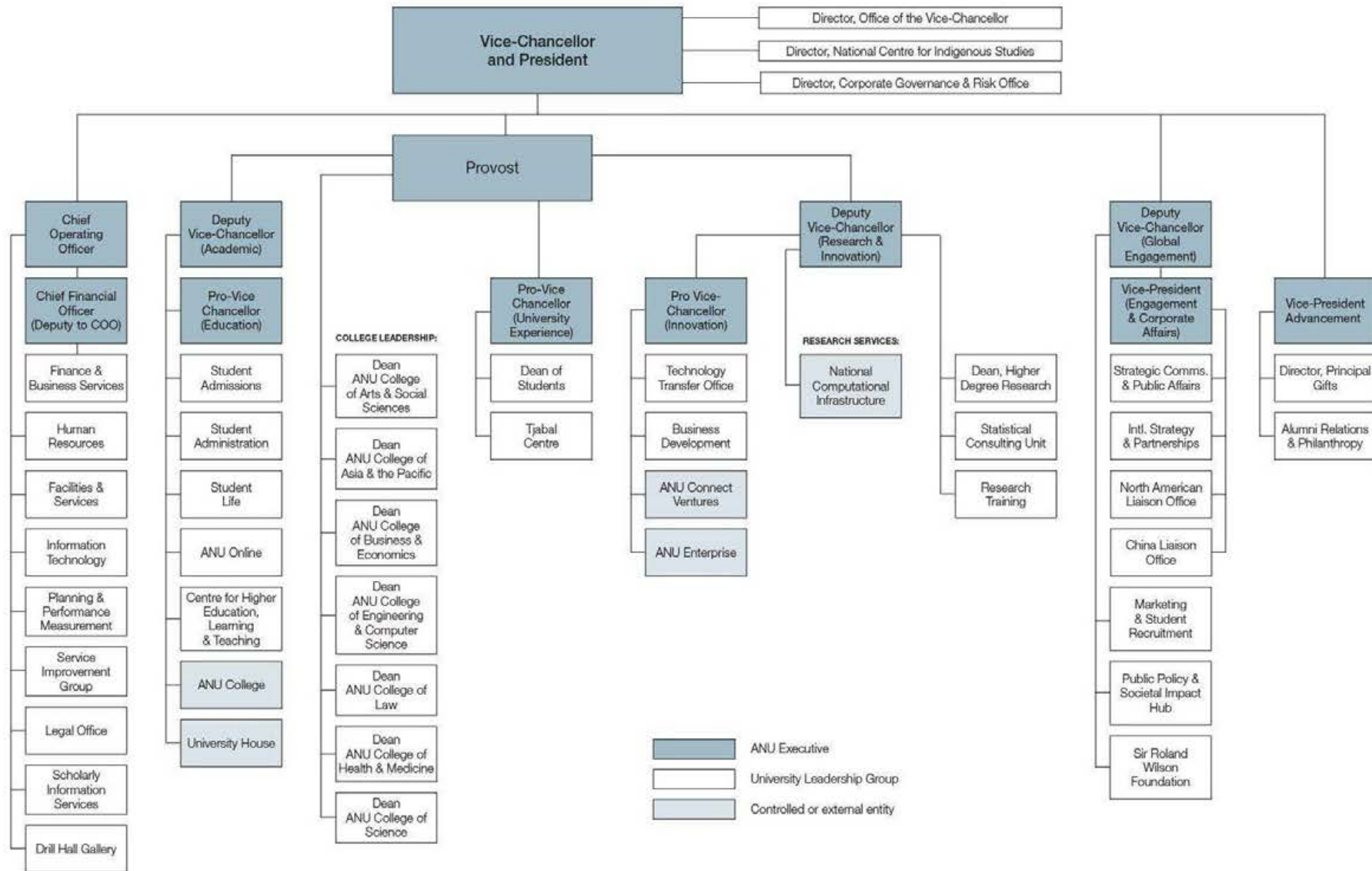
» [law.anu.edu.au](http://law.anu.edu.au)

## ANU College of Health & Medicine

The ANU College of Health and Medicine comprises the ANU Medical School, the John Curtin School of Medical Research, the Research School of Psychology and the Research School of Population Health. These schools work together to deliver world-class research and education across the spectrum of medicine and health-related fields, working in partnership with the health sector at local, national and international levels.

» [chm.anu.edu.au](http://chm.anu.edu.au)

# ANU EXECUTIVE STRUCTURE





# TRANSFORMING AGRI-TECH IN CANBERRA

The Centre for Entrepreneurial Agri-Technology (CEAT) arises from the aspirations of the ACT Government, ACT's Vice Chancellor's Forum, and ANU-CSIRO National Agricultural and Environmental Sciences Precinct (NAESP) partnership.

CEAT will synergise the NAESP's outstanding research capability in plant, agricultural, data, engineering and environmental sciences to realize a globally significant innovation cluster akin to world-leading clusters (e.g. Wageningen, Ghent and UC Davis). While CEAT is located in Canberra, its reach extends across the nation and beyond, with international engagement being a feature of the NAESP partnership. Beginning with a five-year initial investment, CEAT will lay the groundwork for a longer-term, expanding global agri-tech innovation cluster based in Canberra.



CEAT will build on collaborative and interdisciplinary research models to support agri-tech industry innovation and productivity, and to realise translation pathways that achieve effective end-user outcomes. As a one-stop shop for agri-technology, CEAT invites entrepreneurs and farmers to contribute and develop our research; academics to translate their research; and students to take up opportunities for industry engagement and placements. The Centre aims to capitalise on the concentration and synergies of research excellence, innovation culture and networks and translation services available in the NAESP and wider region.

## An opportunity to the shape the future of agri-tech

To realize the vision of CEAT, the Director will engage and manage a diverse and complex stakeholder landscape and drive ambitious investment, growth and expansion to achieve the critical scale to attract high profile talent, partners, firms, opportunities and investment locally, regionally, nationally and internationally. This requires a person who can hit the ground running with established networks of influence with potential industry partners across the public, private and not-for-profit sectors in agri-technology. The Director will span cultural divides to work effectively in the NAESP science-based context through influence, negotiation and collaboration.

Join us and help us realize the potential of Canberra to be a world leading centre for engagement between students, researchers and the agri-tech industry.

Sch 2 2.2(a)(ii)



# CANBERRA'S SCIENCE PRECINCT

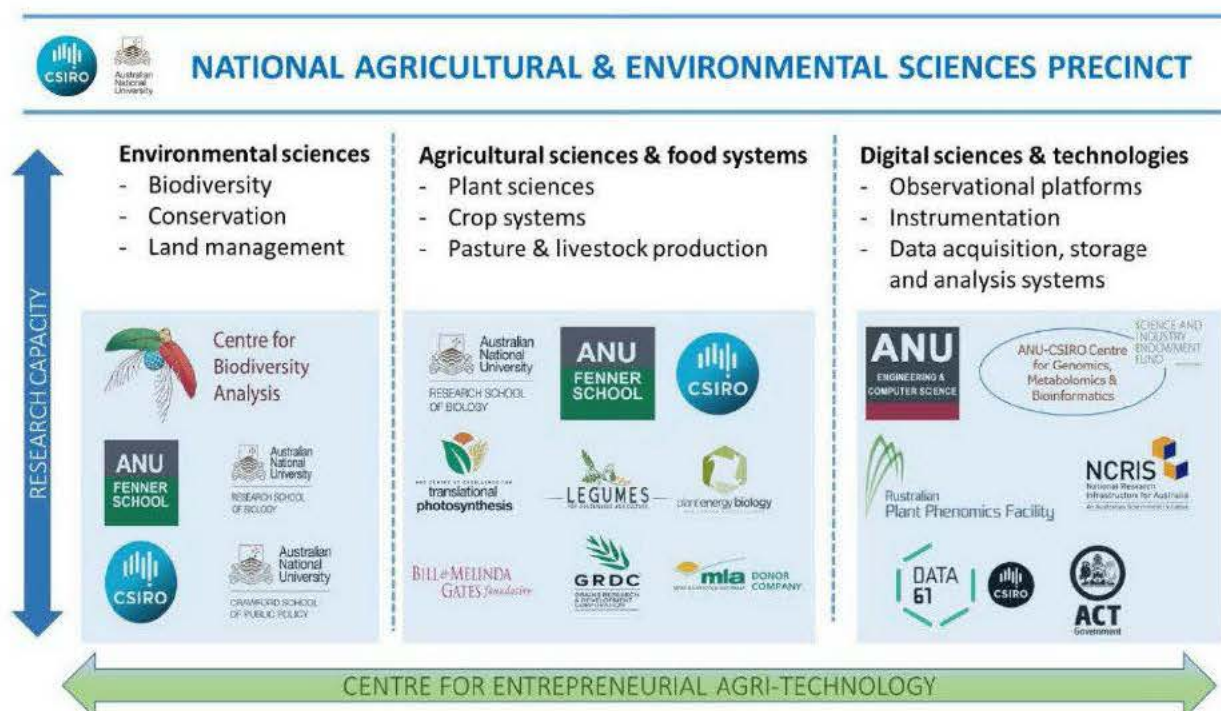
The Australian National University and CSIRO have been world-leaders in plant, agriculture and environmental science research, research training and research translation for fifty years. Together, they founded the National Agricultural and Environmental Sciences Precinct (NAESP) to invest in a collaborative research environment with shared infrastructure. The NAESP also includes strengths in engineering and computer science to further strengthen the precincts capacity to address initiatives in the environmental & agricultural sciences, food systems and digital sciences/technologies. Together, this unique knowledge cluster provides an ideal platform to address regional and global agricultural and food-security challenges.

Government funding have long supported investment in world-class research in plant and agricultural research infrastructure in the NAESP. This investment in state-of-the-art plant growth/phenotyping and analysis facilities provides unique opportunities for the agri-tech industry including:

- > Plant Phenomics and Bioinformatics & Biometry at the Australian Plant Phenomics Facility
- > Microscopy for agricultural research in the Centre for Advanced Microscopy
- > Omic platforms through the Joint Mass Spectrometry Facility
- > Gas exchange systems and isotope analyses
- > Field sites (including a new data-enabled field station near Canberra)
- > Food systems/processing, supported by the Canberra Airport International Freight Hub
- > Earth Observation Centre

Additionally, both NAESP partners continue to invest in computational infrastructure capable of processing and storing large datasets and have highly trained bioinformatics staff with skills to analyse increasing large and complex datasets. The latter is being supported by the newly commenced Biological Data Science Institute (BDSI). As part of its remit, the BDSI will address the challenges of the 'digital agricultural revolution' (i.e. explosion of data) via investments in workforce training and resourcing. The NAESP is also home to the Canberra node of Data61 - Australia's leading data innovation group which was officially formed in 2016.

The NAESP provides opportunities for collaboration with staff at CSIRO Agriculture and Food, whose Black Mountain campus is immediately adjacent to the science faculties of ANU. Their mission is to help Australian farmers and industry improve productivity and sustainability. CSIRO is also host to the High Resolution Plant Phenomics Centre, part of the NCRIS-funded Australian Plant Phenomics Facility.





# CANBERRA'S SCIENCE PRECINCT

The NAESP also provides opportunities for industry to engage with exceptional students, early career researchers and faculty from the following areas of ANU:

- > Research School of Biology
- > Fenner School of Environment and Society
- > College of Engineering and Computer Science

The Research School of Biology (RSB) is devoted to the study of biological processes in plants, animals and humans. RSB academics are supported by grants from large variety of sources, including:

- > ARC Centre of Excellence for Plant Energy Biology
- > ARC Centre of Excellence for Translational Photosynthesis
- > Legumes for Sustainable Agriculture (LSA) Research Hub
- > Gates Foundation RIPE (Realizing Increased Photosynthetic Efficiency) Project
- > Gates Foundation C4 Rice Project
- > International Wheat Yield Partnership
- > Grains Research & Development Corporation
- > NCRIS-funded Australian Plant Phenomics Facility

The Fenner School has expertise in sustainability science in the broad sense, connecting science solutions to practice and policy. They have deep expertise in biodiversity science, including in agricultural landscapes, and strengths in water issues from hydrology to policy. Fenner also have specialist knowledge in a range of specific areas including crop pollination, soil science, forestry, and grazing management. Fenner hosts the Sustained Farms project.

The College of Engineering and Computer Science (CECS) at ANU includes the Research School of Engineering and Research School of Computer Science. They are at the leading edge within numerous fields with links to the agri-tech industry, including algorithms and data, signal processing, artificial intelligence, computer vision and robotics, computational mechanics, materials, fabrication, big software systems, energy and networked systems. With small classes, their students benefit from being part of a dynamic and pioneering research environment, with CECS hosting a node of the ARC Centre of Excellence for Robotic Vision.

*The vibrant intellectual environment and infrastructure of the NAESP makes it an unparalleled environment for industry engagement, particularly where there is a need for technology designers to collaborate with disciplinary experts, technicians, next-generation researchers and industry stakeholders to tackle complex problems in the agri-tech industry.*

