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Centre for eResearch and Digital Innovation

Annual Report 2017

Contents

Foreword

Professor Helen Bartlett, Vice-Chancellor

The Centre for eResearch and Digital Innovation, under the leadership of Associate Professor Helen Thompson, has continued its success as one of FedUni's foremost research centres.

This has been achieved with the strong commitment to new research knowledge and real-world applications.

FedUni's Strategic Plan outlines the importance for transformation, of building unique opportunities, and delivering a sustainable future. CeRDI exemplifies each of these qualities across its research activities.

CeRDI is conducting research in areas leading to industry change and transformation. Its contribution to new knowledge within agriculture, positions it as a national leader. New and continued research collaborations with industry, including the Grains Research and Development Corporation through Online Farm Trials is developing improved management solutions for grains production, and the implementation of best farming approaches.

Precision Agriculture, a locally based organisation with national reach is partnering with CeRDI for three-years to develop collaborative innovations in the digital agriculture space that will have broad implications for improved farming practices.

A strong commitment to partnership has enabled the team at CeRDI to build and develop unique research opportunities in health and wellbeing. This reflects a longer term commitment for positive change in our region and beyond. Dementia Pathways Tool, Sport and Recreation Spatial, the Youth Changing Alcohol Norms project in Horsham, and the Central Highlands Health Justice Partnership have been established in response to unique challenges and opportunities, facilitating innovative technologies and enabling new research knowledge for wider benefit.

CeRDI's research makes a substantial contribution to our sustainable futures. Projects focused on the natural environment profile a range of eResearch, new technologies and citizen science initiatives that have been successfully applied to conservation and the support of natural resources management, planning and biodiversity.

The scope and quality of CeRDI's research is exemplified in the following report. I wish Helen and the CeRDI team well over the next 12-months and look forward to following its continued success in 2018 and beyond.

Introduction

Professor Leigh Sullivan, Deputy Vice-Chancellor, Research and Innovation

It is with pleasure that I provide the Introduction for the 2017 CeRDI annual report and reflect upon the Centre's many achievements during the year.

CeRDI is fast gaining an impressive national reputation as a leader in digital innovation across agriculture. Online Farm Trials (OFT) has been expanded and is supporting the grains industry to develop improved management solutions for grains production, and the implementation of best farming approaches. The success of this project reflects not only the innovative developments CeRDI has adopted with OFT, but also, the strong partnership that exists between CeRDI and the Grains Research and Development Corporation.

Furthering its national reputation as a leader in digital agriculture, CeRDI has partnered on a significant research program that has received Federal government funding via the University's partnership with the Co-operative Research Centre for High Performance Soils. CeRDI has taken a lead role in this CRC by contributing to scoping projects examining soil health and performance indicators that will improve data management approaches for farmers.

The three year research partnership between CeRDI and Precision Agriculture is another initiative that I am excited to see progress. This collaboration forges closer ties between the University and this locally based, national-wide agricultural technology leader. CeRDI and Precision Agriculture are working collaboratively towards the co-creation of innovations in the digital agriculture space.

CeRDI continues to enhance its profile within its key research areas. Substantial contributions are being made through research within the natural environment. Likewise, ongoing projects in health and well-being showcase the significant impact of regional and national focused projects addressing youth, dementia care and chronic disease management. CeRDI is assisting Sport and Recreation Spatial in providing significant research evidence supporting sector planning and decision making with state and national recognition being gained through a combination of sport and recreation and research awards in 2017.

CeRDI's engagement and partnerships in the Heritage and Culture areas are providing unique opportunities to partner with local organisations and to present new insights with applied technology and innovations in Ballarat and the Gippsland region.

I congratulate Helen Thompson and the team at CeRDI on their contribution to developing an important and extensive research program that is making important contributions regionally, nationally and increasingly, internationally.

Introduction

Associate Professor Helen Thompson, Director, CeRDI

The 2017 Annual report presents an opportunity to reflect on our successes for the year and to showcase CeRDI's research achievements in greater depth.

We have fast established a strong track record with Co-operative Research Centre (CRC) projects, having contributed to two successful applications for FedUni. The CRC for High Performance Soils was awarded $39.5 million over 10 years to help Australian farmers make decisions on complex soil management issues. The Food Agility CRC was also awarded $50 million over 10 years to help the nation's food industry grow its comparative advantage through digital transformation. CeRDI is contributing to both projects and has taken a lead role in engagement linked to Federation University Australia's participation in the Cooperative Research Centre (CRC) for High Performance Soils.

CeRDI has continued its funding success across a range of new projects. The Helen Macpherson Smith Trust and VicHealth both awarded substantial funding to extend current natural environment and health and wellbeing research, respectively. In the second half of the year, CeRDI and its project partners received funding from the Department of Industry, Innovation and Science, as part of the Inspiring Australia – Science Engagement Program. Funding will support the implementation of the National WaterbugBlitz, an important citizen science project for building skills and knowledge about freshwater habitats and biodiversity.

Online Farm Trials (OFT) has achieved new milestones this year with additional trials added to the Trial Explorer with new organisations now contributing trial data to this important program. This project continues to build on the strong partnership that has been established and fostered with the Grains Research and Development Corporation.

In August we officially commenced a three-year research collaboration with Precision Agriculture to accelerate the adoption of precision farming techniques. With innovative methods for digital agricultural advancements planned over three distinct project phases, this collaboration will enable farmers, agronomists and researchers with new learnings and improved methods for farming productivity across Australia.

CeRDI's expertise in spatial technology and data portal developments has also expanded. Initiatives such as the South Australia Tree Watch portal and the Western Alliance for Greenhouse Action 'How well are we adapting' portal were developed by CeRDI. We were closely involved with extensions to the online, career pathways platform, 'Land Your Career', while CeRDI's long-term partnership with the Corangamite Catchment Management Authority continued, linked to the Discover the Living Moorabool project which is focused on supporting, enhancing and protecting the Moorabool River.

Exciting new enhancements to existing projects have also occurred during the year. Visualising Ballarat went live as an outcome of ongoing collaboration with the City of Ballarat with enhanced public access to a range of datasets relating to Ballarat's historic, contemporary and natural landscapes. Significant advancements have also occurred with the Dementia Care in Hospitals program, Spatial Connect, and the Central Highlands Health Justice Partnership.

I look forward to pursing new research opportunities in 2018 and building upon our current projects to achieve successful and insightful research across all our research themes.

Overview

The Centre for eResearch and Digital Innovation (CeRDI) is located within the Office of the Deputy Vice Chancellor (Research and Innovation) at Federation University Australia.

CeRDI focuses on multidisciplinary research through the application of advanced information and communications technology (ICT), enabling digital transformations and practice change, together with enhancements in effectiveness and productivity in industry, government and academia. Significant effort has been directed towards extending CeRDI's spatial technology capabilities and eResearch in projects that are clustered around the six core themes of Natural Environment, Digital Agriculture, Hazard Planning and Resilience, Health and Wellbeing, Heritage and Culture, and Regional Development.

CeRDI has thus gained a reputation for:

- the application of ICT and the development of innovative, world-class knowledge management systems;

- significantly advancing the digital literacy and knowledge management capabilities of partner organisations;

- fostering partnerships for the development and implementation of eResearch with industry, government and academia;

- measuring the impact of eResearch and digital innovation through longitudinal research; and

- postgraduate research, with a cohort of HDR students conducting research within the Centre.

CeRDI is outcome-focused and committed to building capacity and engagement with partner organisations, as well as ensuring uptake of technologies that benefit and support research partners and their staff, stakeholders, and the broader community.

CeRDI delivers world-class innovations in technology by anticipating new technology directions and opportunities based on insights from research and partner engagement. These innovations generate beneficial partner outcomes and attract sustained research investment.

Significant advances have been linked to CeRDI's expanding engagement in spatial information systems, visualisation, knowledge management and data interoperability. CeRDI researchers have also implemented a longitudinal program of research to measure the impact of technology on improvements to decision making and practice change, through data captured from projects across CeRDI's research themes in Natural Environment, Agriculture, Health and Wellbeing, Heritage and Culture, Hazards Planning and Resilience, and Regional Development.

CeRDI's research approach is characterised by the following attributes.

- **Partner engagement** – listening skills and the ability to translate information from partners into projects with outcomes that stakeholder's value. CeRDI has a reputation for consistency, reliability, timeliness, credibility and excellence.

- **Fostering long-term partnerships** – sustaining them beyond the period of initial grant funding (many partnerships have continued for more than 10 years) and undertaking practical and applied research that deliver on outcomes.

- **A multidisciplinary team comprised of researchers with specific discipline expertise, technical and support staff and HDR students** – the essential foundation for innovation, knowledge and technology transfer.

- **A diverse portfolio** – stretching across a range of disciplines, with a multiplicity of organisations contributing to overall financial sustainability.

- **Prioritising a high level of co-creation** – through close linkages and engagement with staff from partner organisations including researchers, government, industry and community, which catalyses knowledge mobilisation and ensures beneficial outcomes for partner organisations.

- **Continuous innovation** – in knowledge management, publishing, spatial mapping and participatory geographical information systems.

- **A leader in eResearch and spatial innovation** – adding value to areas of FedUni research strength, aligned with the national eResearch framework and the National Strategic Research Priorities.

CeRDI Team
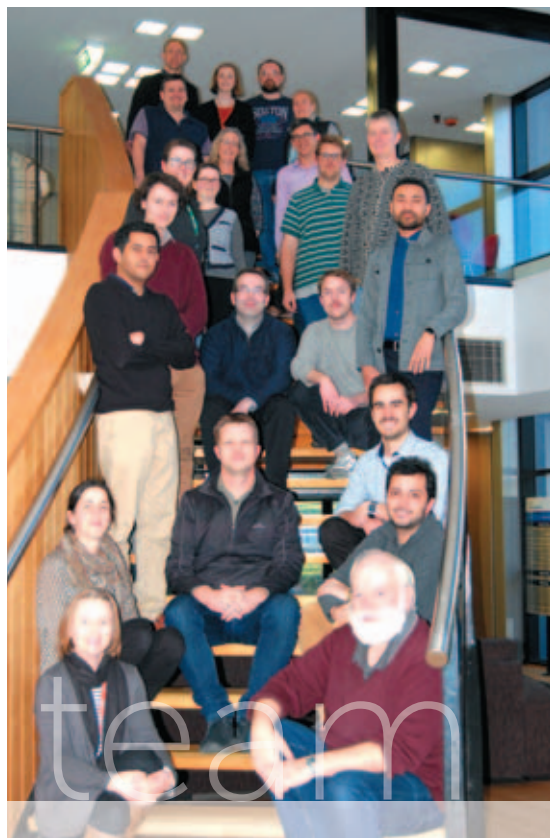
The CeRDI team represents a multidisciplinary mix of researchers and skilled technical staff ensuring that CeRDI continues to be innovative while striving towards its research and technology goals across the six research areas.

In 2017, CeRDI comprised 36 (full-time; part-time; casual) staff across research (23), technical (10), and project management and administration (3). Six HDR (PhD) students continued their research within CeRDI during 2017.

Profiles for CeRDI staff are included in this report. Recent staffing appointments ensure there is greater support for senior research and technical members, enabling them to focus and advance their expertise and skills in new developments and build the Centre's research profile. CeRDI's increasingly multidisciplinary research capabilities distinguish it from traditional research centres and ensure that the research undertaken has impact across a broad discipline base and in each of the six research themes.

eResearch

CeRDI defines eResearch as a set of activities that harness the power of advanced information and communication technologies (ICTs) for research.

Characterised by collaboration and facilitated by fast, high-capacity networks, the range of eResearch activities is diverse and multi-disciplinary. Key themes and drivers of eResearch include:

- **data management and sharing;**
- **research collaboration;**
- **high performance computing;** and
- **customised discipline specific technologies to support research practices.**

eResearch methodologies and capabilities have applications across all research disciplines. As an enabler of innovations and new discoveries, eResearch has the potential to boost research effectiveness through increased interaction between researchers, increased access to data and enhanced access to research outputs.

CeRDI's specific expertise in eResearch is characterised by its innovations in knowledge management, spatial mapping, data interoperability and participatory geographic information systems. These have underpinned CeRDI's growth since 2012.

Further, CeRDI uniquely defines eResearch as being comprised of three complementary directions:

- data discovery research;
- technological innovation research; and
- longitudinal impact research.

Data discovery research consists of two elements: the identification and analysis of research ready datasets (often historically hidden but now made accessible to allow discipline-specific and cross-discipline research); and new discovery through crowd sourcing and citizen science.

Technological innovation research at CeRDI includes the development of international open access standards, data interoperability methodologies and standards, data federation methodologies, three-dimensional and four-dimensional visualisation technologies, and digital tools to facilitate and support the development of crowd sourcing approaches and citizen science.

CeRDI's expertise in eResearch is coupled with a model of research that is characterised by the conceptualisation of discipline-specific investigations within the broader societal context – a dual function of all CeRDI research. The approach adopted by CeRDI researchers includes a social perspective to the impact of eResearch. This allows for insights relating to practice change, decision making, research potential and capacity building that have not previously been adopted consistently within the context of eResearch.

Researchers at CeRDI have implemented a programmatic approach to measuring the impact of technological innovation on improved decision making and in supporting practice change within the practice context. To achieve this, researchers are applying a longitudinal research design across a range of CeRDI's programmatic themes including Digital Agriculture, Natural Resource Management, Regional Development, and Health and Wellbeing.

This research approach places CeRDI in a unique position within the Australian eResearch environment.

CeRDI's Technological Approach

CeRDI capability: Interoperability

The majority of CeRDI's eResearch is invested in the development of spatial data portals.

The majority of CeRDI's eResearch is invested in the development of spatial data portals. For researchers, these portals address the increasing problems associated with the sheer range of information sources and volume of data that is now available (i.e. in the Era of Big Data). In Australia, for example, information and data on agricultural soils is distributed via dozens of web-portals, web-based geographic information system (GIS) tools, password-protected portals, cloud storage, portable storage devices, hardcopy maps, theses, reports, newsletters, documents, videos and podcasts. Outside of the research community, however, this vast source of data is largely ignored, as few people have the time or the skills to consolidate available data.

To address these concerns, spatial data infrastructure (SDI) has been developed and deployed to federate data from disparate database sources into a single web portal, thereby making data more easily discoverable. Globally, the systems developed by Natural Resource Canada provided the initial exemplars that were developed using open geospatial standards and technologies. Other examples include the European Commission's INSPIRE network, the New Zealand SMART system, and those developed by the United States Geological Survey, the French Bureau de Recherche Géologiques et Minières (BRGM), Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Australian Bureau of Meteorology.

CeRDI actively collaborates with these leading organisations by sharing open source technologies and developing open standards. Seamless international information exchange of complex domain data, such as groundwater or soil data, relies on agreed formats, communication protocols and schemas for serving, querying and consuming data, along with agreed content (known as semantic interoperability).

CeRDI Capability: Systems Architecture

The Spatial Data Infrastructure (SDI) deployed by CeRDI was initially developed by CSIRO, and is known as the Spatial Information Services Stack (SISS).

At the core of the SISS are the open source spatial data engines Mapserver (www.mapserver.org) and Geoserver (geoserver.org), which are used for the geospatial processing and service delivery using Open Geospatial Consortium (www.opengeospatial.org) standards. Vector data are commonly stored within a MySQL or PostGIS database, and raster data are dynamically processed from its native format. To deliver complex web feature services (WFS), the Geoserver app-schema extension has been deployed. Geonetwork (geonetwork-opensource.org) is used as the public-facing metadata catalogue for the portals.

The general systems architecture and data flow from custodians to end users is illustrated in Figure 1.

Visualising Victoria's Environment portals: proposed Spatial Data Infrastructure (generalised)

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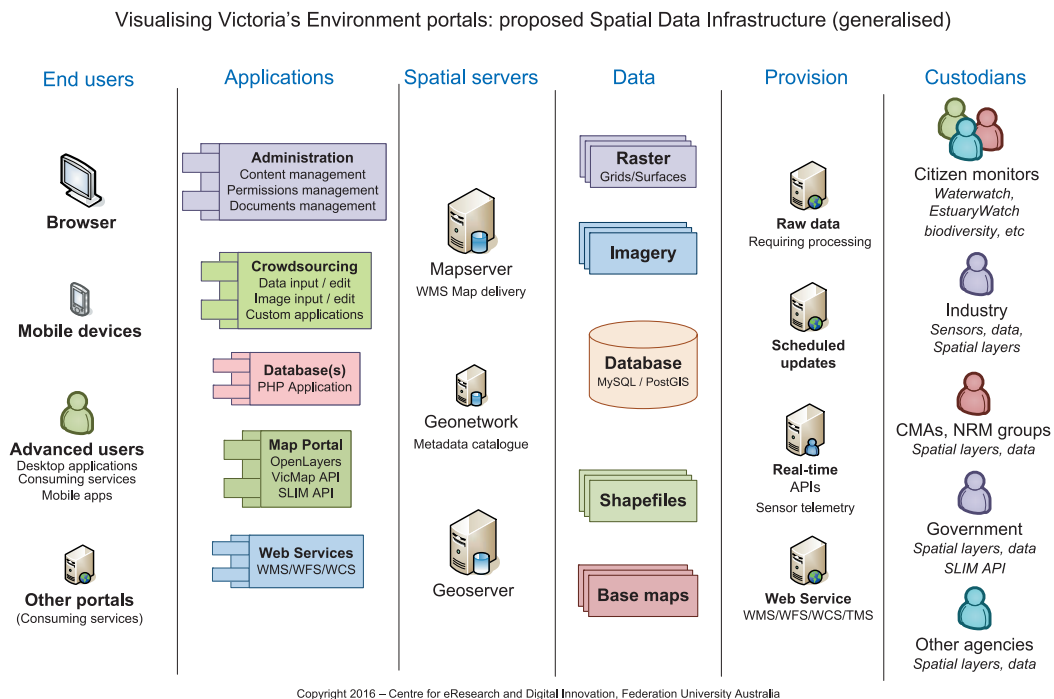
FIGURE 1: CeRDI'S GENERAL SYSTEMS ARCHITECTURE AND DATA FLOW FROM CUSTODIANS TO END USERS. (SOURCE: DAHLHAUS & THOMPSON, 2016).

Key components of the system include the following:

- The data resides with the data managers (ensuring currency and validity).
- They are intuitive to use (similar to Google Maps).
- All forms of data are included (vector, raster, text and multimedia).
- Data downloads are allowed (subject to data custodian's consent).
- Spatial data links to original source (documents and images).
- Spatial data links to real time data (data loggers, webcams).
- They are capable of analysing the interoperable data on the fly.
- Interactive 3D visualisations can be created for user-selected scenes.
- Users can add, edit or update data (subject to quality assurance and quality control).
- The spatial data and models are credible to the user.

The key principles underlying all technical innovation and development at CeRDI include:

- ensuring end-user tools and applications are fast, intuitive and easy-to-use,
- making sure that applications work seamlessly across a variety of platforms, operating systems and browsers to the extent possible,
- use of open-source and standards compliant software and technologies, wherever possible,
- building upon existing collaborative software initiatives and contributing enhancements/tools back to the community,
- ensuring the flexibility of the developed system to consume data from a variety of sources so as not to interfere with existing provider work practices, and
- use of software based in the cloud: no end-user requirement for software, updates, computation power or plug-ins.

The CeRDI technical team applies best practices for web development to ensure systems are responsive and accessible to the needs of users. Members of the CeRDI technical team have had extensive training as well as relevant qualifications, capabilities and industry experience to ensure optimal project outputs, to enable delivery of scalable and customised applications to meet the unique requirements of various project partners.

CeRDI adopts an agile path for software and spatial knowledge systems development. Rapid prototypes of products are developed in conjunction with project partners, stakeholders and researchers, to ensure their technical requirements are met at each development stage

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State Wide Integrated Flora and Fauna Teams

The State Wide Integrated Flora and Fauna Teams (SWIFFT) is a knowledge sharing and information exchange initiative that supports conservation and management of threatened species, biodiversity and the natural environment across Victoria.

Key features of the SWIFFT initiative include an open and free to access website for hosting and exchanging knowledge and information contributed by the conservation community, a quarterly video conference seminar program and support for citizen science programs and resources. SWIFFT is linked to the Visualising Victoria's Biodiversity initiative developed and hosted by CeRDI.

In 2017, the Helen Macpherson Smith Trust (HMST) awarded $90,000 over two years towards the SWIFFT and Visualising Victoria's Biodiversity (VVB) initiatives to continue important capacity building, engagement and development work.

A range of activities are being undertaken for the project, commencing with the redevelopment of the SWIFFT website and further engagement with regional Victorian communities and stakeholders. The redevelopment will entail substantial changes to the design and structure of the website, significantly improving the usability and accessibility of available content and information.

Stakeholder engagement will inform each stage of this project ensuring that each new development for the project reflects their needs and supports regional biodiversity conservation efforts. Online surveys for stakeholders are being implemented throughout the project to ensure feedback and insights are captured and a comprehensive understanding of user's interaction with the SWIFFT platform is achieved.

In addition, new and existing stakeholders and organisations will be invited to share new data to expand and enhance SWIFFT. Regional workshops are being conducted to build awareness of SWIFFT, provide examples of how the platform can be used to support biodiversity conservation and information exchange, and to facilitate wider representation of regional content on the platform. Ongoing knowledge sharing partnerships with these stakeholders will be encouraged and supported.

It is anticipated that the planned advancements to SWIFFT will enable the wider community to participate and collaborate more fully in biodiversity activities by accessing relevant and comprehensive biodiversity information. This will facilitate knowledge sharing and improve the cooperation and collaboration between key industry organisations, and the wider community.

Project Partners:

Helen Macpherson Smith Trust

Zoos Victoria

State Wide Integrated Flora and Fauna Teams

SWIFFT website:
www.swifft.net.au

Key Contact

Rob Milne, CeRDI Research Associate:
r.milne@federation.edu.au

NATURAL ENVIRONMENT

Visualising Victoria's Biodiversity

Visualising Victoria's Biodiversity (VVB) is an open access web portal that provides the Victorian community with a central point of access to a wide range of spatial data on Victoria's environmental values, conservation activities and research.

VVB is a partner site and complementary tool to the State Wide Integrated Flora and Fauna Teams (SWIFFT) initiative. Visualising Victoria's Biodiversity is supported by the Helen Macpherson Smith Trust (HMST) as part of its combined $90,000 two year investment in the SWIFFT and VVB initiatives.

VVB federates and visualises environmental data from national, state, regional and local sources in an easy to use interactive map based interface. VVB draws upon a suite of technical developments undertaken at CeRDI to maximise the discoverability of spatial information and data. This includes a search and report tools that provide direct linkages to data contained within the Victorian Government's open data library (data.vic.gov.au), the Atlas of Living Australia and other interoperable data repositories.

Online tools and features are being developed to provide ways to discover, view and summarise environmental data for awareness raising, research, decision making and conservation activities. VVB provides the facility for individuals, community groups and other stakeholders to share their spatial data in an open online environment. In collaboration with SWIFFT, the VVB has facilitated the exchange of community information and knowledge, environmental research, conservation projects and citizen science data.

The latest funding will support a range of new improvements to the portal informed by further engagement with stakeholders. It will also assist the development of ongoing data sharing agreements and partnerships to further extend the availability of environmental datasets on the portal.
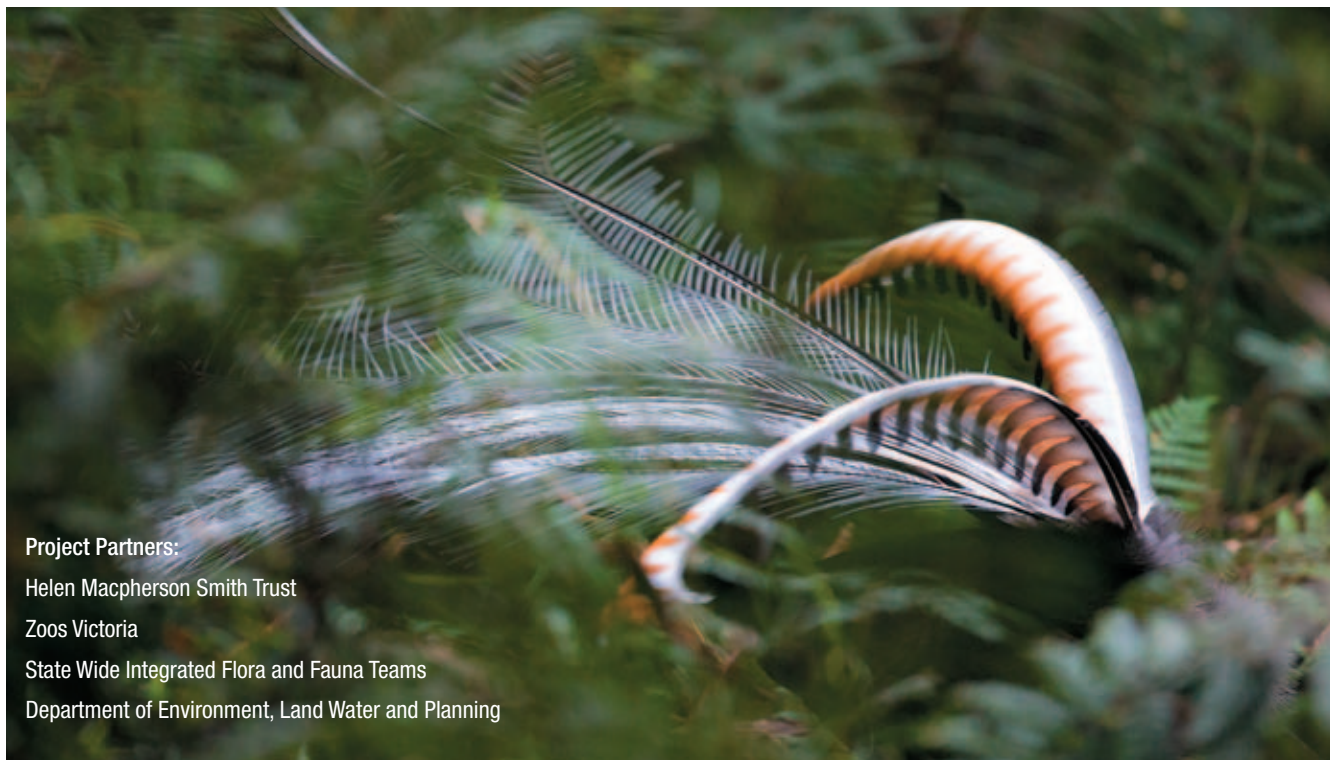
Project Partners:

Helen Macpherson Smith Trust

Zoos Victoria

State Wide Integrated Flora and Fauna Teams

Department of Environment, Land Water and Planning
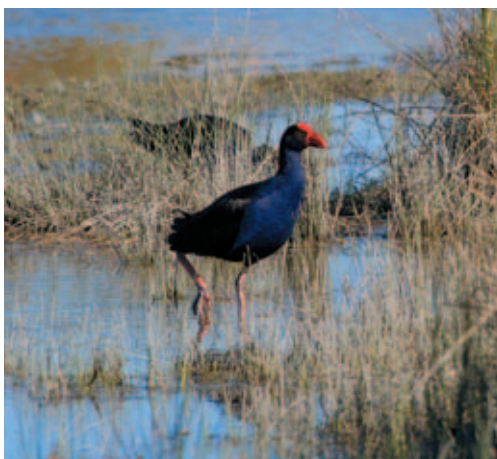
VVB website:
www.vvb.org.au

Key Contact

Rob Milne, CeRDI Research Associate:
r.milne@federation.edu.au

The National Waterbug Blitz

The National Waterbug Blitz is Australia's first nationwide, citizen science, waterway monitoring event.

Citizen scientists across the nation will uncover clues to assess the health of local waterways and wetlands by exploring and identifying the waterbugs that live within them.

Funding for the National Waterbug Blitz: Citizens assessing Australian waterways was announced in 2017. CeRDI together with partners Waterwatch, Corangamite CMA, Envirocomm Connections and The Waterbug Company, were awarded funding from the Department of Industry, Innovation and Science as part of the Inspiring Australia – Science Engagement Program. This project was one of only 18 successfully funded projects from a large pool of national applications.

The National Waterbug Blitz builds upon 20 years of successful citizen monitoring in waterways by Waterwatch Victoria and other state/territory Waterwatch programs by harnessing the expertise and knowledge of participants. The National Waterbug Blitz will allow communities to engage with nature, build their skills, and learn about freshwater biodiversity while participating in an assessment of Australia's waterway health.

Data collected from citizen scientists will provide a new knowledge repository about waterbugs (aquatic invertebrates). These small invertebrates live in freshwater and may include the early stages of development for insects such as dragonflies, damselflies, mayflies, and water beetles. These kinds of waterbugs are particularly sensitive to deterioration in water quality from nutrient contamination and pollution, thus they can provide a good indicator of waterway health.

Assessment of the nation's waterways will be coordinated through the National Waterbug Blitz, commencing in October 2018 and running throughout spring. Community members across Australia are invited to become citizen scientists and collect information on local waterway biodiversity, using waterbug surveys, alongside experienced volunteers and professionals. This collaborative approach to assess waterways will bring together residents and groups across the community, to identify, count, and assess different waterbugs in their local region.

Until now, the massive scale of monitoring Australia's waterways by governments and researchers was a formidable task. However, this project will enable good quality data to be collected over two consecutive years with involvement from both local citizen scientists and professional scientists.

A new Waterbug Blitz website has been established for this project and will include a mapping interface for visualising national waterbug data. Data collection during the blitz is done using the Waterbug App, which is being updated to receive user waterbug data and transmit that data to CeRDI platforms via an API. As monitoring data are collected and submitted by community members, they will appear in the Waterbug Blitz mapping portal alongside complementary agency and community water monitoring data.

Project Partners:

Waterwatch

Envirocomm Connections

The Waterbug Company

The Code Sharman

Corangamite Catchment
Management Authority

National Waterbug Blitz website:
www.waterbugblitz.org.au

Key Contact

Dr Birgita Hansen, CeRDI Research Fellow:
b.hansen@federation.edu.au

South Australia Tree Watch

South Australia Tree Watch is a web-based platform that allows local citizens and the broader community in the Coorong and Tatiara regions of South Australia to rapidly and easily document observations of occurrence and symptoms of tree decline.

South Australia Tree Watch is a comprehensive portal with mapping interface to enable citizens in the Coorong and Tatiara regions of South Australia to document the health of their local trees. The portal was developed for users to locate trees on a satellite image and add information and observations about tree type, ill-health symptoms and land use. Photos can be uploaded onto the portal enabling a visual construction, and record of local trees. The portal is also a custom-built spatial database, which will be used to construct visualisations.

The Coorong and Tatiara regions are located south east of Adelaide, incorporating the Murray River and other significant environmental sites including Lake Alexandrina and Lake Albert. The region has experienced substantial environmental challenges in recent years, including dryland salinity and poor tree health. The region's trees have become iconic features of the natural and agricultural landscape, however many of the trees are experiencing significant health problems with some trees already dying, or showing significant signs of stress and poor health.

The portal was launched in 2017 following a successful collaboration involving researchers from CeRDI and FedUni's Faculty of Science and Technology (FOST), together with support from project partners the Coorong District Council, Tatiara Council and the Coorong Tatiara Local Action Plan.

Using this new portal, information collected from the community and landholders can be analysed alongside existing spatial and non-spatial datasets relating to tree ecology, land use and landscape features (e.g. soil type, waterways, wetlands and roads). By dynamically linking all relevant datasets with crowd-sourced tree observations, the portal will provide identification of factors influencing tree health which can be used in developing appropriate management actions for reversing tree decline.

The website will enable crowd-sourcing observations on tree health from south-eastern South Australia. It will build a map of symptoms with which to undertake a spatial analysis of probable causes of tree health decline in the region. The focus of the site is the map portal, where community members (particularly farmers) can add their observations of tree health.

South Australia Tree Watch Portal:
www.satreewatch.com.au

Key Contact

Dr Birgita Hansen, CeRDI Research Fellow:
b.hansen@federation.edu.au

Land Your Career

Land Your Career is a comprehensive portal with information about land management careers covering a broad range of themes that include water, fire, natural environments, restoring landscapes, forestry, conservation, cultural heritage, biodiversity, sustainability, parks/reserves and landscape/building design.

During 2017, Land Your Career was funded to undertake significant technical and content enhancements to broaden the scope of the portal to include information about land management careers across a wider range of areas including water, fire, natural environments, restoring landscapes, forestry, conservation, cultural heritage, biodiversity, sustainability, parks/reserves and landscape/building design. The upgrades have been performed by CeRDI together with FedUni's Faculty of Science and Technology, a consortium partner on the project.

Land Your Career offers school students and school leavers, careers advisors, teachers and mature age students with accurate information about pathways and qualifications required for specific land management careers.

Land Your Career is part of a larger project – the Integrated Land Management Curriculum for Victoria (ILMCV*) – which involves a unique teaching and training partnership between six tertiary education providers across 18 locations in Victoria's west. The project aims to significantly enhance opportunities for regional, rural and remote students to participate in higher education through increased collaboration and co-operation between institutes in the regionally vital discipline of land management.

The latest enhancements to Land Your Career includes an innovative and informative analytics tool using natural resource management (NRM) job data supplied by NRMJobs and the Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS). Information is also provided about the geographical location of particular NRM jobs together with estimated remuneration, over time. This data is available for searching and is presented spatially. This enables visitors to explore the location of jobs, the salary associated with these jobs and how this has changed over time (2010–2015).

Greater opportunities now exist with this upgraded portal to educate and inspire prospective students on the careers and roles that exist within the land management sector. The mapping feature on the website enable prospective NRM students to gain a comprehensive understanding about how to become qualified and what they can expect in their future career regarding the location of their work and salary levels.

These latest developments have also been supported by the lead organisation, the University of Melbourne, together with project partners Bendigo TAFE, FedUni's Faculty of Science and Technology, South West TAFE, Sunraysia Institute of Technical and Further Education, and Timber Training Creswick.

Project Partners:

Bendigo TAFE

Federation University Australia's
Faculty of Science and Technology

South West Institute of TAFE

Sunraysia Institute of TAFE

The University of Melbourne

Timber Training Creswick

*The establishment of the ILMCV was funded by the
Department of Education and Training through the
Regional Partnership Facilitation Fund.

Land Your Career:
www.landyourcareer.edu.au

Key Contact

Scott Limmer,
CeRDI Systems Analyst Programmer:
s.limmer@federation.edu.au

NATURAL ENVIRONMENT

River Detectives

River Detectives is a program offered in various regions across Victoria to support educators to explore local waterways and catchments with school students.

River Detectives includes practical activities and supporting resources. CeRDI recently upgraded the River Detectives website enabling full integration between the Waterwatch database and interactive maps.

River Detectives is a school-based program supporting teachers and school students to explore local waterways and to understand their important relationship to the surrounding landscape and environment. A unique feature of River Detectives is its water monitoring program where school groups can arrange to collect and analyse water science data. The website enables school groups to submit their data, the same data as Waterwatch volunteers, through the child/student friendly River Detectives website interface.

Working in conjunction with the North Central Catchment Management Authority (CMA), the CeRDI technical team completed significant upgrades to the River Detectives website during 2017.

The updated website expanded the educational resources available and water quality, water bug and habitat data to be submitted directly to the Waterwatch citizen science database and displayed via the Waterwatch data portal. An interactive map combines River Detectives monitoring data, Atlas of Living Australia species data and other sources to allow schools to both compare their water quality data to other regions, and learn more about their local environment.

The 2017 upgrade was a precursor for the expansion of the River Detectives program beyond the original North Central catchment. Schools in the Corangamite, North East, North Central, Melbourne Water and Wimmera catchments can now participate in the program.

Planning is underway to ensure that the River Detectives program plays a key role in the upcoming National Waterbug Blitz in 2018.

Project Partner:

North Central Catchment Management Authority

River Detectives:
www.riverdetectives.net.au

Waterwatch:
www.vic.waterwatch.org.au

Key Contact

Paul Feely,
Senior Systems Analyst Programmer:
p.feely@federation.edu.au

NATURAL ENVIRONMENT

Spatial Connect

Spatial Connect is an online resource that embeds spatial technology within the national geography and science curriculum for secondary school students.

It provides access to resources for curriculum aligned to real-world knowledge initiatives in agriculture, the environment, geology, hydrogeology, urban planning and natural disaster planning and recovery.

Spatial Connect is a project established through collaboration between CeRDI and the Geography Teachers Association of Victoria Inc. (GTAV). Total funding of $60,000 was awarded to the project by the Collier Charitable Fund across 2017 -2018. Through this project, CeRDI and the project partners developed curriculum resources linked to their real-world application in agriculture, environment, geology and hydrogeology, urban planning and natural disaster planning and recovery. Real-world knowledge resources provides students with a deeper understanding of industry, social, community and environmental issues.

Spatial Connect knowledge partners include the Grains Research and Development Corporation (GRDC), Landcare networks, environmental scientists, hydrogeologists, water authorities, Waterwatch, EstuaryWatch, local government, natural disaster planning and recovery initiatives in areas including fires, landslides, floods and climate change, State Wide Integrated Flora and Fauna Teams (SWIFFT) and Visualising Victoria's Biodiversity (VVB).

Spatial Connect is an important initiative aimed at facilitating connections for secondary students with technology applied to the science and geography curriculum. Greater exposure to technologies linked to contemporary issues will provide an enhanced experience for students, increasing their understanding and exposure to science, technology, engineering and mathematics (STEM). It is anticipated that this will increase the interest and uptake of STEM subjects by school students in later secondary school and facilitate their pathways through STEM in tertiary education, and in their future careers.

A major benefit of this project is that all students will be able to receive the same educational opportunities through online learning. Until now, some students have been disadvantaged in pursuing opportunities outside of the classroom setting. Spatial Connect addresses these issues and offers opportunities for disadvantaged students such as those in more remote locations.

Marketing Spatial Connect to all schools is ongoing through the co-ordination of GTAV, who presented in late August of 2017 and 2018 GTAV Teachers' Conference. Professional development with teachers across the state is also continuing on an ongoing basis. GTAV affiliates – Australian Geography Teachers' Association (AGTA) and Australian Federation of Societies for Studies of Society and the Environment (AFSSSE) – are promoting Spatial Connect Australia-wide. FedUni will promote the adoption of Spatial Connect in the tertiary sector via pre-service teachers in the Faculty of Education and Arts.

Project Partners:

Geography Teachers Association of Victoria Inc.

Collier Charitable Fund

Key Contact

Dr Angela Murphy,
CeRDI Senior Research Fellow:
aa.murphy@federation.edu.au

NATURAL ENVIRONMENT

Discover the Living Moorabool

Discover the Living Moorabool is a new online communication tool to emerge from The Living Moorabool project.

It showcases the natural resources and rich indigenous history of the Moorabool River within the Corangamite Catchment Management Authority, providing a unique resource for visitors and citizen scientists alike to explore and enjoy the regions many natural attractions.

The project is an initiative of the Corangamite Catchment Management Authority (CCMA) and part of the Victorian State Government Rivers 2040 project. It aims to enhance and protect the Moorabool River through activities that include revegetation, weed control, and fencing to exclude stock around the river banks and removing barriers to fish and platypus movement upstream. CeRDI worked closely with the CCMA culminating in the launch, in September 2017, of the Discover the Living Moorabool website.

Discover the Living Moorabool website promotes the indigenous heritage and natural resources of the river and surrounding regions. The general public can access information about places of interest relating to cultural heritage and recreational sites in this region. Linkages have also been established to complement river monitoring activities being conducted by citizen scientists as part of Waterwatch. Waterwatch is another initiative which is supported by CeRDI researchers and technologists.

CeRDI's involvement in the Discover the Living Moorabool project further extends its ongoing partnership with the CCMA. Other successful projects completed through this partnership include the award winning Corangamite Soil Health Knowledge Base and the Corangamite Natural Resource Management Planning Portal (NRM Planning Portal).

Project Partner: Corangamite Catchment Management Authority

Before

After

Discover the Living Moorabool:
www.ccmaknowledgebase.vic.gov.au/moorabool

Waterwatch:
www.vic.waterwatch.org.au

Key Contact

Andrew MacLeod, Manager Technical Projects:
a.macleod@federation.edu.au

DIGITAL AGRICULTURE

Online Farm Trials

Online Farm Trials (OFT) is an innovative, online technology offering new insights on a range of grain cropping topics, issues and methods for farming across Australia.

Developed as an initiative between the Grains Research and Development Corporation and CeRDI, OFT provides open and free access to on-farm, or field based, cropping research trial data and information.

OFT applies digital technologies to provide access to a growing library of grains industry research. It aims to improve the enduring profitability of farming enterprises through enhanced access to farm trials research relevant to the grains industry. This is expected to lead to better use of results and findings of past trials, and more rapid implementation of best practice farming approaches.

Development and ongoing management of OFT has been supported through close collaboration with the grains industry including grower and farming systems groups, research organisations, agricultural experts and grain industry organisations.

Interactive maps, searching and viewing tools are provided to enable quick and easy access to relevant information. Online analytical tools provide access to data about break crop performance and sequencing, the selection of appropriate crops, and crop rotations for improving farming profitability and sustainability.

OFT contains over 6,500 trial projects from 74 contributing organisations. Region specific data is available for diverse topics, including crop sequences and their effects on soil nitrogen, Rhizoctonia disease risk and brome grass management. Trial data is also available for large multi-year, multi-organisation research programs such Southern Pulse Agronomy (400 trials), More Profit from Crop Nutrition (351 trials), and Maintaining Profitable Farming Systems with Retained Stubble (150 trials).

During 2017, CeRDI researchers conducted a research audit to plan for the future expansion and to enhance OFT. The research audit reached over 200 organisations and entities including grower/farming systems groups, land care groups, agronomic consultancies, government departments, independent research organisations, universities and private organisations (other than agronomic consultancy).

The findings of the audit provided important industry insights about OFT with recommendations for future OFT engagement and targets for data acquisition and quality planning, and proposed updates for the OFT website, which have been implemented. The new website interface is more intuitive and includes seasonally relevant trials collections. The technology behind the website is also faster, utilising advanced language processing to significantly increase the relevancy of trial results. Other features included in the new website include typo-tolerance, synonym-matching and closer integration of the mapping interface (geosearch).

Key Contact

Dr Ben Wills, CeRDI Research Fellow:
b.wills@federation.edu.au

Project Partner:

Grains Research and Development Corporation

Northern Grower Alliance

Grower Group Alliance

Liebe Group

Central West Farming Systems

Hart Field Site Group

Southern Farming Systems

Birchip Cropping Group

Irrigated Cropping Council

Riverine Plains

South Australian Research Development Institute

West Midlands Group

Victorian Grower Group Alliance

Nicon Rural Services

Ag Excellence Alliance

DIGITAL AGRICULTURE

Precision Agriculture Research Partnership

Precision Agriculture is one of Australia's most experienced agriculture technology providers.

In 2017, the company initiated a three-year research collaboration with Federation University Australia with the goal to enhance Precision Agriculture's services in providing farmers, agronomy practitioners, agricultural researchers, agribusinesses and land managers with place-based decision-useful information on demand, allowing clients to reap a greater value from their investment in precision agriculture.

This research partnership will build knowledge and capacity across both organisations. Precision Agriculture will develop new capabilities within its business to support the delivery of innovative data services, technology and tools in ways that are responsive to the current and emerging opportunities within the precision agriculture industry. At the same time, CeRDI will develop a greater expertise and understanding of applied research needs across the digital agriculture landscape.

The research collaboration with Precision Agriculture will provide an exemplar of how research impact can be fostered through long-term research collaboration with industry. The partnership between Precision Agriculture and CeRDI will involve a series of applied, real-world projects focused on advancing agribusiness decision making through data, insight and action. One of the principle aims of this research is to connect multiple layers of data in the digital platform so that it can be viewed easily, and on demand, by growers. In turn, this information will drive more objective and timely decision-making such as variable rate applications of fertiliser, seed, fungicides, herbicides and other key crop inputs.

Precision Agriculture supports more than 600 agribusinesses nationally to increase farm productivity and sustainability through the practical application of spatial technologies. As a pioneer agricultural company in Australia, Precision Agriculture has a wealth of experience ranging from small farming enterprises to the highest levels of industry. Its internally-held data includes many thousands of soil tests collected and analysed in combination with climate, terrain, soil, geology, geomorphology, drainage, satellite and other key data sets. This will enhance the evidence-base available to Precision Agriculture as a basis for recommendations in a range of variable rate nutrition and soil management solutions.

The first project to be conducted between CeRDI and Precision Agriculture will concentrate on digital enhancements to Precision Agriculture's business processes and customer solutions. Innovative approaches to agricultural data from disparate sources will be adopted using international standards for the interoperable exchange of data. Estimating variability in plant-available water across a paddock based on weather, soil moisture and a range of spatial datasets collected by farmers (such as electromagnetic (EM) surveys, yield maps, normalised difference vegetation index (NDVI) images), when allowing for other parameters that drive variability (including soil chemistry, pH, sodicity and texture contrast soils) will be the focus of a second project.

Another area of research focus will be the development of real-world, practical use cases through a collaborative process with farmers and other end-users who understand the potential of new technologies to deliver desirable or exceptional outcomes.

Project Partner:
Precision Agriculture

Further information
www.precisionagriculture.com.au

Key Contact

Associate Professor Helen Thompson,
CeRDI Director:
h.thompson@federation.edu.au

Ben Fleay, CEO, Precision Agriculture:
ben@precisionagriculture.com.au

DIGITAL AGRICULTURE

CRC High Performance Soils

In 2017, the Federal Government awarded $39.5 million over 10 years to the Cooperative Research Centre for High Performance Soils (known as the Soil CRC) to assist Australian farmers to make decisions on complex soil management issues.

Alongside the government funding, project partners have contributed $60m in cash and $104 million in in-kind contributions. The CRC comprises eight universities, three state agencies (including one in New Zealand), eight industry partners and twenty farmer groups around Australia. As a major participant in the Soil CRC, CeRDI will contribute specialised computing, information analysis and data federating systems, using eResearch approaches.

The aim of the Soil CRC is to integrate research to provide farmers with the knowledge and tools they need to make decisions on extremely complex soil management issues. The Soil CRC will bridge the gap between soil science and farm management and also increase the level of innovation around Australia's management, protection and value of soil assets. The CRC will also increase the level of innovation around Australia's management, protection and value of soil assets.

As a major participant in the Soil CRC, CeRDI will utilise specialised experience and adopt a range of interoperable technologies to facilitate greater exposure to the most current and comprehensive economic, environmental and social information and datasets while making the data available in other portals and applications. CeRDI will also lead one of eight scoping projects and is participating in four of the other scoping projects, funded by the Soil CRC.

The first FedUni led research activity for the Soil CRC is a scoping study to investigate soil performance indicators. This pilot project, which will commence in 2018, will include an examination of data to measure and monitor indicator trends and identify the tools for storing, sharing and making data available by understanding how soil indicators are currently being collected. Data will be gathered from key stakeholders in the agriculture industry, including farmers, using an online survey. Responses will then be analysed and consolidated and an overview presented at an industry-wide workshop which will generate additional project outcomes that will guide future CRC research development and planning.

Project Partners:

The main participants in the Scoping Study are:

Agriculture Victoria Research

Manaaki Whenua Landcare Research

Southern Cross University

University of Southern Queensland

University of Tasmania

In addition, another 26 Soil CRC members from research and industry are contributors to this project.

More information on the Soil CRC can be found at: **www.soilcrc.com.au**

Key Contact

Associate Professor Peter Dahlhaus, CeRDI Principal Research Fellow: **p.dahlhaus@federation.edu.au**

Western Alliance for Greenhouse Action

An initiative between CeRDI and the councils of the Western Alliance for Greenhouse Action (WAGA), has led to the development of the How Well Are We Adapting web portal.

The portal is a web-based tool to assist WAGA councils to implement a framework for monitoring, evaluation and reporting on climate adaptation.

WAGA council members are drawn from local governments in Melbourne's west, including the Cities of Brimbank, Greater Geelong, Hobsons Bay, Maribyrnong, Melton, Moonee Valley and Wyndham, and the Shire of Moorabool. Collectively, they aim to respond to climate change across the region by implementing plans and projects that focus on the mitigation of greenhouse gas emissions as well as adaptation to the impacts of climate change.

The How Well Are We Adapting framework, developed in partnership between the City of Brimbank, RMIT Centre for Urban Research and Net Balance Foundation, underpins the work of the WAGA councils. It specifies the monitoring, evaluation and reporting on climate adaptation performance of the WAGA member councils. The framework is unique, representing a world first climate change adaptation monitoring and evaluation framework implemented for measuring adaptation focused on local government, developed and tested by decision-makers.

In 2016, WAGA councils engaged CeRDI to develop the How Well Are We Adapting portal. The portal provides the foundation for developing the capacity for councils and each of their communities to respond to and manage municipal climate impacts. The CeRDI project team worked extensively with the WAGA councils to develop the portal, and have implemented a novel approach to monitoring, evaluation and reporting on climate adaptation. The portal, which was launched in 2017, combines spatial visualisation of data in an interactive map with on-the-fly data and dynamically links the data reporting tools and the mapping tool enabling rapid numerical, qualitative and spatial summaries for end users.

The project portal will build the capacity of the member councils to respond to and manage climate threats, and will also provide important information for residents across the region to develop and raise awareness of local climate change impacts and how these can be addressed.
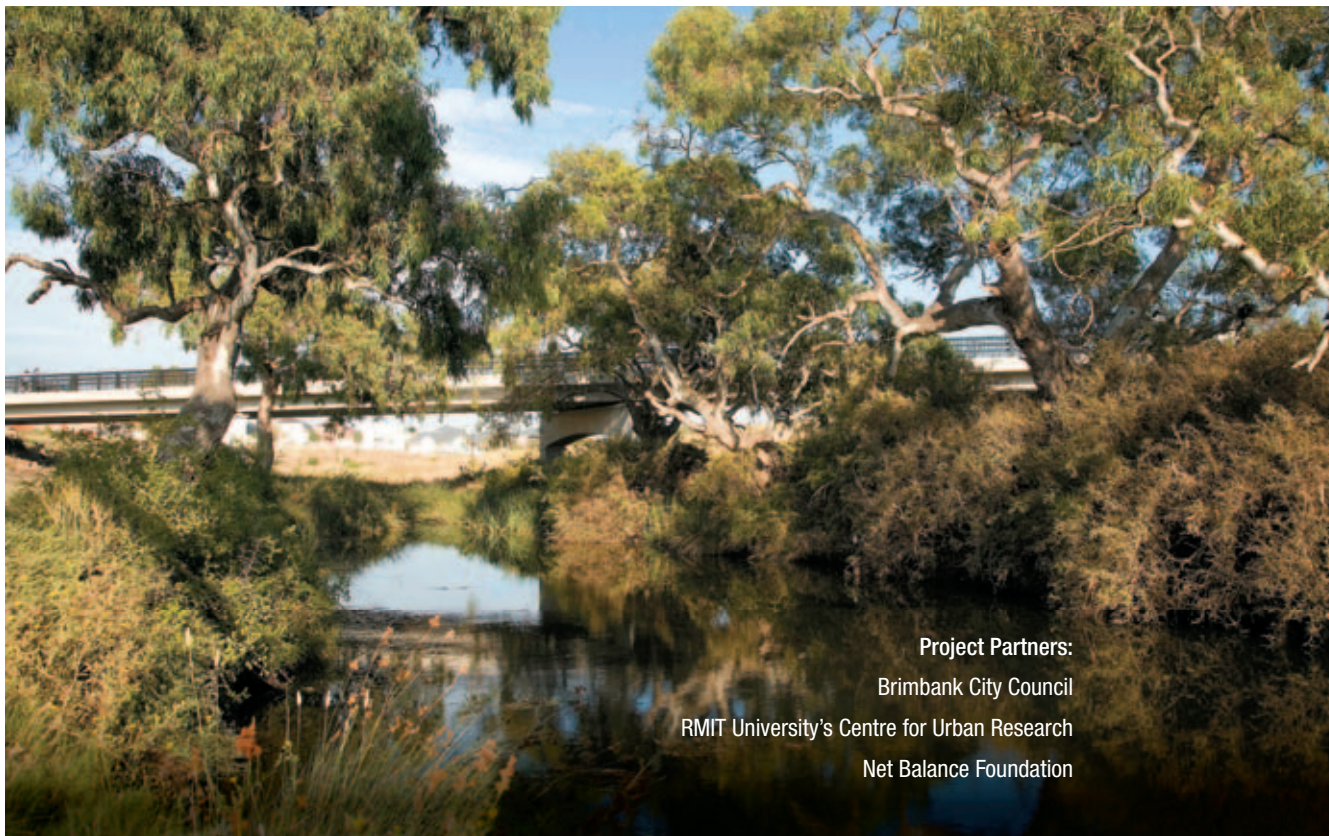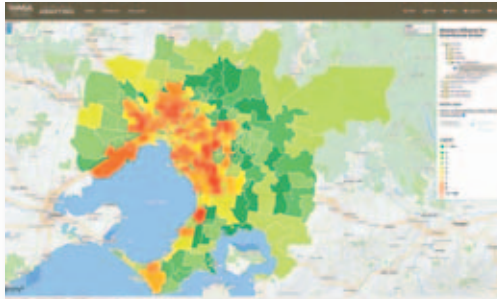
Project Partners:
Brimbank City Council
RMIT University's Centre for Urban Research
Net Balance Foundation

How Well Are We Adapting Portal:
adapt.waga.com.au

WAGA website:
waga.com.au

Key Contact

Dr Birgita Hansen, CeRDI Research Fellow:
b.hansen@federation.edu.au

HEALTH AND WELLBEING

VicHealth Alcohol Culture Change

Horsham Rural City Council in partnership with CeRDI is implementing a new initiative to undertake research and to promote cultural change towards reducing alcohol use for youth in Horsham.

The project has been funded through VicHealth's Alcohol Culture Change Grants Initiative for Local Councils.

The Alcohol Culture Change Initiative aims to prevent alcohol related harm by improving cultures to reduce risky drinking within Victorian subpopulations. VicHealth have invested $3.1 million to drive cultural change in at risk populations. The initiative recognises that the 'one size fits all' approach does not address the diverse drinking cultures within the Victorian community, and have funded targeted programs in the hope that this will have a greater impact.

During 2016, CeRDI was engaged by Horsham Rural City Council (HRCC) to collaborate on an application to VicHealth's Alcohol Culture Change Grants Initiative for Local Councils. HRCC was one of eight councils state-wide to receive funding for a pilot study (Stage 1) to assess alcohol culture and identify potential health interventions leading to cultural change and safer, reduced alcohol consumption for young people (aged 15–20 years) in the region.

Data collected during the pilot project provided important insights to form an understanding of the current practices of alcohol consumption and alcohol misuse in the region, and to identify opportunities for cultural change to reduce alcohol use. This research data was used to inform the development of a model to promote a shift in existing alcohol culture among rural young people. The project titled 'Rural youth action – Challenging Alcohol Norms' (RyACAN) involves a multidimensional approach targeting key stakeholders, young people, parents and the wider community to shift norms around alcohol consumption and alcohol misuse in the region.

In 2017, a proposal to extend the project was awarded Stage 2 funding from VicHealth to implement the model over next 24 months. This next stage of the program includes a range of community based initiatives aimed at building knowledge, awareness and capacity, an integrated education program for parents and young people, and a social marketing campaign to counter current perceived norms and promote alternative choices for young people. Alongside the intervention is a comprehensive research program with the HRCC to measure the outcomes and impact on the drinking culture of young people. A report capturing the first 12 months of project implementation has been completed in cooperation with La Trobe University and the Horsham Rural City Council.

Project Partners:

La Trobe University

Horsham Rural City Council

Grampians Community Health

Victoria Police

Wimmera Primary Care Partnership

Wimmera Regional Sports Assembly

Wimmera Southern Mallee Local
Learning and Employment Network

Wimmera UnitingCare

Wimmera Health Care Group

Ambulance Victoria

Department of Health and Human Services

Project website:
**www.cerdi.edu.au/cb_pages/alcohol_
culture_and_change_in_the_wimmera.php**

Key Contact

Dr Angela Murphy,
CeRDI Senior Research Fellow:
aa.murphy@federation.edu.au

HEALTH AND WELLBEING

Dementia Pathways Tool

The Dementia Pathways Tool is a publically-accessible, online resource that offers primary health care professionals, and the public, with access to an extensive repository of information, tools and resources to guide and enhance current assessment, referrals and pathways to support patients with dementia.

Initially established for the Grampians region, and subsequently the south east Melbourne region, the Dementia Pathways Tool is soon to be updated following recent funding success.

The Dementia Pathways Tool provides a comprehensive yet intuitive web-based repository of dementia-related information, tools, service directories and resources and, unlike many other resources, is publically available. It provides community access to information about dementia that may be of relevance, including family and carer support, financial and legal issues, driving capabilities and powers of attorney.

In 2018, CeRDI will work closely with Deakin University and Ballarat Health Services' Associate Professor Mark Yates to implement important upgrades to the Dementia Pathways Tool.

Planned enhancements to the Tool include a review and update of the content to align with the Clinical Practice Guidelines for Dementia in Australia (2016). The content will be developed and expanded to dementia management and care priority areas, including driving, capacity assessment, pharmaceutical management and prevention. A dedicated pathway with information specific to practice nurses will also be included during updates to the Tool. These upgrades are expected to provide practitioners and the community with access to additional information and resources via the Dementia Pathways Tool.

Education sessions across the region will be conducted with health practitioners to coincide with the relaunch and update to the Tool. An evaluation of the Tool will be conducted during education sessions, and in the months after launch. CeRDI will work closely with key staff at Ballarat Health Services to support the research.

Funding for this project was granted to Assoc Prof Mark Yates from Lundbeck, a Danish international pharmaceutical company engaged in the research and development, production, marketing and sale of drugs used in the treatment of disorders of the central nervous system.

Project Partners:

Victoria State Government Health and Human Services

Western Victoria Primary Health Network

South Eastern Melbourne Primary Health Network

Associate Professor Mark Yates, Deakin University and Ballarat Health Services

The Dementia Pathways Tool is available at
www.dementiapathways.com.au

Key Contact

Meghan Taylor, CeRDI Research Officer:
m.taylor@federation.edu.au and

Alison Ollerenshaw, CeRDI Research Officer:
a.ollerenshaw@federation.edu.au

HEALTH AND WELLBEING

Dementia Care in Hospitals

The Dementia Care in Hospitals Program promotes practice change through education to improve the awareness of cognitive impairment and promote communication with patients with dementia.

FedUni is collaborating with Ballarat Health Services with this program to improve its accessibility and sustainability into the future.

The Dementia Care in Hospitals Program (DCHP) aims to improve the care of patients with cognitive impairment within the acute hospital setting. Cognitive impairment includes a range of thinking and memory difficulties, and is often unrecognised despite affecting up to one-third of hospital patients. This leads to higher rates of adverse outcomes. Led by Associate Professor Mark Yates, the program was first introduced at Ballarat Health Services (BHS) in 2003.

During 2017, the DCHP was expanded into a national project with 29 hospitals in Victoria, the Australian Capital Territory, South Australia and Western Australia implementing the program. As part of the national rollout, an electronic education program has been developed by FedUni through CeRDI and the Faculty of Health (Prof Britt Klein) in collaboration with BHS, to improve the accessibility and sustainability of the program into the future.

The DCHP online education program was developed in the Moodle learning management system with capabilities to track and monitor which staff have completed the training program. The appearance and presentation of the online education program is unique, having been customised by the CeRDI technical team to further enhance the appearance and functionality of the education program. This will support clinical and other hospital staff in easily working through the online program. The training modules incorporate text, audio and video content interspersed with interactive content and activities including multiple choice quizzes. The DCHP e-learning module was reviewed by staff at BHS and introduced in four hospitals across Australia to pilot the new mode of delivery.

BHS will conduct research to measure the knowledge, culture and practice changes following the introduction of the DCHP e-learning module and will include an assessment of patient outcomes. It is anticipated that the DCHP e-learning module will improve the care and outcomes for patients with cognitive impairment now and into the future.

Key Contact

Meghan Taylor, CeRDI Research Officer:
m.taylor@federation.edu.au or

David Ebbs, CeRDI Researcher:
d.ebbs@federation.edu.au

HEALTH AND WELLBEING

East Grampians and Stawell Chronic Disease Integrated Response Initiative

CeRDI has been engaged by East Grampians Health Service and Stawell Regional Health to enhance the capacity to effectively implement an evidence based approach for complex health conditions related to place specific issues within the region, as they relate to service delivery.
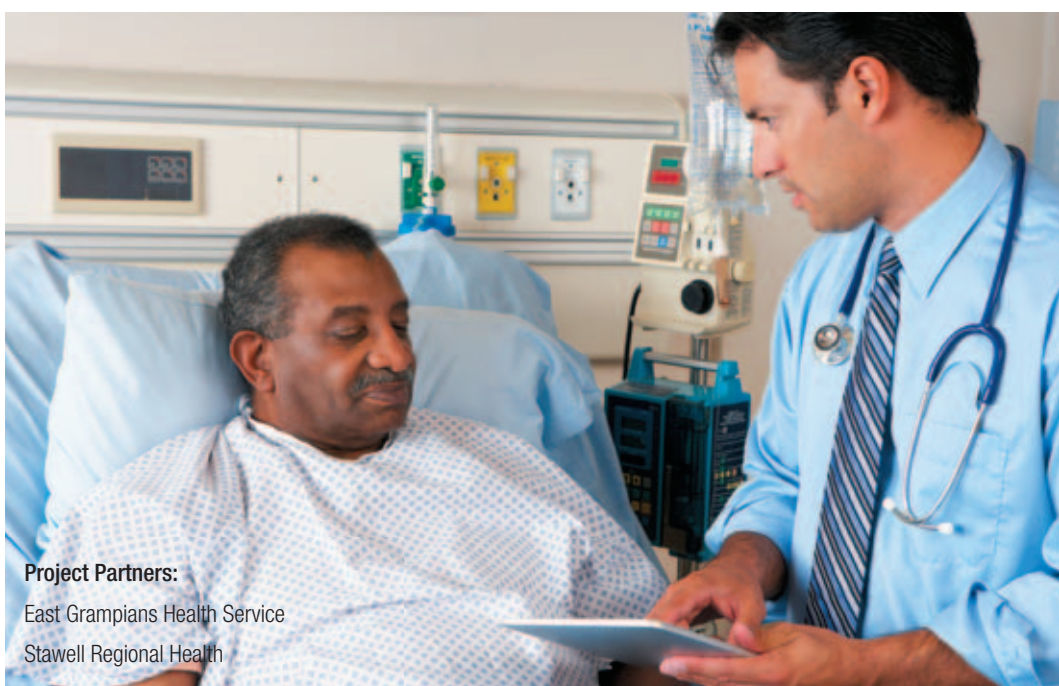
East Grampians Health Service (EGHS) is the only rural health service and just one of seven pilot projects to be funded by the Victorian government for the HealthLinks: Chronic Care program. Patients with chronic and complex conditions often require flexible, responsive and integrated home care options to decrease unplanned hospitalisation and provide better patient experiences and outcomes. The program aims to improve care for patients at high risk of multiple, unplanned hospital admissions through the implementation of the pilot program which comprises eight key components.

CeRDI has been appointed the research organisation on the program and will work with project partners to measure the program's effectiveness and to build an understanding of the program's impact on the health quality of life outcomes for individuals. The research team will conduct comprehensive research in which participant-user satisfaction will be measured and project responsiveness to service user needs will be collected using quantitative and qualitative research methods.

The research aims to measure four core areas associated with the program's implementation, including:

- Improved patient, caregiver and family experiences of health and social services delivery
- Reduction of the number of hospital admissions and inpatient bed days
- Effectiveness of the range of hospital and community based interventions for managing unplanned hospital admission
- Effectiveness of the program model for meeting the unique characteristics of rural health service environments.

Research will commence in 2018 and will run for two years in parallel with the program's implementation. Funding for $30,000 has been secured through the partnership to conduct this research evaluation. The report for the first year of operation is being finalised and will provide the basis for project development and enhancement into 2019.

Project Partners:
East Grampians Health Service
Stawell Regional Health

Key Contact

Dr Angela Murphy,
CeRDI Senior Research Fellow:
aa.murphy@federation.edu.au

HEALTH AND WELLBEING

Wimmera Information Portal

The Collier Charitable Fund awarded $50,000 to the Wimmera Information Portal which consolidates social, health and wellbeing datasets from key government agencies, not for profit organisations and community groups.

The Wimmera Information Portal (WIP) is a collaboration between the social, health and community services within the Wimmera region to address systemic disadvantage. WIP is an online portal that brings together existing social, health and wellbeing datasets and information created and managed by government agencies, organisations, community groups and individuals to inform planning, decision making and response strategy development.

The portal provides a single access point for data and offers a stronger platform from which to interrogate regional data. These advances will enable a holistic understanding across a range of the current and future issues for the Wimmera, further complementing regional decision making and enabling the implementation of community-wide strategies to address regional disadvantage.

The development of the WIP has occurred organically. Issues of systemic disadvantage, particularly related to rural disadvantage were recognised by a number of agencies within the Wimmera. CeRDI was engaged to help enable, through the use of technology, easy access to datasets and interagency collaboration, as well as impact research over time.

An initial pilot of WIP provided access to data on demographics, physical activity, healthy eating, economic factors, education, mental health and climatic conditions to social and community service and health providers. This information, plus some additional datasets, have been acquired from multiple sources. Recent funding for the WIP from the Collier Charitable Fund has supported the enhancements and consolidation of the online portal which has been developed as a demonstration model.

The development of the portal has been a collaborative process with meetings with project partners used to plan the WIP and discuss ideas, datasets and functionality. The pilot portal has provided a channel to highlight and uncover new data sets, knowledge management needs and collaboration opportunities. This has informed priorities and areas for future developments and expansions for which current funding will be used.
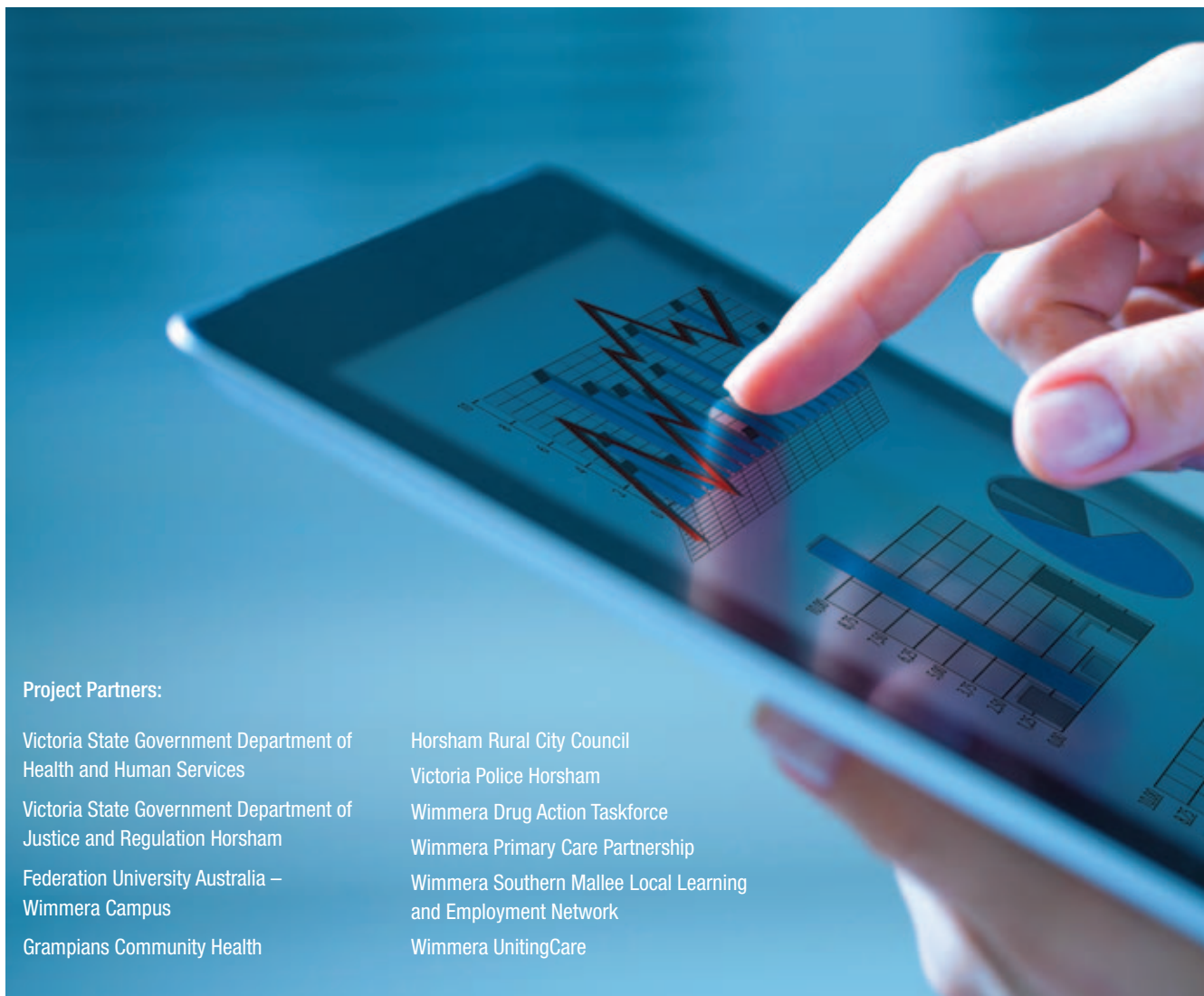
Project Partners:

Victoria State Government Department of
Health and Human Services

Victoria State Government Department of
Justice and Regulation Horsham

Federation University Australia –
Wimmera Campus

Grampians Community Health

Horsham Rural City Council

Victoria Police Horsham

Wimmera Drug Action Taskforce

Wimmera Primary Care Partnership

Wimmera Southern Mallee Local Learning
and Employment Network

Wimmera UnitingCare

The Wimmera Information Portal:
wip.cerdi.edu.au

Key Contact

Dr Angela Murphy, CeRDI Senior Research Fellow:
aa.murphy@federation.edu.au

HEALTH AND WELLBEING

Central Highlands Health Justice Partnership for Youth

The Central Highlands Health Justice Partnership for Youth is an important, local program delivering an integrated legal-health service to improve the legal, health and wellbeing outcomes for disadvantaged young people.

The Central Highlands Health Justice Partnership for Youth (CHHJP) was fist established with the aim of assisting disadvantaged youth in the Central Highlands region experiencing health issues arising from their legal problems. Health-legal programs such as this have been implemented across the world for different target groups, with much success. The CHHJP provides early intervention for young people experiencing multiple health and legal issues through the delivery of an integrated medical and legal service with a youth lawyer based across BCH sites.

The CeRDI-led CHHJP commenced operations in 2015 in collaboration with project partners Ballarat Community Health (BCH) and Central Highlands Community Legal Centre (CHCLC). Since this time, the program has assisted over 130 young people in accessing support for their legal problems. Extensive promotional activities associated with the program have enabled it to receive wide regional exposure, resulting in strong referrals from external agencies.

The importance of the program has recently led to the broadening of the partnership base to include Youthlaw. Youthlaw, together with existing partner agencies, have jointly committed funding to the CHHJP program to ensure the service can continue to operate until early 2019. This is an exciting new development for the program which was first established after receiving major grant funding from the Victorian Legal Services Board and Commissioner.

Researchers at FedUni have been closely monitoring the program since it was first launched. They have conducted research alongside the project and documented the research outcomes. The CHHJP research findings for the program's first 18-months of operation were compiled in a research report which was released in late 2017. The report outlines the contribution of the program and offers important insights about the impact it has had on young people in the region; in building new capacity with the BCH Youth Team, and for organisations referring young people or access outreach services through the CHHJP.

Project Partners:

Ballarat Community Health

Central Highlands Community
Legal Centre

Youthlaw

Victorian Legal Services
Board and Commissioner

Program website:
www.stuck.org.au

Key Contact

Dr Margaret Camilleri, CeRDI Research Fellow:
m.camilleri@federation.edu.au

Sport and Recreation Spatial

Sport and Recreation Spatial offers a comprehensive collection of state-wide data about sports participation, sport and recreation facilities, population demographics and population health from multiple data custodians.

Sport and Recreation Spatial uses web-based GIS technologies to present spatial data to consolidate over five million sport participant records from 12 leading sports from across the industry.

Sport and Recreation Spatial, a collaborative program of research between the School of Health and Life Sciences (FedUni), CeRDI and the Institute for Health and Sport (Victoria University), was established in 2012. It enables investigations into sport and recreation participation and facilities, and associated health outcomes, to support evidence-based decision making. The extensive range of current data available through the portal enables innovative investigations to be conducted using state-wide data. Key focus areas include sport and recreation participation levels and trends, influences on participation, the value attributed to sport and associated health benefits, and the venues, providing an increase in understanding between facilities and sport participation.

The research team, led by Assoc Prof Rochelle Eime from the School of Health and Life Sciences (FedUni) and the Institute for Health and Sport (Victoria University) apply their extensive knowledge to the sport and recreation sector regarding sport participation, facilities and health. A core innovation of Sport and Recreation Spatial is its use of web-based GIS technologies to present spatial data relevant to all levels of the sport and recreation industry.

The Sport and Recreation Spatial team have been recognised for their achievements with an Award for Excellence from Parks and Leisure Australia in the Research Project category (Victoria and Tasmania). Parks and Leisure Australia is the peak industry association for professionals working in the Parks and Leisure sector in Australia. The award recognises the extensive achievements in the leisure and well-being related industries, including research supporting wellbeing through leisure.

Sport and Recreation Spatial also received a 2017 VicHealth award for the award category 'Research into Action'. The Sport and Recreation Spatial team received this award for their work on the Sport Participation Research project which entailed an analysis and reporting on data from 12 sports to state sporting organisations, state government and VicHealth.

Project Partners:

Tennis Victoria

Netball Victoria

Victoria University

VicHealth

Sport and Recreation Victoria.
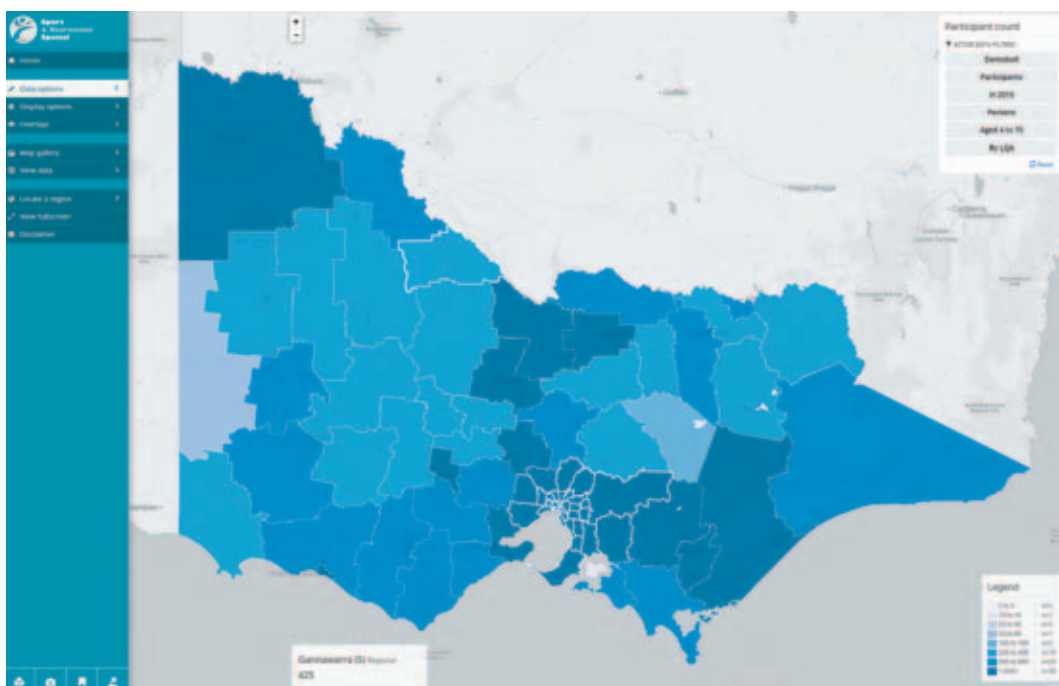
Sport and Recreation Spatial website:
www.sportandrecreationspatial.com.au

Documentary film about Sport
and Recreation Spatial:
www.youtube.com/watch?v=CGgmDEkrF5Q

Key Contact

Associate Professor Rochelle Eime,
School of Health and Life Sciences:
r.eime@federation.edu.au

Associate Professor Helen Thompson,
CeRDI Director:
h.thompson@federation.edu.au

HERITAGE AND CULTURE

SongWays Music Mapping and Historic Urban Landscapes Ballarat

A new SongWays Music Mapping portal, available through the Historic Urban Landscapes Ballarat website, offers new insights about the important historical and contemporary role of music and sound in Ballarat and the surrounding regions.

The SongWays Music Mapping is one of the latest discovery projects available through Historic Urban Landscapes Ballarat. The SongWays Music Mapping portal offers insights about the role of music and sound in Ballarat and the surrounding regions and documents the region's rich and diverse musical heritage, which has earned Ballarat its reputation as a 'music city'.

The portal offers a unique mix of stories, visual memorabilia and brief videos that are mapped to some of Ballarat's most iconic music-making sites. Currently the portal has music-making stories associated with key landmarks that include Ballarat's bandstands, the Courthouse at the School of Mines Ballarat, the Bridge Mall Inn and the Main Road Precinct.

CeRDI together with the City of Ballarat have collaborated closely to establish this spatial mapping archive. Its design ensures that the portal includes input from the community and where residents could share their stories and memorabilia about music and space around Ballarat. Contributions are uploaded online enabling these experiences and reflections to be shared, showcasing a unique perspective of Ballarat's musical heritage.

This project complements and extends the work associated with HUL Ballarat and Visualising Ballarat. These projects have been designed to assist stakeholders, community members, practitioners and researchers to collaborate and identify community values, landscape values, with information about acceptable levels of change and to provide certainty as to priority development to attract and support.

The CeRDI team have contributed widely to the development of both HUL Ballarat, and more recently, the SongWays Music Mapping Portal, ensuring the development of an interactive web portal that engages the community and enables users to easily access authoritative and credible information.

SongWays Music Mapping:
www.hulballarat.org.au/songways.php

HUL Ballarat:
www.hulballarat.org.au

Visualising Ballarat:
www.visualisingballarat.org.au

Key Contact

Scott Limmer, CeRDI Systems Analyst Programmer:
s.limmer@federation.edu.au

Project Partners:

City of Ballarat

Public Record Office Victoria

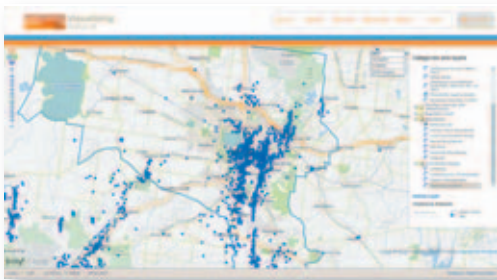Sovereign Hill

REGIONAL DEVELOPMENT

Visualising Ballarat

Visualising Ballarat offers state-of-the-art, online knowledge management and urban planning tools. It is a collaborative project between CeRDI and the City of Ballarat, providing access to datasets relating to Ballarat's historic, contemporary and natural landscapes.

Visualising Ballarat was specifically designed for stakeholders, community members, practitioners and researchers and to facilitate identification of community values, landscape values and acceptable levels of change. The data sets available are wide ranging, from historic landscapes, trees, parks, views, and landmarks, to natural landscapes, geology, services and infrastructure, boundaries and regulatory tools. Visualising Ballarat also supports a range of research and development activities into the future.

Future direction setting for Visualising Ballarat and Historic Urban Landscapes (HUL) Ballarat (http://www.hulballarat.org.au) is overseen by a project control group with representatives from CeRDI and the City of Ballarat. The CeRDI team have been closely involved in recent additions to the Visualising Ballarat data layers, enabling new understandings to be gained about Ballarat's historical development. Ballarat land parcels can now be examined using advanced options providing information about parcel sizes and creation dates.

Additional technology updates to Visualising Ballarat during 2017 have further improved the experience for website users. All data layers are available for download via the new Data Catalogue (http://data.visualisingballarat.org.au/dataset) and enhancements have been completed to the 3D capabilities which include allowing draping of historical maps over the terrain.

Project Partners:

City of Ballarat

Public Record Office Victoria

Sovereign Hill

Key Contact

Andrew MacLeod,
CeRDI Manager Technical Projects:
a.macleod@federation.edu.au

Staff Profiles

Research

**Associate Professor
Helen Thompson,
Centre Director**

Doctorate of Business Administration, Bachelor of
Commerce (Accounting) with Distinction

Helen has led Centre activities since 2002
and is responsible for the achievement of
all CeRDI organisational objectives in
respect of research, project management,
partner projects, business development
and financial management. Under Helen's
leadership, CeRDI has become one of the
University's most successful research
centres, establishing a reputation for
excellence at the regional, national and
international level. Helen has organisation-
wide leadership for eResearch. She is
engaged in research into the use of ICT
and is involved in a range of activities
which contribute to the economic and
social development of regional and rural
Victoria. Helen was appointed as one of
20 National Broadband Champions 2011–
13. She is a member of GovHack Ballarat
Working Group; Chair of Committee for
Ballarat Maximising eHealth Taskforce;
Governance Group member for the
Federation for Advancement of Victorian
eResearch and Committee Member for the
Regional Universities Network Regional
Futures Conference.

**Associate Professor
Peter Dahlhaus,
Principal Research Fellow**

PhD, Master of Applied Science,
Bachelor of Applied Science

Peter joined CeRDI in 2012 as an
experienced researcher and geologist. He
has a comprehensive knowledge of the
geology, geomorphology and
hydrogeology of south west Victoria,
where he has been influential in applying
his scientific knowledge to direct policy on
salinity and soil health management as an
author of catchment action plans and
strategies, and municipal planning
overlays. Peter is well-known by
community groups as a science
communicator and as an advisor to
various catchment management
authorities, water authorities and
municipalities in the region. Together with
colleagues at CeRDI, Peter's current
research focuses on spatial data
interoperability and visualisation to ensure
that natural resource management data,
information and knowledge is globally
available to researchers, government
agencies, municipalities and the public.

Dr Angela Murphy, Senior Research Fellow

PhD, Graduate Diploma Education, Graduate Diploma Criminology, Bachelor of Arts (Social Sciences)

Angela joined CeRDI in late 2014 and has extensive research and engagement experience, having previously worked across a number of research centres at FedUni as a private consultant and within the public health and welfare sector. Angela has managed over 40 research projects and consultancies. Her current focus is on developing evidenced-based research to measure eResearch impact and practice change.

Dr Birgita Hansen, Research Fellow

PhD (Conservation Genetics), Bachelor of Science (Evolutionary Ecology)

Birgita brings to the CeRDI team extensive experience in ecology and environmental management, contributing to improving the management and dissemination of biodiversity knowledge. Her research to date has focused on understanding the ecological response of birds to modification of their habitat, which has included studies into riparian restoration in agricultural landscapes and waterbird monitoring at local and continental scales.

Dr Margaret Camilleri, Research Fellow

PhD, Master of Social Science (Social Policy), Graduate Diploma Community Development, Bachelor of Arts (Multicultural Studies)

Marg has worked in the community legal sector and the justice system for over 25 years. Much of her work in the criminal justice area has focused on access to justice, particularly for people with disabilities. Marg recently joined CeRDI to lead the Central Highlands Health Justice Partnership project, which aims to improve legal, health and wellbeing outcomes for disadvantaged young people. The project, funded by the Legal Services Board, includes project partners Ballarat Community Health and Central Highlands Community Legal Centre.

Dr Nathan Robinson Senior Research Fellow, Soil Science

PhD, Bachelor of Applied Science (Honours), Graduate Diploma (GIS and remote sensing)

Nathan joined the CERDI in October 2017 after working in soil and landscape analysis for the Victorian government for over 18 years. Nathan has been a lead researcher in the use of proximal sensors and rapid sensing techniques in the assessment of soil properties and links to crop yield. Nathan completed his PhD at Federation University in 2016 and his role in CeRDI is closely linked to his PhD and Soil Science where he is conducting research on advancements to spatial analysis to better understand the links between soil and the agricultural production systems.

Dr Benjamin Wills, Research Fellow

PhD (Management), Bachelor of Arts (Honours), Bachelor of Economics

Ben is a social scientist with a background in economics, human geography and management research. Ben commenced work in CeRDI in 2017 as a research fellow and conducts research and publishes on the social and economic impacts of digital agriculture initiatives. Ben is currently undertaking an audit of existing and future users of Online Farm Trials, contributing to the project design for future digital agriculture projects such as the Food Agility CRC, and integrating economic impact methodologies into CeRDI impact assessment work.

Bruce Simons, Research Associate

Bachelor of Science

Bruce has worked as a geophysicist in private industry and the Northern Territory and Victorian geological surveys. While at the Geological Survey of Victoria and, since 2012, at CSIRO, Bruce has designed information management systems and part of international and national collaborative research projects into data exchange mechanisms and interoperability. Bruce joined CeRDI in 2017 with the aim of making natural resource management data, information and knowledge globally available to researchers, government agencies, municipalities and the public, while minimising the overheads to data providers.

Alison Ollerenshaw, Research Fellow

Master of Applied Science, Graduate Diploma of Applied Science (Professional Psychology), Bachelor of Arts, Diploma Project Management

Alison joined CeRDI in 2012 and provides support CeRDI projects including the Central Highlands Health Justice Partnership project, and the Western BACE project. Alison has collaborated on many regional projects that have a health and community development focus. Alison commenced her PhD during 2016.

Robert Milne, Research Associate (Environmental Science)

Bachelor of Applied Science (Environmental Management)

Rob joined CeRDI in 2013. He has specialist skills in geographic information systems and data management and has extensive project management and stakeholder engagement experience gained during his extensive career with FedUni and as partner in the family farming business.

Dr Megan Wong, Research Officer

PhD, Graduate Diploma of Education, Bachelor of Science

Megan joined CeRDI in 2017 and brings a broad range of experience gained across 15 years in the Science, Environment and Education sectors. Megan completed her PhD in 2014 at Monash University investigating the association of soil biology with vegetation and land use change across the Riverine Plains of Victoria. Megan is assisting with research activities linked to the Precision Agriculture partnership.

Dr Angela Neyland, Research Officer

PhD, Bachelor of Arts (Honours), Bachelor of Science

Angela commenced work at CeRDI in 2017 after graduating with a PhD from the Australian National University. She has a diverse research background encompassing both earth sciences and social sciences with a BSc/BA with honours in geology and archaeology from the University of Queensland. Angela's unique range of experiences and skills are being applied in CeRDI in various projects relating to natural resource management, digital agriculture and cultural heritage.

Julie Parker, Research Officer

Master of Science in Applied Geography, Bachelor of Science (Geography)

Julie began working with CeRDI in 2017. Julie's fieldwork in the Mendoza Province, Argentina for her Master's degree led her to explore interests in viniculture and viticulture. Prior to joining CeRDI, she travelled to several viticultural regions to participate in grape harvests. Julie has a strong background in geography and experience conducting research which she is applying to her CeRDI work with the Online Farm Trials project.
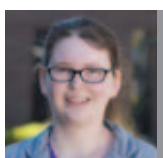
Jennifer Corbett, Research Officer

Bachelor of Management (Honours) (Marketing)

Jennifer joined CeRDI in 2009. She provides research support across a range projects including regional ICT studies and projects in the agriculture sector.

Meghan Taylor, Research Officer

Bachelor of Science / Bachelor of Biomedical Science

Meghan commenced at CeRDI in 2011 and provides research support across various projects, including the HUL Ballarat and Visualising Ballarat and Online Farm Trials research.

Nick Bradsworth, Research Officer

Bachelor of Environmental Science (Honours), Diploma of Conservation and Land Management

Nick joined CeRDI in 2017 after completing his Honours research. His research used Geographic Information Systems, and modern GPS tracking technology, to study the fine-scale movements of an urban apex predator, the Powerful Owl. Nick assists with CeRDI's environmental projects including the State Wide Integrated Flora and Fauna Teams, Visualising Victoria's Biodiversity, and a joint project with CSIRO researching the value of environmental data generated as a requirement under Federal legislation.

Rick Pope, Research Associate

Graduate Diploma in Land Rehabilitation

Rick started working with CeRDI in 2015 and has extensive expertise in geographic information systems (GIS) and global positioning systems (GPS). Rick has a close working relationship with Local Government, the spatial industry as well as Landcare networks in Victoria, Queensland and Western Australia.
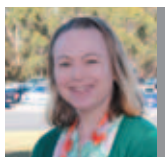
Dr Judi Walters, Administration Officer, Research Support

PhD (Forest Ecology), Master of Science, Bachelor of Forest Science (Honours), Certificate IV (Professional Writing and Editing)

Judi commenced at CeRDI in 2015 having worked extensively within the field of scientific research, publishing and editing from within a range of organisations and universities spanning fields such as forest ecology, bushfire research and contaminated lands auditing. Judi joined the OFT team and provides research support services within CeRDI.

David Ebbs, Researcher

Bachelor of Engineering (Chemical) (Honours), Masters of Business Administration

David commenced his PhD with CeRDI in 2015 after more than 25 years working predominantly in the manufacturing sector. A Chemical Engineering degree and MBA equipped him well for engineering and factory management, specialising in productivity improvements. His research is on alternative water supplies, and investigating a triple bottom line analysis of alternative methods for using stormwater to supplement a city's water supply. David also works part-time in CeRDI.

Chris Bahlo, Researcher

Bachelor of Information Technology (Honours),
Bachelor of Information Technology (Professional Practice), Bachelor of Business

Chris commenced her PhD at Federation University Australia in early 2016, as part of the RUN Precision Agriculture Flagship, researching data interoperability in Precision Agriculture. She works part-time at CeRDI and as a sessional at Federation University Australia. In 2013 she graduated with a Degree in Information Technology from the University of Ballarat, being awarded the Ballarat University Medal. Chris has worked in information technology and agriculture roles, and also has business experience.
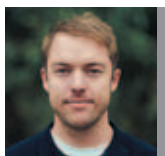
Patrick Bonney, Researcher

Bachelor of Science, Master of Science (Zoology)

Patrick commenced his PhD at CeRDI in 2016 and is also employed part-time in the Centre. Patrick is undertaking research examining citizen science and public policy. Both his studies and his part-time employment involve working with volunteers, environmental groups and government and non-government agencies involved with Citizen Science and Natural Resource Management. For his PhD, Patrick is working closely with the Corangamite Catchment Management Authority to measure and explore the issues and opportunities of the Waterwatch Victoria and EstuaryWatch Victoria programs.

Technical

Andrew Macleod, Manager Technical Projects

Honours Applied Science (Information Technology), Bachelor of Computing

Andrew joined CeRDI in 1999. He provides technical leadership for all Centre activities. Andrew has been instrumental in developing the technology innovations, data interoperability and knowledge management approaches demonstrated through CeRDI spatial initiatives.

Paul Feely, Senior Programmer

Bachelor of Computing (Honours)/Bachelor of Commerce

Paul joined CeRDI in 2003. He specialises in PHP and MySQL development and has been the lead programmer on major projects including Sport and Recreation Spatial and Online Farm Trials.

Scott Limmer, Systems Analyst Programmer

Bachelor of Information Technology

Scott joined CeRDI in 2008 to provide assistance with expanding programming and web development activities. Since then he has introduced new multimedia and web2 technology skills to the team and has involvement in key projects including Land Your Career, Grain and Graze 3 and Dementia Pathways Tool.

Heath Gillett, Programmer

Bachelor of Computing

Heath joined CeRDI during 2009. He has extensive experience in design, programming, implementation and support of various IT systems. Heath has been a lead developer on key projects including the Barwon South West Knowledge Base and GRDC Online Final Reports project.

Peter Plucinski, Programmer

Bachelor of Finance, Master of Commerce

Peter joined the CeRDI development team in early 2016. He specializes in modern PHP, MySQL and JavaScript as well as front end development. He brings knowledge and experience with MVC frameworks such as Laravel and versioning tools such as Git to the team. Prior to joining CeRDI, Peter worked as a software developer for a Melbourne based company.

Craig Briody, Web Developer

Bachelor of Computing

Craig joined CeRDI in 2002. Craig specialises in the development and implementation of web-based projects as well as having significant experience in the development and delivery of comprehensive client training programs.

Sudeera Abeywickrema, Web Developer

Bachelor of Information Technology

Sudeera joined CeRDI in 2013, and contributes to the implementation of a range of web-based applications and systems and the integration of emerging technologies to enhance CeRDI outcomes.

Drew Collins, Technical Assistant

Bachelor of Film and Television

Drew joined CeRDI in 2013 after completing work experience at CeRDI in 2011. Drew provides technical assistance across a range of projects..

Project and Administration

Kathy Gamble, Administration Support Officer

Graduate Diploma of Education, Diploma of Fine Art

Kathy joined CeRDI in January 2013 after five years with the Federation Business School. Kathy assists the CeRDI team with administrative support across various projects and is the Personal Assistant to the Centre Director.

Martijn Schroder, Business Innovation and Optimisation Manager

Martijn commenced work with CeRDI in 2017 in the role of business innovation and optimisation manager. Prior to this he worked in management consulting, and more recently, was the digital transformation manager for the City of Ballarat, creating their digital and innovation strategy. Martijn's work in CeRDI is on expanding the research reach in new and innovative areas including, for example, roads maintenance.

Current CeRDI HDR Students

Chris Bahlo (PhD)
PhD title: Advancing data interoperability standards for animal welfare and production systems

Faculty: Science and Technology
Year   Commenced: 2016
Supervisors: Assoc Prof Peter Dahlhaus, Dr Mark Trotter (CQU)

Patrick Bonney (PhD)
PhD title: Citizens as monitors – crowdsourcing for water policy development

Faculty: Science and Technology
Year Commenced: 2016
Supervisors: Dr Angela Murphy, Dr Birgita Hansen, Dr Claudia Baldwin (USC)

David Ebbs (PhD)
PhD title: The impact of using stormwater to supply a city

Faculty: Science and Technology
Year Commenced: 2015
Supervisors: Assoc Prof Peter Dahlhaus, Dr Andrew Barton, Dr Harpreet Kandra

Alison Ollerenshaw (PhD)
PhD title: The relationship between business incubator services and the psychological capital of tenants

Faculty: Health
Year Commenced: 2016
Supervisors: Dr Angela Murphy, Assoc Prof Helen Thompson, Prof Suzanne McLaren

Shirish Sharma (PhD)
PhD title: Interoperable framework to integrate involuntary geospatial data in web based geoportals

Faculty: Science and Technology
Year Commenced: 2016
Supervisors: Assoc Prof Peter Dahlhaus, Dr Angela Murphy, Dr Iman Avazpour

Himalaya Singh (PhD)
PhD title: A geospatial analysis of sport/leisure injuries of Victoria, Australia

University partner: Australian Centre for Research into Injury in Sport and its Prevention (ACRISP)
Faculty: Health
Year Commenced: 2013
Supervisors: Prof Caroline Finch (ACRISP); Assoc Prof Helen Thompson, Dr Lauren Fortington (ACRISP),
                                  Assoc Prof Rochelle Eime (Faculty of Health FedUni and ISEAL Victoria University)

Research Outputs

Publications

Book Chapters

Hansen B.D., Clemens R.S., Gallo-Cajiao E., Jackson M.V., Kingsford R.T., Maguire G.S., Maurer G., Milton D., Rogers D.I., Weller D.R., Weston M.A., Woehler E.J., & Fuller, R.A. (in press). *Shorebird monitoring in Australia: a successful long-term collaboration among citizen scientists, governments and researchers.* In 'Monitoring threatened species and ecological communities'. (Eds S Legge, DB Lindenmayer, NM **Robinson**, BC Scheele, DM Southwell and BA Wintle) (CSIRO Publishing: Melbourne).

Journal Publications

Benke, K., & **Robinson**, N. (2017). Quantification of uncertainty in mathematical models: relationship between field pH and laboratory measurements. *Applied and Environmental Soil Science.* doi.org/10.1155/2017/5857139

Brodaric B., Boisvert E., Chery L., **Dahlhaus** P., Grellet S., Kmoch A., Letourneau F., Lucido J., **Simons** B. & Wagner B. (in press). Enabling global exchange of groundwater data: GroundWaterML2 (GWML2). *Hydrogeology Journal.*

Dahlhaus P.G., Nicholson C., Ryan B., **MacLeod** A. & **Milne** R. (in press). Liberating soil health data for profitable agriculture and catchment health in the Corangamite region, Australia. *New Zealand Journal of Agricultural Research,* (DOI: 10.1080/00288233.2018.1432491).

Ebbs D., & **Dahlhaus** P., Barton A. & Kandra H. (in press). An unexpected decrease in urban water demand: making discoveries possible by taking a long term view. Water Policy.

Ebbs D., **Dahlhaus** P., & Kandra H. (2017) Ballarat's messy path to a Water Sensitive City. *Water e-Journal,* 2/4. doi: 10.21139/wej.2017.037.

Ollerenshaw A., Wong Shee A., & Yates M. (2017). Towards good dementia care: awareness and uptake of an online Dementia Pathways Tool for rural and regional health practitioners. *Australian Journal of Rural Health*. doi: 10.1111/ajr.12376

Ollerenshaw A., & **Camilleri** M. (2017). Health justice partnerships: initial insights into the delivery of an integrated health and legal service for youth in regional Victoria. *Rural and Remote Health* (Online) 17: 3975. Available at http://www.rrh.org.au/articles/subreview.asp?ArticleID=3975.

Ollerenshaw A., **Murphy** A., & McDonald K. (2017). Leading the way: the integral role of local government within a multi-sector partnership delivering a large infrastructure project in an Australian growth region. *Local Government Studies*, 43(2), 291–314. doi.org/10.1080/03003930.2016.1274259

Piggott M.P., **Hansen** B.D., Soderquist T. & Taylor A.C. (2017). Population monitoring of small and isolated Petrogale penicillata colonies at the extreme of their range using faecal DNA sampling. *Online Early in Australian Mammalogy*. http://dx.doi.org/10.1071/AM16056

Robinson, N.J., Benke, K.K., Norng, S., & Crawford, D.M. (2017). Improving information content in soil pH maps: a case study in south-western Victoria. *European Journal of Soil Science*, 68(5), 592-604. https://doi.org/10.1111/ejss.12452

Wills, B.D. (2017). Eating at the limits: Barriers to the emergence of social enterprise initiatives in the Australian emergency food relief sector, Food Policy, 70, 62-70. doi:10.1016/j.foodpol.2017.06.001 ISSN 0306-9192.

Wills, B.D., & Arundel, A. (2017). Internet-enabled access to alternative food networks: A comparison of online and offline food shoppers and their differing interpretations of quality, Agriculture and Human Values, 1-12. doi:10.1007/s10460-017-9771-2 ISSN 0889-048X

Wilson D., Hansen B., Honan J., & Chamberlain R. (2017). 170 years of Latham's Snipe Gallinago hardwickii arrivals in New South Wales show no change in arrival date. *Australian Field Ornithology* 34, 76-79.http://dx.doi.org/10.20938/afo34076079

Conference Papers and Presentations

Bahlo, C. (2017). Accessible farm animal welfare data: the role of interoperable standards in precision livestock farming. *1st Asian-Australasian Conference on Precision Pastures and Livestock Farming*, Hamilton NZ, 16-18 October 2017. http://doi.org/10.5281/zenodo.897205

Dahlhaus P., & MacLeod A. (2017). Towards data democracy in groundwater science. *Australian Groundwater Conference*, 11–13 July 2017, University of New South Wales, Sydney, Australia.

Dahlhaus P.G., & MacLeod A. (2017) Towards data democracy in groundwater science. *Groundwater Futures: Science to Practice, Australian Groundwater Conference*, 11-13th July 2017, UNSW, Sydney. Book of Abstracts p.169.

Ebbs D., Dahlhaus P., Barton A. & Kandra H. (2017), A city sustained by stormwater, Federation University HDR Conference, Federation University Australia, Mt. Helen

Mendes de Jesus J., Ribeiro E., Medyckyj-Scott D., Ritchie A., Wilson P., Dahlhaus P., Gregory L., MacLeod A., & Simons B. (2017). SoilML data exchange format and soil web services. *Pedometrics* 2017, 26 June–1 July (2017), Wageningen, The Netherlands.

Ollerenshaw A. (2017). The relationship between business incubator services and the Psychological Capital of tenants. *Federation University Australia Higher Degrees by Research Conference: Making your Vision a Reality*, 27 July 2017, Federation University Australia, Ballarat.

Schaap, B., Mendes De Jesus, J.S., Ribeiro, E., Van Egmond, F.M., Medyckyj-Scott, D., Ritchie, A., Wilson, P., Baritz, R., Dahlhaus, P., Gregory, L., MacLeod, A., Simons, B. (2017). Towards global soil data interoperability: GODAN soil data WG and SoilML (open) data exchange format. *Soil Science in a Changing World, Wageningen Soil Conference*, 27th - 31st August 2017, Wageningen University, The Netherlands. Book of Abstracts (eds. J. Wallinga, G. Mol, T. Mulder, A. Zaal & B. Jansen) (ISBN 978-94-6343-061-6) p.112 https://www.wur.nl/upload_mm/3/a/3/11191a74-6ccc-40a6-b109-b7b24487fe2f_2017_WSC_Book%20of%20Abstracts_Final_web.pdf

Singh, H. (2017, November). W*here do sport and leisure injury prevention efforts need to be targeted?* Paper presented at the Australasian Injury Prevention and Safety Promotion Conference, Ballarat, Australia.

You G., Al Mandalawi M., Soliman A., Dowling K., & Dahlhaus P. (2017). Finite element analysis of rock slope stability using shear strength reduction method. *GeoMEast 2017 International Conference, 'Sustainable civil infrastructures: innovative infrastructure geotechnology'*, 15–19 July 2017, Sharm El-Sheik, Egypt.

Industry Reports

Bonney, L., Turner, P., **Wills**, B.D., & Mirowski, LT & Vo, S.A. (2017). Traceability Systems for Wild Caught Lobster, Via Sense-T and Pathways to Market, Fisheries Research Development Council, Deakin, ACT [Government or Industry Research].

Dahlhaus, P., Nicholson, C., Ryan, B., **MacLeod**, A., & **Milne**, R. (2017). Federating Private and Public Soil Data: The Corangamite Soil Health Knowledge Base Project. Profile. Issue 183, March 2017. Soil Science Australia newsletter. pp:22-23 ISSN:2207-4082

Dahlhaus, P.G., & **Thompson**, H. (2017). EPA Victoria: A proposal for collaborative partnership in eResearch. Co-developing next generation data delivery and knowledge management systems. Discussion paper. Centre for eResearch and Digital Innovation. Federation University Australia. 22nd December 2017, 13p.

Dahlhaus, P.G., & **Thompson**, H. (2017). Precision Agriculture: A proposal for collaborative eResearch in agriculture. A partnership to develop digital tools to enhance precision agriculture services. Discussion paper. Centre for eResearch and Digital Innovation. Federation University Australia. 23rd February 2017, 23p.

Ebbs, D., & Barton, A. (2017). Flowrate Testing for the 'Flexiflume' Irrigation Nozzle, A report for C.E. Bartlett's Pty. Ltd., August 2017, Ballarat, Australia.

Ebbs, D., & Barton, A. (2017). Flowrate Testing for the 'Flexiflume' Irrigation Nozzle – Phase 2, A report for C.E. Bartlett's Pty. Ltd., September 2017, Ballarat, Australia.

Awards

2017 Parks and Leisure Australia Award of Excellence: Research Project Award; Sport and Recreational Spatial.

2017 VicHealth Award for Research into Action: Sport and Recreation Spatial.

Best Rapid Oral Presentation: PhD Candidate Himalaya Singh. 13th Australasian Injury Prevention and Safety Promotion Conference, 2017. Presentation: *Where do sport and leisure injury prevention efforts need to be targeted?*

Soil Science Australia: 2017 CG Stephens award for best PhD for soil science across Australia: Dr Nathan Robinson, Senior Research Fellow. Thesis title: *Assessing productive soil-landscapes in Victoria using digital soil mapping"*

Research Income

The following chart illustrates CeRDI's income from 2008 to 2017.

The key performance measure of research income continues to grow year on year[1]. Research income in 2017 increased across key areas, as shown in Figure 2.

Income across each of CeRDI's research theme is presented in Figure 3. It indicates that Digital Agriculture continues to generate the highest income.
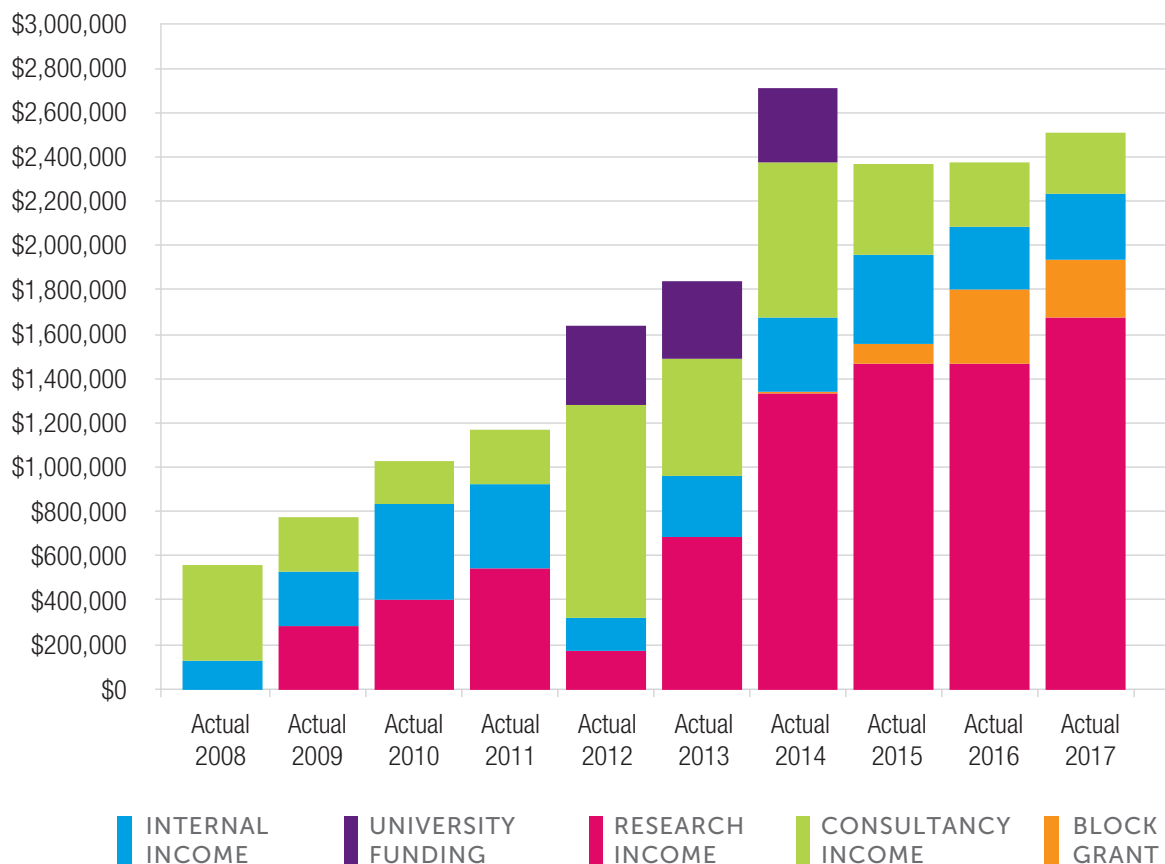

FIGURE 2. CERDI'S INCOME FROM 2008 TO 2017.

Note. The change in the University Funding component of income for 2015 shown above reflects the University's organisational change for the Corporate Web Team, which in 2015 was no longer under CeRDI administration

1   Research income in 2012 was substantially higher than shown in the chart. The research income shown in 2012 was due to the method of income classification which was operating in Research Services during that period.
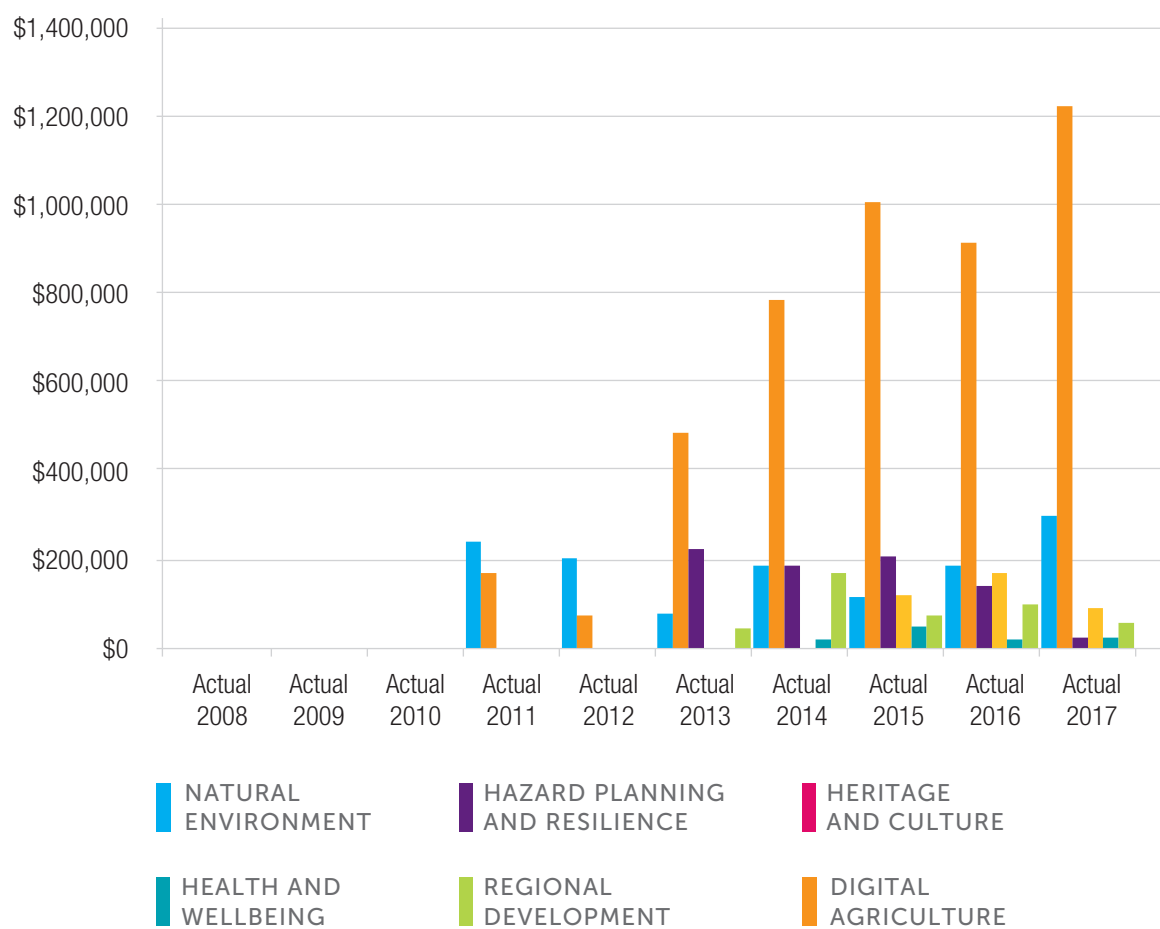
FIGURE 3. CERDI INCOME FROM 2008 TO 2017
ACROSS EACH OF THE SIX RESEARCH THEMES.

Research Partnerships and Collaborations

Ag Excellence Alliance

Agriculture Victoria Research

Ambulance Victoria

Associate Professor Mark Yates, Deakin University and Ballarat Health Services

Australian Mathematical Sciences Institute

Australian Tourism Accreditation Program

Ballarat Health Services

Ballarat Community Health

Bayside City Council

Bendigo TAFE

Birchip Cropping Group

Brimbank City Council

Capital Woodland and Wetlands Conservation Association

Central Highlands Community Legal Centre

Central West Farming Systems

City of Ballarat

City of Greater Geelong

City of Kingston

Colac Otway Shire

Collier Charitable Fund

Commerce Ballarat

Community Legal Centres NSW

Coorong District Council

Corangamite Catchment Management Authority

Country Fire Authority

CSIRO

Deakin University

Department of Environment, Land, Water and Planning (Victoria)

Department of Health and Human Services

Department of Industry, Innovation and Science

East Grampians Health Service

Envirocomm Connections

Facey Group

Federation University Australia's Faculty of Science and Technology

Federation University Australia – Wimmera Campus

Fitzroy Legal Service

Foundation for Rural & Regional Renewal

Geography Teachers Association of Victoria Inc.

Glenelg Hopkins Catchment Management Authority

Grains Research and Development Corporation

Grampians Community Health

Grampians Medicare Local

Grower Group Alliance

Gunaikurnai Traditional Owner Land Management Board

Hart Field Site Group

Helen Macpherson Smith Trust

Horsham Rural City Council

Irrigated Cropping Council

La Trobe University

Law and Justice Foundation

Legal Services Commission of South Australia

Leo Cussen Institute

Liebe Group

Manaaki Whenua Landcare Research	TAFE Directors Australia
Marschay Shorthorns	Tatiara Council
Melton City Council	Tennis Victoria
Mornington Peninsula Shire	The Code Sharman
National Association of Community Legal Centres	The University of Melbourne
Natures Cargo	The Waterbug Company
Netball Victoria	Timber Training Creswick
Net Balance Foundation	University of New England
Nicon Rural Services	University of Southern Queensland
North Central Catchment Management Authority	University of Tasmania
Northern Grower Alliance	VicHealth
Peak Fitness	Victoria University
Precision Agriculture	Victorian Grower Group Alliance
Public Record Office Victoria	Victorian Legal Assistance Forum
Riverine Plains	Victorian Legal Services Board and Commissioner
RMIT University's Centre for Urban Research	Victoria State Government Department of Justice and Regulation Horsham
Rotary District 9780	Victoria Police
South Australian Research Development Institute	Victoria Police Horsham
South Eastern Melbourne Primary Health Network	Waterwatch
	Western Victoria Primary Health Network
Southern Cross University	West Midlands Group
Southern Farming Systems	Wimmera Drug Action Taskforce
South West Institute of TAFE	Wimmera Primary Care Partnership
Sovereign Hill	Wimmera Regional Sports Assembly
Sport and Recreation Victoria	Wimmera Southern Mallee Local Learning & Employment Network
State Wide Integrated Flora and Fauna Teams	Wimmera UnitingCare
Stawell Regional Health	Wimmera Health Care Group
	Youthlaw
Sunraysia Institute of TAFE	Zoos Victoria

Contact CeRDI

For further details about CeRDI's diverse portfolio of research please visit our websites: **www.cerdi.edu.au** and **http://spatial.federation.edu.au**

Mailing Address

Centre for eResearch and Digital Innovation
Federation University Australia
PO Box 691
Ballarat Victoria 3353

Office Location

Suite 15, Greenhill Enterprise Centre
Ballarat Technology Park
University Drive, Mount Helen
Victoria 3350

Phone: +61 3 5327 9314
Fax: +61 3 5327 9895

Centre for eResearch and Digital Innovation (CeRDI)

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