

CeRDI
Annual Report
2019

TWO
THOUSAND
AND
NINETEEN

Acknowledgement of Country

Federation University Australia acknowledges the Custodians of the lands and waters where our campuses are located and recognises their continuing responsibilities to care for country at these sites of teaching and learning. We pay our respects to Elders past and present and extend our respects to all Aboriginal and Torres Strait Islander First Nations peoples.

The Aboriginal Traditional Custodians of the lands and waters where our campuses, centres and field stations are located include:

BALLARAT | Wadawurrung

BERWICK | Boonwurrung

BRISBANE | Turrbal and Jagera

EUSTON STATION | Tatti Tatti

GIPPSLAND | Gunai Kurnai

NANYA STATION | Mutthi Mutthi and Barkindji

WIMMERA | Wotjobaluk, Jaadwa, Jadawadjali, Wergaia, Jupagulk

For further details about CeRDI's diverse portfolio of research please visit our website: www.cerdi.edu.au

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Contents

Foreword: Professor Chris Hutchison, Deputy Vice-Chancellor	2
Introduction: Associate Professor Helen Thompson, CeRDI Director	3
About CeRDI	
Overview	4
CeRDI Team	5
eResearch	6
Research Themes and Activities	7
CeRDI Technological Approach	8
CeRDI's Capability: Interoperability	8
CeRDI's Capability: Systems Architecture	9
CeRDI Research Projects	
Agriculture	12
Visualising Australasia's Soils	12
Online Farm Trials	13
Agriculture Research Federation	14
Soil Sampling Research with Glenelg-Hopkins Catchment Management Authority	16
Natural Environment	18
Visualising Victoria's Groundwater	18
LitterWatch Victoria	20
Yarra Catchment Atlas	21
National Waterbug Blitz	22
Southern Right Whale Photo Identification Project	23
Zoos Victoria: Bogong Moth Tracker	24
Hazard Planning and Resilience	25
Western Alliance for Greenhouse Action: How Well Are We Adapting Portal	25
Emergency Management Victoria: My Community Portal	26
Health and Wellbeing	27
Central Highlands Family Violence: Data Press Project	27
Youth C.A.N. Project	28
Heritage and Culture	29
Honouring our ANZACS Website	29
Regional Development	30
City of Ballarat Smart Cities and Suburbs	30
Staff profiles	32
Research Outputs	41
Data Democracy Film	45
Research Income	46
Research Partnerships and Collaborations	48



Foreword

Professor Chris Hutchison,
Deputy Vice-Chancellor
(Research and Innovation)

This has been an important year for CeRDI, heralding new, innovative and exciting research and collaborations, the outputs of which will inform and support industry and communities into the future.

Visualising Australasia's Soils and AgReFed are just two of the new projects being led by CeRDI that are expected to generate new knowledge to support Australian soil data federation. The opportunities, collaborations and learnings from these projects will be far reaching and are projects 'to watch' in the future.

CeRDI continues to contribute to research across all thematic research areas. Each of the projects reflect the strong and vibrant research culture and community within the Centre, and at Federation University broadly. The contributions and learnings garnered from many of these projects have informed, and are the focus of content comprising the Data Democracy films, recently launched by CeRDI. The documentaries represent a significant contribution to the debate about data democracy and provide further evidence of CeRDI's eResearch reputation.

The Centre's research is diverse and multi-disciplinary. The range and breadth of research conducted, and presented in this report, is testament to this. These research activities demonstrate the many strengths within CeRDI and which we at Federation University celebrate.

I commend Helen Thompson and the team at CeRDI on the great work that has been achieved this year and I look forward to further successes in 2020.



Introduction

Associate Professor
Helen Thompson,
CeRDI Director

The stories featured in this annual report demonstrate the contribution of CeRDI to research and outputs that are benefitting our region, and contributing important insights at a national and international level.

Our natural environment theme, spearheaded by a dedicated team of researchers, ecologists and technology professionals, is delivering important conservation projects that are complemented by technology innovations. Evidence of this includes two citizen science projects that have received media interest and attention. The Moth Tracker project with Zoos Victoria, and the National Waterbug Blitz are exemplars of the work that CeRDI is undertaking to support conservation, natural resources, and the environment through research and the use of technology.

Supporting and advancing eResearch within the agriculture domain remains a strong focus for CeRDI. Research activities on projects within agriculture reflect the breadth of our research and the contribution we are having in grains and cropping, soils, and in enabling data sharing and federation for greater research knowledge in agriculture.

Exemplifying this is the establishment of the Agriculture Research Federation (AgReFed); the aim of which is to deliver a shared approach between data provider communities for Findable, Accessible, Interoperable and Reusable (FAIR) agricultural data. This will lead to benefits including improved profitability and sustainability for Australia's agricultural sector.

This annual report highlights many other research activities and successes, for which the outputs and contributions have led to new knowledge. Complementing this is the successful completion of our higher degrees by research candidates (PhD).

This report represents a celebration of our activities and provides a strong foundation for expanding our research footprint in the year ahead.

About CeRDI

Overview

The Centre for eResearch and Digital Innovation (CeRDI) at Federation University Australia is located within the Office of the Deputy Vice-Chancellor (Research and Innovation) and based at the Ballarat Technology Park, Mt Helen.

CeRDI focuses on multidisciplinary research and the application of eResearch and advanced technology systems to enable digital transformations and practice change, together with enhancements in effectiveness and productivity in industry, government and academia.

CeRDI's multidisciplinary research capabilities distinguish it from traditional research centres. This ensures that the research undertaken has impact across a broad discipline base and in each of the six research themes.

CeRDI has a long-established reputation for achieving successful outcomes and is committed to building capacity and engagement with its collaborators. This ensures the application and uptake of the technologies and research for the benefit of our partners, industry and the broader community.

The work of CeRDI has made significant advances in expanding engagement in spatial information systems, visualisation, knowledge management and data interoperability. CeRDI responds to, and anticipates, new technology directions and opportunities based on insights from research and partner engagement. These innovations generate beneficial outcomes and attract sustained research investment.

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

- **Partner engagement** – listening skills and the ability to translate information from partners into research projects with outcomes that stakeholder's value. CeRDI has a reputation for consistency, reliability, timeliness, credibility and excellence.
- **Fostering long-term partnerships** – sustained 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 candidates drawn from within the research centre and elsewhere in Federation University. These are essential foundations 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. Catalyses knowledge mobilisation and ensures beneficial outcomes for partner organisations.
- **Continuous innovation** – data federation, knowledge management, web publishing, spatial mapping, data visualisation and decision support systems.
- **A leader in eResearch and digital innovation** – adding value to Federation University's areas of research strength.

CeRDI Team

CeRDI employs 36 staff (full-time; part-time; casual) with 24 staff in the research team, nine in the technical team and two project management and administration. CeRDI has nine HDR (PhD) candidates.



eResearch

eResearch is the application of information technologies to support existing and new forms of research. At CeRDI, eResearch is characterised by the following features:

- **Applied** – research focused on developing solutions that meet specific real-world priorities for our research investors, stakeholders and communities.
- **Impactful** – research that creates novel and disruptive technologies that enhance industry, sector, and community practices; improve digital literacy among researchers and industry practitioners; and influences social change through implementing data and information democracies.
- **Multidisciplinary and cross-disciplinary** – contributes to a range of Field of Research (FoR) codes (information and computing sciences; physical geography and environmental geoscience; earth sciences; human movement and sport science and historical studies). Collaborates with researchers in Schools across Federation University.
- **Collegiate, collaborative and inclusive** – engages in collaborative design that results in co-developed solutions. Leads and participates in a range of research projects at the international, national and regional scale.



Research Themes and Activities

At CeRDI, eResearch and digital innovation has focussed on the development of interoperable spatial knowledge systems that meet the needs of our research investors across a range of diverse disciplines.

Most of these systems are collaboratively designed and developed to federate qualitative and quantitative data from disparate sources, both in the public and private sectors. The data federations are almost always provisioned as customised web-based portals that are used for data discovery, dynamic modelling and visualisation, decision support, and knowledge dissemination.

The demand for these bespoke knowledge systems has driven significant and growing investment in our research that has clustered around six core themes:

- **Natural Environment**, including land, water and biosphere, with research investment in catchment management, citizen science, community-based monitoring, protection and conservation of threatened species, implementing environmental sensor technologies, environmental modelling and decision support systems, and monitoring, evaluation, reporting and improvement (MERI).
- **Agriculture**, mostly focused on broad-acre farming, with research investment in precision agriculture, food agility, soil performance and health, on-farm data aggregation and visualisation (public-private data federations), farm decision support systems, on-farm sensors and Internet of Things (IoT) technologies, remote and proximal sensing technologies, cropping trials, grains trials research, and real-time soil moisture sensing and interpolation.
- **Hazard Planning and Resilience**, including emergency management planning and disaster recovery, with research investment in emergency services, community-based emergency management, fire, flood, landslides, coastal inundation and erosion, community engagement tools, community monitoring tools, strategic planning for emergencies and natural disasters, and planning and preparedness for climate change.
- **Health and Wellbeing**, including social justice and regional health challenges, with investment in spatial mapping of sports and recreational activities and services, diagnostic tools to assist with dementia referrals, collaboration and evaluation on health justice partnerships, interventions for youth alcohol consumption, family and domestic violence, and sport and leisure injury epidemiology.
- **Heritage and Culture**, including Historic Urban Landscapes (HUL) and Aboriginal land management, with investment in urban planning, social perceptions, landscape amenity, tourism, tools to support indigenous cultural assets management and mapping indigenous heroism, and digitising local history associated with World War One and World War Two.
- **Regional Development**, mainly focused on supporting regional communities in strategic planning, with investment in digital strategies and improving digital literacy, fostering smart cities, business accelerators, portals to support strategic and statutory planning in municipalities, and information portals to support regional communities.

CeRDI Technological Approach

CeRDI's Capability: Interoperability

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

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 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 CSIRO, and the Australian Bureau of Meteorology (BOM).

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's 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 is 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 their 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.

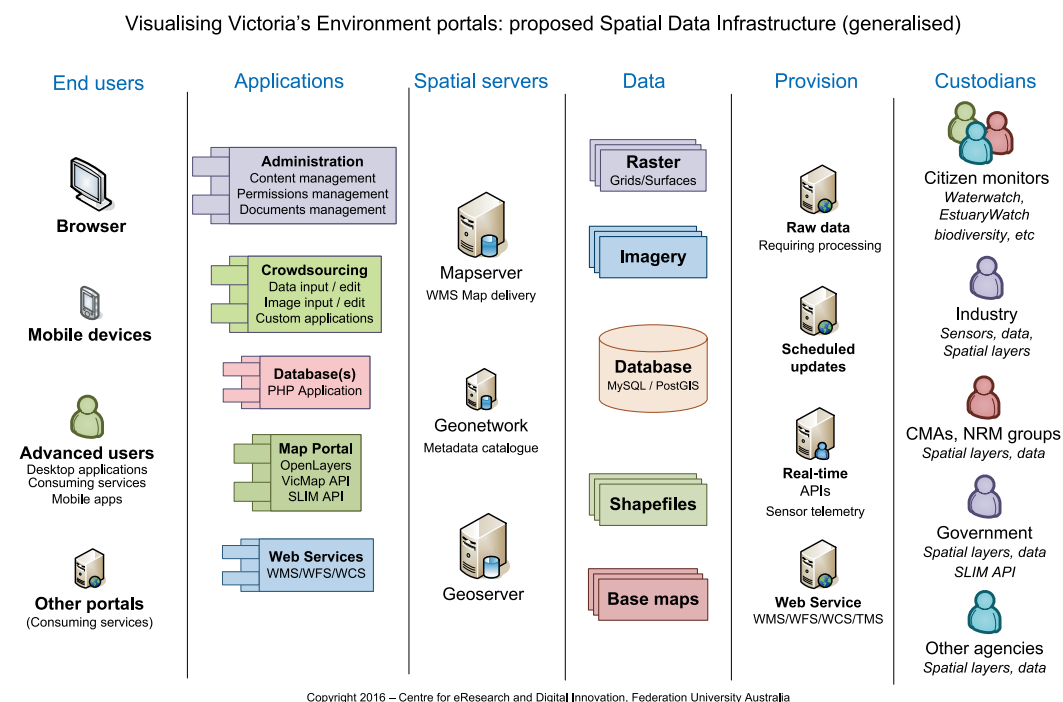


FIGURE 1. CERDI'S GENERAL SYSTEMS ARCHITECTURE AND DATA FLOW FROM CUSTODIANS TO END USERS (SOURCE: DAHLHAUS AND THOMPSON, 2016).

Key components of the system include:

- 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 relevant qualifications and capabilities as well as extensive training and industry experience to ensure optimal project outputs. This enables 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 that technical requirements are met at each stage of development.

CeRDI Research Projects





AGRICULTURE

Visualising Australasia's Soils

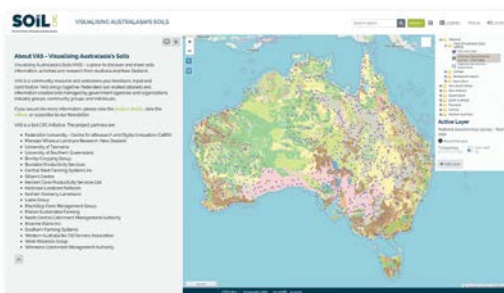
CeRDI is the lead partner on a new project, Visualising Australasia's Soils (VAS), which has been funded by the Co-operative Research Centre for High Performance Soils (Soil CRC) with project investment totalling \$1.1 million.

A feature of the VAS project is the creation of a web portal to enable access to shared public and private soil datasets. CeRDI is contributing specialised computing, information analysis and data federating systems and using eResearch approaches to inform this project. Interoperable technologies will be used to enable 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.

The web portal is a significant output associated with VAS, in which custodians retain data ownership and control how and what data is shared. They are also active participants in contributing data to the portal. Extensive foundational work will be undertaken with industry partners to understand, and demonstrate, the value of data governance, data sharing and data access and usage.

Workshops with participants from partner organisations across Australia and New Zealand will generate insights informing the development of the web portal, including its broad functionality, alongside sophisticated spatial mapping features. Data governance issues and the value of sharing and using soil datasets, will be considered by partners to ensure the portal development and technology meets the needs of end-user.

Two brief videos have been developed to provide an introduction to the project. In the videos, CeRDI's Associate Professor Peter Dahlhaus describes the project aims and scope, highlighting the potential capabilities and benefits to agronomists, farmers and researchers of a national soil data portal.



Website: <https://data.soilcrc.com.au/>

To access the videos:

www.youtube.com/watch?v=p0tqV3bH1gU

www.youtube.com/watch?v=n1qnEtoSy5s

PROJECT PARTNERS

Cooperative Research Centre for High Performance Soils

Birchip Cropping Group

Burdekin Productivity Services

Central West Farming Systems Inc.

Gillamii Centre

Herbert Cane Productivity Services Ltd

Holbrook Landcare Network

Liebe Group

North Central Catchment Management Authority

Nutrien (formerly Landmark)

Riverine Plains Inc.

Southern Farming Systems

University of Southern Queensland

University of Tasmania

Western Australia No Till Farmers Association

West Midlands Group

Wimmera Catchment Management Authority

Online Farm Trials

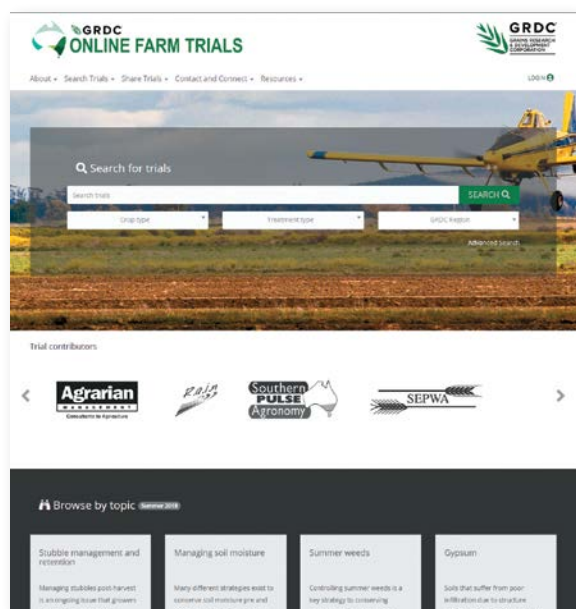


AGRICULTURE

Online Farm Trials (OFT) is a collaborative research project that is supporting Australia's grains industry by making the results of grains research trials readily available. This online resource delivers growers, agronomists, and other industry stakeholders, the information and data they need to assist in on-farm decision making.

OFT is a long-term project involving CeRDI and the Grains Research and Development Corporation. It commenced in 2015 and involves the digital transformation of trial research data and information from Australia's grains industry. It offers advanced spatial mapping and filtering systems providing users and contributors with access to published research trials and information. The trials data available on the portal have been supplied by stakeholders, including grower and farming systems groups, government researchers, universities and private industry across Australia.

The OFT portal is continually evolving, and new data is regularly uploaded to ensure increased breadth and currency of available information. During 2019, OFT has continued to develop technically and expand its stakeholder base through increased organisational contributions and trial data. The latest technical developments enhance the user and contributor experiences with a new dashboard offering contributor-organisations improved management of trial data and providing information about access of trial data by users, such as the frequency of views or access for particular trial data.



PROJECT PARTNERS

Grains Research and Development Corporation
Ag Excellence Alliance (South Australia)
Birchip Cropping Group
Grower Group Alliance
International Plant Nutrition Institute
Liebe Group
Nicon Rural Services
Northern Grower Alliance
Southern Farming Systems
Victorian Grower Group Alliance

Website: <https://www.farmtrials.com.au>



AGRICULTURE

Agriculture Research Federation

Advances in farm technology have led to an increase in data collection by growers, agronomists, researchers and industry, with the potential to employ advanced analysis techniques for better prediction. However, these data are not always findable, accessible or interoperable, and therefore are not able to be easily integrated and reused. These four key features of data (findable, accessible, interoperable and reusable) are becoming increasingly necessary and data that fulfils these requirements is described as being 'FAIR'. Data that is not FAIR leads to loss of time in data cleaning and manipulation, or, in worst case scenarios, poor science outcomes due to relevant data being ignored because it is inaccessible.

The Agricultural Research Federation (AgReFed) aims to improve the sharing and reuse of agricultural data. It is initiated and funded by National Collaborative Research Infrastructure Strategy (NCRIS), through the Australian Research Data Commons (ARDC), with participation and co-investment from six partner organizations including CeRDI (lead organisation), CSIRO, The University of Western Australia/Department of Primary Industries and Regional Development WA, University of New England, and the University of Adelaide.

CeRDI, together with the project partners, has sought to increase the FAIRness of its datasets and services, through the implementation of data exchange and metadata standards and controlled vocabularies. The technical architecture of the AgReFed platform uses distributed web services and a centralised discovery and visualisation portal.

The founding Data Provider Communities recently endorsed the guidelines for the development of a Data Stewardship and Governance Framework for AgReFed. The framework is openly available to other data communities interested in working for sustained provision of FAIR data:

Box, Paul; Levett, Kerry; Simons, Bruce; Wong, Megan. (2019) *Guidelines for the development of a Data Stewardship and Governance Framework for the Agricultural Research Federation (AgReFed)*. Sydney: CSIRO; <https://doi.org/10.25919/5cf179ba35db9>

With the support of an ARDC Discovery Grant, the framework is being enacted through the establishment of a set of founding governance decisions and policies. This will further the sustained increase in coverage of data provider communities (individuals, research organisations, public and private) to make their agricultural research data FAIR through participation in the federation community.



PROJECT PARTNERS

National Collaborative Research Infrastructure Strategy
 Atlas of Living Australia
 Australian Plant Phenomics Facility
 Australian Research Data Commons
 CSIRO
 Earlham Institute
 EcoCommons, Griffith University
 Food and Agriculture Organization of the United Nations
 Geoscience Australia
 Grains Research and Development Corporation
 Griffith University
 Macquarie University
 NSW Department of Primary Industries
 Queensland Cyber Infrastructure Foundation
 TERN, The University of Queensland
 The University of Adelaide
 The University of Sydney
 The University of Western Australia
 University of New England
 University of Southern Queensland
 Western Australia Department of Primary Industries and Regional Development



Website: www.agrefed.org.au/



AGRICULTURE

Soil Sampling Research with Glenelg-Hopkins Catchment Management Authority

CeRDI senior research fellow Dr Nathan Robinson is working with Glenelg-Hopkins Catchment Management Authority (GHCMA) and Southern Farming Systems (SFS) to establish a soil monitoring network to support the delivery of natural resources management for key environmental and sustainable agriculture priorities.

The project is part of the implementation plan of the National Landcare Phase Two, Regional Land Partnerships program. A key feature of the project is the implementation of the Soils4Farms partnership to assist farmers improve and protect their soil.

The project will examine soil acidity management – a national and regional priority – with a focus on supporting farmers. One hundred soil monitoring research test sites were established in the GHMCA region, and samples taken to establish a benchmark for soil condition. These sites were resampled in 2023 and compared against the benchmark to determine whether changes have occurred.

Various sample depths will be tested, including composite samples that adhere to the national soil carbon research programme methodologies. Each site was chosen in consultation with the farmer and where there is likely to be no contamination effects from factors such as fertiliser dumps, stock camps or water troughs.

The project will also seek to address insights from the soil benchmarking for the GHCMA region which will also provide new knowledge about:

- soils, climatic zones and land uses for the region;
- what has been done with respect to soil monitoring and benchmarking in the region to date;
- how could legacy site data and information be used to support development of a benchmarking program for the region, and
- what sites and areas are proposed for sampling in the establishment of soil monitoring for the region.
- changes in soil condition from resampling the 100 sites across the region.



PROJECT PARTNERS

Glenelg-Hopkins Catchment Management
Authority

Southern Farming Systems

National Landcare Program Phase Two

Website: [www.cerdi.edu.au/
SoilSamplingResearchwithGHCMA](http://www.cerdi.edu.au/SoilSamplingResearchwithGHCMA)



NATURAL
ENVIRONMENT

Visualising Victoria's Groundwater

CeRDI's award-winning project Visualising Victoria's Groundwater (VVG) received its largest transformation during 2019 with the deployment of a new application programming interface (API).

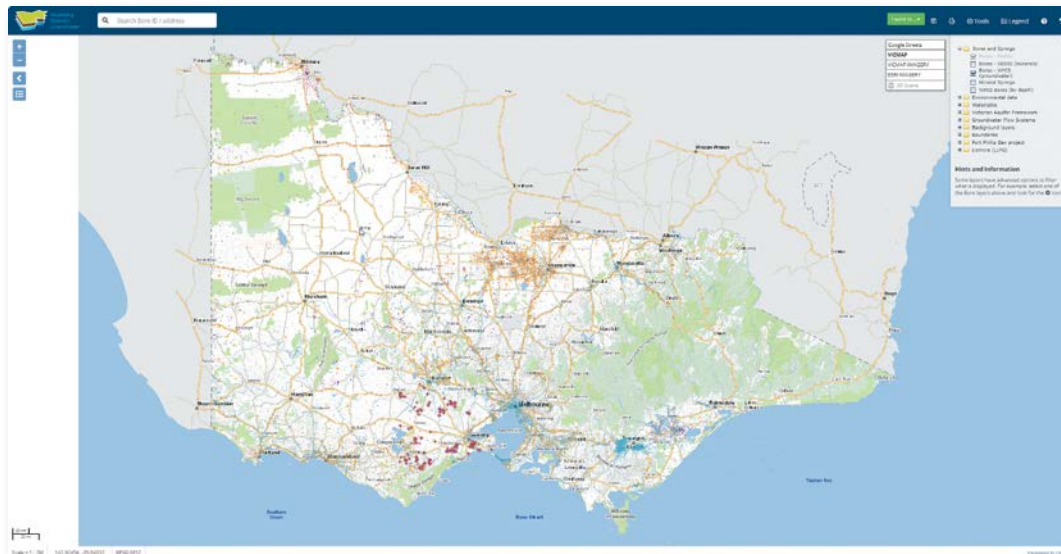
The new program expanded the current delivery of information for improved usability at the interface. These latest advances have implications for the VVG application broadly, while also providing a use-case that has informed the important work that CeRDI is contributing to the Second Environmental Linked Features Interoperability Experiment (SELFIE) as a collaborative and contributing member of Open Geospatial Consortium (OGC).

VVG was launched in 2012 as an online portal for the groundwater bore data in Victoria. The portal directly links the repositories of data that are managed by various government departments, agencies and research institutions. Data is available for display as bore holes on a map, with links to the individual data for each bore. This information is novel as it provides water managers and groundwater users with easy access to current data that can assist in the consumptive use and environmental water flows.

The latest VVG developments further expand the value of the portal, for contributors and end-users. The application programming interface will assist in delivering the Geological Exploration and Development Information System (GEDIS) data on borehole logs that are provided from GeoScience Victoria. This new interface enables GEDIS information to be integrated into VVG, ensuring a user-friendly approach is adopted when doing this and advanced data interoperability approaches can now be achieved.

Another development for VVG involves the groundwater data extract for the Victorian Water Measurement Information System (WMIS), which is managed by the Department of Environment, Land, Water and Planning (DELWP). The file transfer protocol between this data and the VVG server ensures easier automation of updates to VVG's main data source. The current extract provided by WMIS will streamline processes, as well as providing access to new, telemetered data.

The CeRDI-VVG team have long anticipated and advocated for these technical updates. These now ensure the continued accessibility, usability and relevance for the VVG portal into the future. Furthermore, the latest updates inform CeRDI's contribution and use-case for SELFIE by enabling real-life testing on specific resource models using recognised best practices and OGC standards for a wide range of participant-provided, domain-specific use-cases. The work that CeRDI and other Open Geospatial Consortium members are developing for SELFIE will provide a use-case across a range of programs and applications, adding value to the industry.



PROJECT PARTNERS

Australian National University (Integrated Catchment Assessment and Management Centre)

Cooperative Research Centre for Spatial Information (CRCSI)

CSIRO

Geological Survey of Victoria

Goulburn Murray Water

Natural Resources Canada

Queensland University of Technology

Senversa Pty Ltd

Southern Rural Water

Thiess Services Pty Ltd

Victorian Department of Economic Development, Jobs, Transport and Resources

Victorian Department of State Development, Business and Innovation

Victorian eResearch Strategic Initiative



Website: www.vvg.org.au



NATURAL
ENVIRONMENT

LitterWatch Victoria

CeRDI collaborated on a project with the Department of Environment, Land, Water and Planning (DELWP) to research and develop a standardised litter monitoring database and online spatial information system for Port Phillip Bay. The project, LitterWatch Victoria, brings together existing community and agency litter monitoring data to help develop new approaches that will ultimately guide beach litter control policy and planning for the Port Phillip region.

Nationally, and within the state of Victoria, litter in coastal and marine environments is a key threat. Litter pollution data has been collected in Victoria by a variety of community groups, but it has been difficult to use this information due to a lack of consistency in monitoring and measurement activities to ascertain changes in litter on beaches around the Bay. Furthermore, the data that is available is difficult to access and report upon, especially for members of the public.

The project addressed a range of litter monitoring, planning and policy objectives. The most notable of these is to co-develop, with key community groups, a standardised approach for monitoring and managing litter pollution in and around the Port Phillip Catchment. The project involves two simultaneous and concurrent components: An online spatial portal will be developed to capture existing litter data and provide the opportunity for data interrogation and visualisation; and establishment of agreed methodological approaches to enable a standardised measurement and monitoring of litter pollution.

In commenting on the project, project-lead CeRDI's Dr Birgita Hansen, said "extensive effort is going into this project to ensure the most appropriate approaches are developed, in consultation with key community groups. These are intended to deliver outcomes that are useful to both the Department at the policy and planning level, and to the communities conducting on-ground activities within Port Phillip. Thus, consultation with community representatives is integral to the success of this project and their utilisation of the LitterWatch portal".

The development of methods and guidelines for structured litter monitoring were undertaken alongside the production of a user administration system for groups to contribute and manage their data.

The portal was completed and launched in 2019.

PROJECT PARTNERS

Victorian Department of Environment, Land,
Water and Planning
Beach Patrol
Bellarine Catchment Network
Love Our Street
Port Phillip EcoCentre
Sustainability Victoria

Website: www.litterwatchvictoria.org.au



Yarra Catchment Atlas



NATURAL
ENVIRONMENT

CeRDI has partnered with the Yarra Riverkeeper Association to develop the Yarra Catchment Atlas – an online spatial information portal intended to feature biodiversity, environmental and cultural information for the Yarra Catchment.

Public awareness of the biodiversity and cultural heritage of the Yarra River and Port Phillip Bay is generally poor due to a lack of access to the information collected by community groups and agencies. The Yarra Catchment Atlas aims to redress this by federating a range of relevant datasets into a publicly accessible interactive mapping portal.

The Yarra Catchment Atlas will address two goals: first, to provide a tool to gain better insight into biological and ecological systems in the Yarra Catchment and how they influence dynamics in Port Phillip Bay; and second, improve appreciation and understanding of the Yarra Catchment and Bay.

These goals will be achieved through exposure of relevant data relating to program and project activities, the nature of data collection (spatial, temporal and thematic), the relationship between different datasets (including data summaries and analyses), and ways the public can get involved. Additionally, the project will improve collaboration and partnership across the community by supporting existing community programs and showcasing the valuable data they collect.

Over 40 community groups and organisations collect data and conduct regular activities within the Yarra Catchment, but few of these groups present their data on open platforms and most of these data are inaccessible to the public. The Yarra Riverkeeper Association has received funding support from the Department of Environment, Land, Water and Planning through the Port Phillip Bay Fund, to collaborate with groups to collect, collate and present Yarra catchment data on the Yarra Catchment Atlas. These data sources are anticipated to include: river flora, fauna, water quality parameters, litter composition and volume, the indigenous history of the Yarra River, the drainage system around the Yarra River among other themes.



PROJECT PARTNERS

Yarra Riverkeeper Association
Victorian Department of Environment, Land,
Water and Planning
Port Phillip Bay Fund

Website:

www.cerdi.edu.au/YarraCatchmentAtlas



NATURAL
ENVIRONMENT

National Waterbug Blitz

The National Waterbug Blitz website is a hub for communicating information about the annual, national waterways monitoring event. Commencing in spring 2018, the monitoring event involves citizen scientists collecting data about the health of Australia's waterways and wetlands.

During 2019, National Waterbug Blitz partners launched the Waterbug Data Portal which provides public access to federated data from across Australia, including both state government Waterbug monitoring and community monitoring such as Waterwatch.

A nationwide waterway monitoring event was held during 2019. This citizen science event helped to assess the health of the nation's waterways by exploring and identifying what aquatic macroinvertebrates ("waterbugs") they contain. This three-month long water monitoring event, held in Spring, is the culmination of extensive work by the project team to ensure uptake and involvement by citizen scientists and members of the wider community. The data collected by the community is loaded into the Waterbug Data Portal.

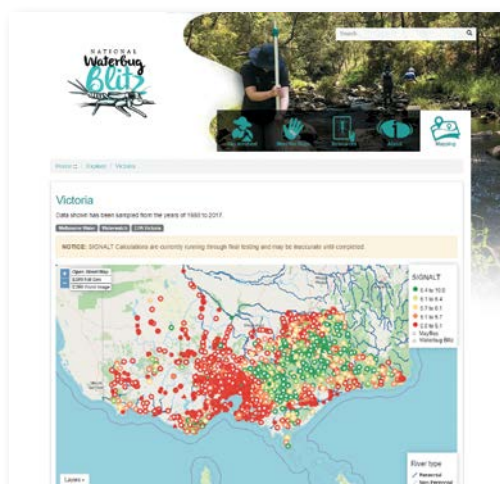
The Waterbug Data Portal enables the mapping and interrogation of data from water catchments. As community assessments from different regions grow with each monitoring event, the data collected by citizen scientists will complement agency data, providing insights about the health of Australia's rivers, lakes and wetlands. This assists authorities with waterways management and planning. These data also provide the wider community with information about their local water catchments to identify the health of these sites.



PROJECT PARTNERS

Corangamite Catchment Management Authority
EnviroComm Connections
The Waterbug Company
Waterwatch

Website: www.waterbugblitz.org.au



Southern Right Whale Photo Identification Project



NATURAL
ENVIRONMENT

CeRDI worked with the Department of Environment, Land, Water and Planning (DELWP) and the Arthur Rylah Institute to develop a new citizen science web portal for the State Wide Integrated Flora and Fauna Teams (SWIFFT) website. The portal is supporting the Southern Right Whale research and photo identification program being undertaken by DELWP in Victoria.

The easy-to-use online interface supports community contribution for the conservation of Southern Right Whales (and other whale species) in south-east Australia. Monitoring and recording of the whales is a vital activity in supporting and protecting this critically endangered species. Capturing photos and sightings of whales by citizens, and uploading these to the web portal, enables individual whales to be identified and catalogued by DELWP researchers. Each whale has a unique pattern of white features (callosities) on their head that can be used to identify individual whales.

CeRDI played a key role in developing the customised online interface. The collection of sighting data through the portal assists DELWP in monitoring movements, breeding patterns, habitat use and trends in the population size of the whales. This enables DELWP researchers and staff to identify and monitor individual whales, and to continue their important work conserving and protecting the species.

This project extends the existing partnerships and collaborations that CeRDI has with DELWP, Arthur Rylah Institute, SWIFFT, Helen Macpherson Smith Trust and Zoo's Victoria.



PROJECT PARTNERS

Arthur Rylah Institute

Victorian Department of Land, Water and Planning

SWIFFT

Zoos Victoria

Website: <https://whaleface.swiff.net.au/>



NATURAL
ENVIRONMENT

Zoos Victoria: Bogong Moth Tracker

CeRDI collaborated with Zoos Victoria on the development of a citizen science web application to support research and conservation efforts to aid the mountain pygmy possum. The Moth Tracker application is tracking Bogong moths which are an important food source for mountain pygmy possums when they wake from their annual hibernation.

In recent years, moth populations have declined, posing a threat to this tiny marsupial's survival. Tracking Bogong moths using sightings uploaded by the public – citizen scientists – during the seasonal migration of moths from Queensland, New South Wales and western Victoria to the alpine region, is essential. The moth data collected using the Moth Tracker application will be used by researchers to understand moth migration and assist in identifying factors that may be influencing their declining population and what this means for the survival of mountain pygmy possums.

CeRDI led the development of technologies to support a number of citizen science initiatives. The new Bogong moth sightings application, hosted on the State Wide Flora and Fauna Teams (SWIFFT) website has been designed to be easy and quick to use and optimised for mobile devices.

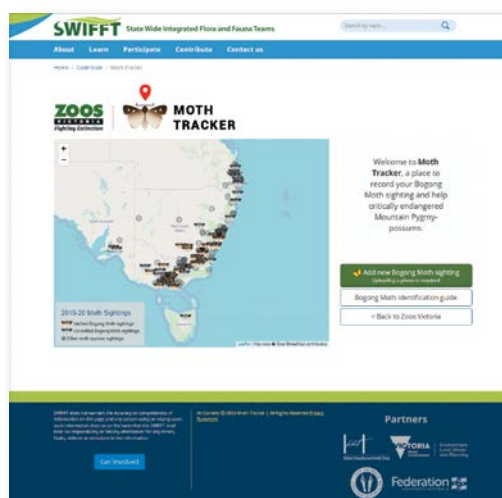
A fundamental element of citizen science is the opportunity it provides for members of the public to actively participate in research and innovation. With the help of the general public, photos and sightings of the moths are being contributed during the migration season, uploaded and stored using a format that ensures the data can be exchanged with other databases and technology platforms as required.

This project extends the development and technology work CeRDI is completing to support Zoos Victoria's 'Fighting Extinction' program. An agreement was established between Zoos Victoria and CeRDI to collaborate on a multiyear project providing information technology services and eResearch expertise tied to the 'Fighting Extinction' program. This collaboration has enabled enhancements and extensions to be made to the program, which has been established with the aim of preventing the loss of threatened wildlife.



PROJECT PARTNERS

Zoos Victoria



Website: www.swiff.net.au/mothtracker

Western Alliance for Greenhouse Action: How Well Are We Adapting Portal



HAZARD
PLANNING AND
RESILIENCE

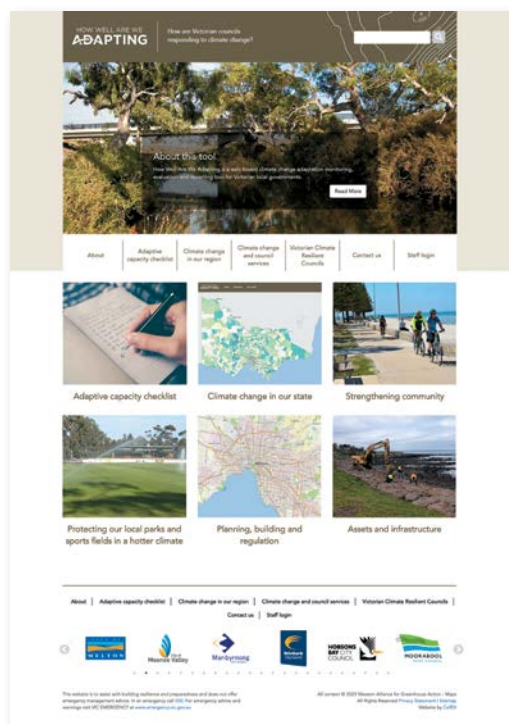
The How Well Are We Adapting (HWAWA) framework, developed in partnership with the RMIT Centre for Urban Research and Net Balance Foundation, underpins the work of the Western Alliance for Greenhouse Action (WAGA) councils.

Member councils include the Cities of Brimbank, Greater Geelong, Hobsons Bay, Maribyrnong, Melton, Moonee Valley and Wyndham, and the Shire of Moorabool.

The framework specifies the monitoring, evaluation and reporting on climate adaptation performance of the WAGA member councils. The framework is unique, being one of the first world-wide climate change adaptation monitoring and evaluation frameworks implemented for measuring adaptation focused on local government and developed and tested by decision makers.

CeRDI has been closely involved in the development of the technology that supports the HWAWA framework. This includes three major components: (1) Developing further indicators; (2) Extending the tool to other (non-WAGA) Victorian councils; and (3) Embedding climate change adaptation in councils' decision-making through use of the tool. CeRDI will work closely with WAGA and RMIT to implement this second stage.

The How Well Are We Adapting portal offers a web-based tool to assist the WAGA councils to implement a framework for monitoring, evaluation and reporting on climate adaptation.



PROJECT PARTNERS

Brimbank City Council
City of Greater Geelong
City of Melton
City of Moonee Valley
Hobsons Bay City Council
Maribyrnong City Council
Monash University
Moorabool Shire Council
Net Balance Foundation
RMIT University's Centre for Urban Research
Wyndham City Council

Website: adapt.waga.com.au



HAZARD
PLANNING AND
RESILIENCE

Emergency Management Victoria: My Community Portal

CeRDI collaborated with Emergency Management Victoria (EMV) to support Community Based Emergency Management (CBEM) through the development of the My Community Portal.

A community-based approach to emergency management (EMV, 2016) was introduced in 2016 to support people to build safer and more resilient communities. This approach relies on community expertise and local knowledge to enhance local decision making. A key strategy is to support communities in producing localised, reliable and up to date information.

CeRDI was involved in developing the interactive platform to support individuals and communities to upload and share location-based information, including via a web map, and access data, to improve their preparedness for emergencies.

My Community Portal offers an intuitive and visual interface that easily facilitates the sharing of local expertise. It also enables communities and organisations to work together and plan for emergencies by supporting the gathering, publishing and sharing of information about:

- the people who live, work in and visit the community,
- the assets, values and support systems of these people, including what they see as important,
- local priorities including the likely emergency scenarios that may affect the community,
- what can be done, including what is already in place, what is considered acceptable and what can be improved,
- the goals and actions to be completed by organisations, communities and organisations together, and by the community members themselves, and
- different ways of learning and working together before, during and after times of need.



Website: <https://www.cerdi.edu.au/CommunityBasedEmergencyManagementPortal>

Central Highlands Family Violence: Data Press Project



HEALTH AND
WELLBEING

CeRDI is working with service providers across the Central Highlands to develop a regional family violence spatial portal.

The Data Press project is a collaboration between the Central Highlands Integrated Family Violence Committee (CHIFVC), Ballarat Health Services and Federation University and aims to improve access to relevant data on family violence from across the local region.

A key outcome for this project is the development of a spatial data portal to federate local data and public health data to provide a comprehensive repository about family violence in the local community. The spatial portal will map public sector data and provide community profiles based on service needs, causality and impacts of family violence. It is anticipated that the portal will assist with improving operational and strategic decision-making through the availability of data. This is the first time such an initiative has been undertaken in Victoria.

Commitment for the project comes from the lead partners and from wide-ranging service agencies across the region, many of which are members of the CHIFVC. This includes organisations that are tasked with primary prevention, treatment and recovery, social support services, health, legal and educational services-based organisations. Together they support the sharing of de-identified data that can be analysed to improve the understanding of family violence in the region. The project has been funded by the R.E. Ross Trust.

Recommendations from the 2015 Royal Commission into Family Violence identified a need for improved data collection, systems and processes relating to family violence. This has provided the impetus for progressing the current project and subsequent data portal.

Once completed, the portal will be available for agencies to access via a password protected site.



PROJECT PARTNERS

CHIFVC

Strengthening Hospital Responses to Family
Violence

Ballarat Health Services



HEALTH AND
WELLBEING

Youth C.A.N. Project

The Youth Changing Alcohol Norms (Youth C.A.N) project, funded by VicHealth and co-ordinated by Horsham Rural City Council (HRCC) and CeRDI was completed in 2019. The project culminated in the preparation of a final report incorporating extensive research outcomes and documenting the successes associated with the programme.

The aim of the two-year Youth C.A.N. project was to assess and change alcohol culture and identify potential health interventions leading to cultural change and safer, reduced alcohol consumption for young people (aged 15–20 years) in Horsham. Stage one of the project captured insights about current alcohol consumption and alcohol misuse in the region, and the opportunities for cultural change to reduce alcohol use. The second stage of the project involved knowledge-building, awareness and capacity, comprising integrated education for parents and young people, and a social marketing campaign to counter perceived norms and promote alternative choices for young people. Alongside this, a comprehensive research program to measure the impact and outcomes of the project on young people was implemented by CeRDI.

The final report outlines the research findings associated with the project. Prepared by Dr Angela Murphy and members of the research team at CeRDI, it provides an in-depth description and analysis of all the activities across the project. This is complemented by extensive research findings with data collected from over 1,000 participants. The report includes recommendations to support and guide future practice and to address alcohol norms for young people, and their communities. CeRDI is working with VicHealth and HRCC on the development of a manual for effective, place-based interventions.

Other highlights from the project include the development of a short video showcasing one of the key programs for young people in Horsham, involving live theatre. Entitled 'It's OK to say no', the video has become an important mechanism for promoting alternative choices for young people and to the wider Horsham community.



PROJECT PARTNERS

Horsham Rural City Council
Ambulance Victoria
Grampians Community Health
Victoria Police
Victorian Department of Health and Human Services
Wimmera Health Group
Wimmera Primary Care Partnership
Wimmera Regional Sports Assembly
Wimmera Southern Mallee Local Learning and Employment Network
Wimmera Uniting Care

For further information about the Youth C.A.N. project:
www.cerdi.edu.au/YouthChangingAlcoholNorms

The Alcohol Cultures Guide:
Taking Action on Risky Drinking Cultures:
www.vichealth.vic.gov.au/-/media/ResourceCentre/PublicationsandResources/alcohol-misuse/Alcohol-Cultures-Guide.pdf?la=en&hash=D8EB62BE05F838F6098B6FF07227542704CED75B

To access the video:
www.youtube.com/watch?v=LKHMNTB8sU&feature=youtu.be

Honouring our ANZACS Website

Developed by the City of Ballarat, with technical support from CeRDI, the Honouring Our Anzacs website marks the Centenary of ANZAC.

The centenary commemorates 100 years of service by the Australian and New Zealand Army Corps and will assist the public in accessing the stories of Ballarat service men and women who participated in the First World War.

The website documents the fascinating history behind the development of the Avenue of Honour, and later, the erection of the Arch of Victory and the pivotal efforts by the “Lucas Girls” (employees of the E. Lucas & Co. textile company). The novelty for users of the Honouring Our Anzacs site is the opportunity to conduct a search for a family member or former service person and instantly receive a map pinpointing the location of their tree on the Avenue of Honour, including tree number and accompanied by biographical details.

The website will bring to light further details of the journey to war of Ballarat’s service men and women. Some 3,801 Ballarat residents enlisted to serve in World War One. One in eight did not return home. The Honouring Our Anzacs site provides more of the personal details beyond the basic unit, name and tree number that were able to be displayed on the commemorative plaque placed at the foot of each tree.

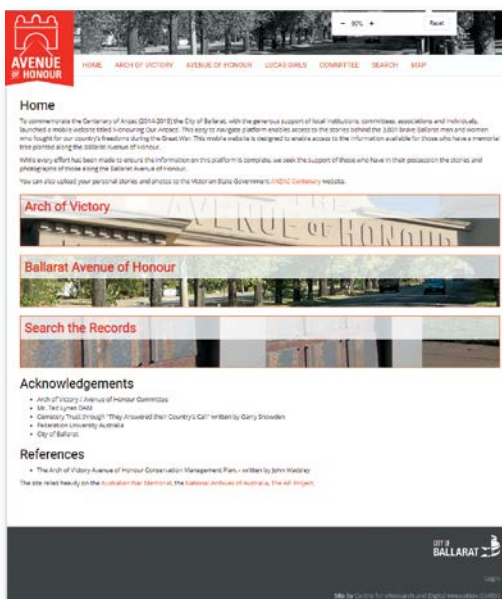
For the first time, interested historians and family researchers are provided with the name of the Lucas textile company employee who planted each service person’s tree. Over 400 Lucas textile company employees assisted in fundraising for the avenue, digging and planting trees between 1917 and 1919, and later helped to construct the Arch of Victory.

Drawing on data held by the Australian War Memorial, National Archives of Australia and University of New South Wales’ (UNSW) AIF Project, the website enables the public to gain a greater sense of each service person’s story, including their birthplace, age, embarkation and disembarkation dates and locations, medals awarded, the ships they sailed on, trades and time spent at the front.

Honouring Our Anzacs is an integral component of a comprehensive plan to maintain and redevelop the Avenue of Honour, its monuments and heritage features, to continue to reflect on the impacts of war for the Ballarat community and to keep alive these stories into the future.



HERITAGE AND
CULTURE



PROJECT PARTNERS

City of Ballarat

Website:

<https://honouringouranzacs.com.au/people/search>



REGIONAL
DEVELOPMENT

City of Ballarat Smart Cities and Suburbs

Federation University Australia and the City of Ballarat are partnering on a project to provide physical and digital infrastructure for open community data sharing and innovation, internet of things (IoT) technology and data driven decision making. It is funded by the Department of Industry, Innovation and Science through the Smart Cities and Suburbs Program.

IoT technologies provide new opportunities for smarter devices, improved efficiency and sustainability and data driven decision making. This project will install the infrastructure required for this technology for the Ballarat community with an open LoRaWAN (Long Range, low power Wide-Area Network) service.

Utilising this network, the City of Ballarat and Federation University will conduct pilot studies to explore the use of smart sensors and devices for evidence-based decision making. For Federation University this includes the installation of new weather sensors to understand localised weather patterns, the purchase of smart bin sensors for waste data tracking and efficient bin collection, and anonymous infra-red people counters to monitor public transport and building use.

Complementary to these pilot studies, and representing a major part of the project, is the development of a new community-based data sharing platform: Ballarat Open Data. This platform brings together data sets from a range of local organisations and community groups for sharing, collaboration, data visualisation and the development of new technologies and business opportunities.

The key outcomes of the project include:

- An open IoT network at Lake Wendouree, Federation University and Ballarat's creative district.
- The creation and launch of Ballarat Open Data - for effective data management, publishing, access, sharing and community engagement.
- Smart places and smart environment pilots for data driven decision making by Federation University and City of Ballarat.

CeRDI will develop the data platform, with activities enabling effective data management publishing, access and sharing. CeRDI will also contribute to open data access, visualisation and analytics for evidence-based decision-making and community engagement.

CeRDI and the City of Ballarat will utilise their connections with local organisations and community groups to discover data that could contribute to Ballarat Open Data.



PROJECT PARTNERS

City of Ballarat

Australian Government Department of Industry,
Innovation and Science

Ballarat Hacker Space

MESHED

Website:

www.cerdi.edu.au/BallaratSmartCities

Staff profiles

Research



Associate Professor Helen Thompson,
Director

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

Helen has led the Centre since 2002 and is responsible for the achievement of all CeRDI organisational objectives in research, project management, partner projects, business development and financial management. Under Helen's leadership, CeRDI has become one of the University's most successful centres, establishing a reputation for excellence at the regional, national and international level. Helen also has organisation-wide leadership for eResearch. She is engaged in research into the use of information and communications technology and is involved in a range of activities which contribute to the economic and social development of regional and rural Victoria.



Associate Professor Peter Dahlhaus,
Senior 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, being an author of catchment action plans and strategies, and municipal planning overlays. 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. Peter is the lead researcher on numerous CeRDI projects, including the Visualising Australasia's Soils and Visualising Victoria's Groundwater.

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 research centres at Federation University 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 and practice change.

Dr Nathan Robinson, Research Fellow, Soil Science

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

Nathan joined CERDI in 2017 after working in soil and landscape analysis for the Victorian government for 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. His role at CeRDI is closely linked to his PhD and to Soil Science. To better understand the links between soil and the agricultural production systems, he is conducting research on advancements to spatial analysis.

Dr Birgita Hansen, Research Fellow

PhD, Bachelor of Science (Evolutionary Ecology)

Birgita has extensive experience in ecology and environmental management, contributing to improving the management and dissemination of biodiversity knowledge. Her research 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.

Alison Ollerenshaw, Research Fellow

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

Alison joined CeRDI in 2012 providing research support across a range of Centre projects and activities. She has experience in research and project management, impact evaluation, and in the application of mixed methods research. In 2016, Alison returned to full-time study conducting research examining the relationship between business incubator services and tenants' positive psychological constructs. Alison works in CeRDI on various projects.

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 and contributing to the project design for future digital agriculture projects.

Dr Amie Sexton, Research Fellow

PhD (Anthropology), Bachelor of Arts (Honours), Grad Dip Education, Bachelor of Arts (French) and Bachelor of Music

Amie completed a PhD on the anthropology of wine production in France and Australia at The University of Melbourne in 2017. She has worked in education, marketing, events and as a freelance musician and artist, mostly in regional Victoria. Amie has a particular interest in the creative process, wine, stories, the arts, community and education. Amie contributes to CeRDI projects Online Farm Trials and Visualising Australasia's Soils.

Robert Milne, Research Associate (Environmental Science)

Bachelor of Applied Science (Environmental Management)

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

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.

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 has worked extensively on the AgReFed project.

Dr Angela Neyland, Research Officer

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

Angela commenced at CeRDI in 2017 after graduating with a PhD from the Australian National University. Angela 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 across 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 viticulture and viticulture. Prior to joining CeRDI, she travelled to several viticultural regions to participate in grape harvests. Julie has a 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 coordination and support to a range of 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. Meghan graduated in 2017 with a Bachelor of Science/Bachelor of Biomedical Science.

Kate Light, Research Officer

Master of Agriculture

Kate is a specialist in breeding canola with disease (blackleg) resistance. In CeRDI, Kate is a key member of the Online Farm Trials team, contributing her agriculture knowledge and expertise to this project.

Helen Hunter, Project Officer

Bachelor of Arts (History), Graduate Diploma of Museum Studies

Helen joined CeRDI in 2018. Helen has worked predominantly in the not-for-profit settings and in tertiary research centres, coordinating and supporting research projects, managing events and providing editorial assistance on a history journal. She is passionate about public heritage interpretation, social welfare and public health and works across the heritage and health and wellbeing research areas.

Derek Walters, Project Officer

Bachelor of Applied Science (Honours)

Since completing his undergraduate degree (Geology), Derek has worked in hydrogeology, as exploration and production geologist, and recently as a data analyst with the Department of Environment, Lands, Water and Planning. Derek completed his honours degree in 2015 for which he received the Professor Ferdinand Mortiz Krause Medal for excellence in geology. Derek commenced with CeRDI in 2018, working primarily on updates to Visualising Victoria's Groundwater portal.

Dr Joel Epstein, Research Associate (part-time)

PhD

Joel has been working with CeRDI since 2015, providing support to the SLT and Director on a range of activities including strategic planning. Joel has a PhD in Chemical Physics and over thirty years' experience in strategic planning. Prior to CeRDI, Joel worked at Kodak and the University of Ballarat.

Rick Pope, Research Associate

Graduate Diploma in Land Rehabilitation

Rick commenced working for 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. In CeRDI, Rick has been involved with many CeRDI projects.

Chris Bahlo, Research Associate

Bachelor of Information Technology (Honours), Bachelor of Information Technology (Professional Practice), Bachelor of Business, Diploma of Agricultural Science

Chris has worked in information technology and agriculture roles and has business experience. She is completing her PhD in CeRDI and is researching data interoperability in precision agriculture.

Patrick Bonney, Research Associate

Master of Science (Zoology), Bachelor of Science

Patrick is undertaking research examining citizen science and public policy. He is completing his PhD in CeRDI and is measuring and exploring the issues and opportunities of the Waterwatch Victoria and EstuaryWatch Victoria programs.

Dr Judi Walters, Research Associate

PhD (Forest Ecology), Master of Science, Bachelor of Forest Science (Honours),
Diploma of Arts (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 is part of the Online Farm Trials team.

Jude Channon, Research Officer

Master of Education, Bachelor of Arts

Jude worked as a research officer with CeRDI in 2017 and in 2019 returned to CeRDI after taking time out to implement a large-scale healthcare project across regional Victoria. Jude provides extensive support and is a key member of the Online Farm Trials team.

Technical

Andrew Macleod, Manager Technical Projects

Honours Applied Science (Information Technology), Bachelor of Computing

Andrew has extensive experience in project planning and the implementation of major information technology projects. 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 Systems Analyst 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 CeRDI projects.

Heath Gillett, Senior 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 Visualising Australasia's Soils.

Julian Laffey, Programmer

Bachelor of Information Technology (Software Engineering)

Julian has over 25 years' experience in IT and programming. He has developed systems in a variety of environments, including manufacturing, transport, history and community engagement. Julian is providing programming skills across a range of CeRDI projects.

Craig Briody, Web Developer

Bachelor of Computing

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 provides technical assistance across a range of projects. He also produces multi-media resources and videos for CeRDI projects.

Dan Ferguson, Technical Assistant

Bachelor of Computer Science (Professional)

Dan joined CeRDI in 2019 and provides technical assistance across a range of projects.

Project and Administration Support

Kathy Gamble, Administrative 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 provides administrative assistance and support for the CeRDI team. Kathy is also the personal assistant to the Centre Director.

Peter Codd, Project Coordinator

Bachelor of Applied Science, Diploma of Business Management

Peter commenced part-time work with CeRDI in 2018, assisting in updating the historical data on the Natural Resource Management Planning Portal for the Corangamite region. Peter's career spans over 40 years, having worked for the Victorian government and Corangamite Catchment Management Authority in various roles.

Higher Degrees by Research Candidates

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

Chris Bahlo, PhD candidate

PHD TITLE: Open data and interoperability standards: opportunities for animal welfare in extensive livestock systems
SCHOOL: Engineering, IT and Physical Sciences
YEAR COMMENCED: 2016
SUPERVISORS: Associate Professor Peter Dahlhaus, Associate Professor Helen Thompson

Alison Ollerenshaw, PhD candidate

PHD TITLE: The relationship between business incubator services and the psychological capital of tenants
SCHOOL: Science, Psychology and Sport
YEAR COMMENCED: 2016
SUPERVISORS: Dr Angela Murphy, Associate Professor Helen Thompson, Professor Suzanne McLaren

Patrick Bonney, PhD candidate

PHD TITLE: Citizen science: Knowledge, networks and the boundaries of participation
SCHOOL: Science, Psychology and Sport
YEAR COMMENCED: 2016
SUPERVISORS: Dr Angela Murphy, Dr Birgita Hansen, Dr Claudia Baldwin (USC)

Basharat Ali, PhD candidate

PHD TITLE: Investigating the roles of data, digital agriculture and resilience in agricultural performance.
SCHOOL: Engineering, IT and Physical Sciences
SUPERVISORS: Associate Professor Peter Dahlhaus, Associate Professor Helen Thompson, Dr Nathan Robinson

Elissa Ashton-Smith, PhD candidate

PHD TITLE: The conservation and management of sandy beach ecosystems: Exploring the divergence between policy, science and socio-cultural expectations for stewardship and use.
SCHOOL: Science, Psychology and Sport
SUPERVISORS: Dr Jessica Reeves, Associate Professor Fred Cahir, Dr Birgita Hansen

Rekha Attanayake, PhD candidate

PHD TITLE: Developing new methods to help farmers make decisions on lime use and lime requirement.

SCHOOL: Engineering, IT and Physical Sciences

SUPERVISORS: Associate Professor Peter Dahlhaus, Dr Nathan Robinson, Lisa Miller

Rob Clark, PhD candidate

PHD TITLE: Predicting crop yield within the growing season at sub-paddock scale: a big data approach.

SCHOOL: Engineering, IT and Physical Sciences

SUPERVISORS: Associate Professor Peter Dahlhaus, Dr Nathan Robinson,
Dr Elizabeth Morse-McNabb

Derek Walters, PhD candidate

PHD TITLE: Port Phillip Bay: the real value of groundwater

SCHOOL: Engineering, IT and Physical Sciences

SUPERVISORS: Associate Professor Peter Dahlhaus, Dr Ander Guinea

Higher Degrees by Research Alumni



Dr David Ebbs, PhD

THESIS TITLE

Harvesting stormwater: testing the paradigm by assessing the impacts with an inter-disciplinary case study

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SCHOOL

Engineering, IT and Physical Sciences

ABSTRACT

Integrated Urban Water Management (IUWM) is often proposed as a framework for comprehensively managing the water cycle in urban areas. One of the tenets of IUWM is that, due to increased impervious area, stormwater runoff in excess of the natural flow could be captured and used to supplement the water supply, while mitigating the environmental impact. This thesis tests that theory through an inter-disciplinary case study utilising legacy data for the regional city of Ballarat, Australia. The case study approach has enabled the water balance of an urbanised catchment to be better understood in various ways and provided for five tightly nested research projects, being:

1. Does the long-term development of water management within a city provide insight into what drives decisions, therefore informing future progress?
2. Can the drivers of water use be adequately determined from a community wide, historical analysis such that future regulatory decisions can be informed?
3. Will assessment of the long-term streamflow of a river, combined with an urban water balance of the catchment, enable the identification of additional stormwater flow due to urbanisation, in excess of the natural flow?
4. Can the impact of urbanisation on groundwater be identified (i.e. trends quantified or qualified) from the city's legacy data or any available data sources, or models?
5. Is it possible to establish a comparative analysis technique that accounts for the uncertainty of information which changes over time, maintains intellectual rigour and is understandable and easily presented?

IUWM was found, perhaps unsurprisingly, to be a complex problem with the challenges being very contextual on the particular catchment and city being studied. This research revealed that evidence of greater volumes of water being generated from increasingly urbanised impervious catchments is not easy to find. This finding may challenge conventional thinking and means that decisions on stormwater harvesting and WSUD practices more broadly should first be informed by evidence of the water balance.

This research also revealed some very significant challenges in the water industry with finding and effectively using very dispersed data sets which are held and managed across multiple water agencies in various digital and hard copy formats. Information and data availability is critical to all aspects of IUWM, including in the measurement of its success, and so this research reminds the water industry of the importance of its data management practices.

Research Outputs

Book Chapters

Dahlhaus, P.G. (2019). The lay of the land: the geological evolution of the landscape. Chapter 2 in: *Geelong's Changing Landscape: Ecology, Development and Conservation* (Eds. D.S. Jones and P.B. Roös) pp. 11-20. (CSIRO Publishing, Collingwood).

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. (2019). Shorebird monitoring in Australia: a successful long-term collaboration among citizen scientists, governments and researchers. In: Legge, S., Lindenmayer, D. B., Robinson, N. M., Scheele, B.C., Southwell, D.M. & Wintle, B.A. (Eds). *Monitoring threatened species and ecological communities*. CSIRO publishing, Melbourne.

Journal Publications

Bahlo, C., **Dahlhaus**, P., **Thompson**, H., & Trotter, M. (2019). The role of interoperable data standards in precision livestock farming in extensive livestock systems: A review. *Computers and Electronics in Agriculture*, 156, 459-466.

Good, M., Morgan, J.W., Venn, S., & Green, P. (2019). Timing of snowmelt affects species composition via plant strategy filtering. *Basic and Applied Ecology*, 35, 54-62.
doi: 10.1016/j.baae.2019.01.004

Hansen, B.D., **Dahlhaus**, P.G., **Milne**, R.G., **MacLeod**, A.D., & Pitfield, C. (2019). The Natural Resource Management Planning Portal: Perspectives for NRM Planning and Reporting. *Society & Natural Resources*, 32(6), 709-719.
doi: 10.1080/08941920.2018.1559383

Hansen, B.D., Fraser, H.S., & Jones, C.S. (2019). Livestock grazing effects on riparian bird breeding behaviour in agricultural landscapes. *Agriculture, Ecosystems & Environment*, 270-271, 93-102. doi: 10.1016/j.agee.2018.10.016

Robinson, N.J., **Dahlhaus**, P.G., **Wong**, M., **MacLeod**, A., Jones, D., & Nicholson, C. (2019). Testing the public-private soil data and information sharing model for sustainable soil management outcomes. *Soil Use and Management*, 35(1), 94-104. doi: 10.1111/sum.12472

Steel, K.M., **Thompson**, H., & Wright, W. (2018). Opportunities for intra-university collaborations in the new research environment. *Higher Education Research & Development*, doi: 10.1080/07294360.2018.1549537

Conference Papers and Presentations

Al Mandalawi M., You G., **Dahlhaus** P., Dowling K., Sabry M. (2019). Analysis of a Combined Circular–Toppling Slope Failure in an Open–Pit. In: Wasowski J., Dijkstra T. (eds) *Recent Research on Engineering Geology and Geological Engineering. Proceedings of the 2nd GeoMEast International Congress and Exhibition on Sustainable Civil Infrastructures, Egypt 2018 – The Official International Congress of the Soil-Structure Interaction Group in Egypt (SSIGE)*. Springer, Cham. pp:10-30 (DOI: 10.1007/978-3-030-02032-3_2).

Ali, B. (July, 2019). Role of Leadership on the Relationship between Technology Readiness, Trust and Digital Agriculture in Australia. *Federation University HDR Research Conference* 2019, Ballarat, Australia.

Box, P.J., Levett, K; **Simons**, B., **Wong**, M. (2019). A governance and data stewardship framework for FAIR agricultural data: The Agricultural Research Federation (AgReFed) - an Australian research infrastructure case study. Conference proceedings CODATA: *Towards Next-Generation Data-Driven Science*. Beijing.
https://conference.codata.org/CODATA_2019/sessions/143/paper/407/

Camilleri, M. & **Ollerenshaw**, A. (2019). Responding to the Legal Needs of Young People through Health Services. *Criminology in the New Era: Confronting Injustice and Inequalities*, November 13 -16, 2019. San Francisco, CA.

Hansen, B., Gould, L., Davey, C., Honan, J., Chamberlain, R., & Stewart D. (2019). The Latham's Snipe national surveys. *Australasian Shorebird Conference*, Hobart. 27-28 October, 2019.

Hansen B, Honan J, Wilson D, Stewart D, Crossley A, Chamberlain R, Ura T, Takemae A, Tajiri H, Davey C, & Gould L. (2019). An overview of movement and migration knowledge from the Latham's Snipe Project. *Australasian Ornithological Conference*, Darwin. 3-5 July 2019.

Hansen, B., Jones, C., & Fraser, H. (2019). Livestock grazing effects on riparian woodland bird breeding. *Australasian Ornithological Conference*, Darwin. 3-5 July 2019.

Levett, K., **Wong**, M., Box, P., **Simons**, B., **Thompson**, H., **MacLeod**, A., David, R., Schneider, D., Watkins, D., Hergenhan, R., Gregory, L., Wilson, P., Taylor, N., **Limmer**, S., **Gillett**, H., Cox S. (2019). *Implementing FAIR in the Agricultural Research Federation. eResearch Australasia Conference*. Brisbane, Australia. 21-23 Oct 2019.

Ollerenshaw, A. The relationship between business incubator services and the psychological capital of tenant-entrepreneurs (2019). *Federation University HDR Research Conference* 2019, Ballarat, Australia.

Robinson, N. (2019). Improving the FAIRness of Australia's grains research sector data. *19th Australian Agronomy Conference*. Wagga Wagga NSW. 25-29 August 2019.

Robinson, N. (2019). Online Farm Trials (OFT) – the past, present and future. *19th Australian Agronomy Conference*. Wagga Wagga NSW. 25-29 August 2019.

Robinson, N., **Dahlhaus**, P., **Feely**, P., **Light**, K., **MacLeod**, A., **Milne**, R., **Parker**, J., **Thompson**, H., **Walters**, J. & **Wills**, B. (2019). Online Farm Trials (OFT) – the past, present and future. Cells to Satellites. *19th Australian Agronomy Conference*, 25 – 29 August 2019, Wagga Wagga, NSW.

Robinson, N., **Dahlhaus**, P., **Wong**, M., **Corbett**, J., Cann, M., Mitchell, R., Fear, D. & Orgill, S. (2019). Farmers, advisors and researcher's perceptions to soil organic matter. Soil Organic Matter in a stressed world. *7th International Symposium on Soil Organic Matter*, 6 – 11 October 2019, Adelaide. Symposium Poster Abstracts, p.95.

Robinson, N., **Thompson**, H., **Dahlhaus**, P., **Feely**, P., **MacLeod**, A., **Wong**, M., & **Walters**, J. (2019). What's FAIR about Digital Agriculture? *steeDA, Conference on science, technology, engineering and economics for Digital Agriculture*, 3-5 December 2019, The University of Sydney, Australia.

Walters, D. (2019). Port Phillip Bay: the real value of groundwater. *International Association of Hydrogeologists*, 17 September, Melbourne Australia.

Walters, D., & **Dahlhaus**, P. (2019). Port Phillip Bay Groundwater – The Real Value. *Groundwater in a changing world. Australian Groundwater Conference 24 - 27 November 2019*, Brisbane, Australia.

Wills, B., Parker, J., Robinson, N., & Wong, M. (2019). Improving the FAIRness of Australia's grains research sector data. In: Cells to Satellites. J Pratley Ed. *Proceedings of the 19th Australian Society of Agronomy Conference*, 25-29 August 2019, Wagga Wagga, NSW, Australia © 2019. (<http://www.agronomyaustraliaproceedings.org/>).

Reports

Dahlhaus P.G. & **Walters** D.J. (2019). *Port Phillip Bay Coastal Hazard Assessment – groundwater component: Review of literature, data and information gaps. Final Report for CSIRO*, 30 April 2019. Centre for eResearch and Digital Innovation, Federation University Australia.

Box, P., Levett, K., **Simons**, B., **Wong**, M. (2019). Guidelines for the development of a Data Stewardship and Governance Framework for the Agricultural Research Federation (AgReFed). Sydney: CSIRO; 2019. <https://doi.org/10.25919/5cf179ba35db9>

McInnes K.L., Hernaman V., Lauchlan Arrowsmith C., **Dahlhaus** P.G., **Walters** D., Rosengren N., Prakash M., Hemer M., Hoeke R., O'Grady J and Gregory R. (2019). *Port Phillip Bay Coastal Hazard Assessment. Gap Analysis*. CSIRO Oceans and Atmosphere.

Murphy, A., **Ollerenshaw**, A., **Corbett**, J., & **Taylor**, M. (2019). *Youth Challenging Alcohol Norms: Final project report*. Ballarat, Australia: Centre for eResearch and Digital Innovation, Federation University.

Murphy, A., Martin, C., & **Corbett** J. (2019). East Grampians Health Service: *The Healthy@Home project final report*. Ballarat, Australia: Centre for eResearch and Digital Innovation, Federation University.

Wong, M., Box, P., Epstein, J., Lee, A., Thompson, H., Levett, K., Channon, J. (2019). *Policy Suite for the enactment phase of the Agricultural Research Federation (AgReFed)*. Policies endorsed by the AgReFed Council at 10.10.2019.

Other outputs

'Unpacking interoperability' webinar

CeRDI Research Associate Bruce Simons was a guest speaker for a webinar facilitated by the Australian Research Data Commons. The webinar examined interoperability and the implementation of FAIR data practices:

www.youtube.com/watch?v=VkCLeyVY5rE&feature=youtu.be

Sport and Recreation Spatial Sport Participation Research Project wins award

The Sport and Recreation Spatial-Sport Participation Research Project won the 2019 Parks and Leisure (Vic/Tas) research award at the May state conference. The team of Associate Professor Rochelle Eime, Dr Jack Harvey, and Melanie Charity are now finalists for the national research award to be presented in Perth in October. Rochelle attended the conference and was presented the award from Grant Greenway from etp- Turf. The Research project is in partnership with Victoria University. The Sport and Recreation Spatial research team also won this State award and the National award in 2017.

CeRDI participates at Open Geospatial Consortium in Belgium

Andrew MacLeod and Bruce Simons participated in the 111th Technical Meeting of the Open Geospatial Consortium (OGC) held in Leuven, Belgium in June 2019. The Consortium brings together international experts for a week-long event comprising summits, meetings and workshops to advance the development and use of international standards and services to promote international geospatial interoperability. The OGC standards enable complex spatial information and services to become accessible and valuable across different applications. Andrew and Bruce presented at the session about "Sharing Data in Agriculture", where they reported on Federation University's involvement in the OGC Borehole Interoperability Experiment. Andrew and Bruce also participated in the adjunct workshop for the Second Environmental Linked Features Interoperability Experiment (SELFIE). SELFIE aims to represent complex environmental data for easy use on the web, and to overcome internet search engine's poor ability to find data services.

GovHack 2019 winners

Members of the CeRDI team participated in GovHack 2019 and developed the Innovative Land Index. This entry was announced as the Victorian winning entry for the Visualising the Soils category. GovHack is an annual, international competition, focussing on open data projects that are developed in teams and presented in the course of a 46-hour event. The CeRDI team was led by Dan Ferguson with Dr Angela Neyland, Dr Basharat Ali, Chris Bahlo and Derek Walters presented their concept for a future planning and land zoning tool. The Innovative Land Index (ILI) is a spatial mapping tool and index using soil characteristics, rainfall and distance of farmland from major urban centres of farmland to determine relative importance of land for purposes of preservation, land zoning decision-making and planning.

Data Democracy Film



CeRDI collaborated with documentary film makers Wind & Sky Productions to commission a new film about Data Democracy.

The Data Democracy film examines the current debate about the accumulation, federation and aggregation of public and private data associated with society's rapid growth of electronic data. The documentary includes an overview of the current management of data ensuring fairness consistent with honouring individual rights. The film features leading experts Paul Box (CSIRO), Associate Professor Peter Dahlhaus (CeRDI), George Fong (ex-Internet Australia), Professor Richard Sinnott (University of Melbourne) and Dr Gillian Sparkes (Victorian Commissioner for Environmental Sustainability), who offer informed and insightful discussion about the issues pertaining to fairness, access, sharing and communicating data in the technological era.

The Data Democracy film and a short series of films titled 'Extended FAQs' are available for public access through the CeRDI website. In commenting about the film's evolution CeRDI Director Associate Professor Helen Thompson said "More discussion and insights are required about data democracy. Its public value is undeniable and yet there are still very real concerns about how and who and where this data is accessed. In commissioning the documentary we hope to provide new insights that better inform the public, providing the basis of further debate relating to the value, contribution and uncertainties associated with data democracy".

<https://www.cerdi.edu.au/DataDemocracy>

Research Income

Research income for the Centre between 2015 and 2019 is presented in the following charts. As shown in Figure 2, the key performance measure of overall income remained stable. The Centre's research income in 2019 increased from 2018.

Income across CeRDI's research themes is presented in Figure 3. With the exception of Agriculture, income generation across all themes increased in 2019.

CeRDI Income 2015–2019

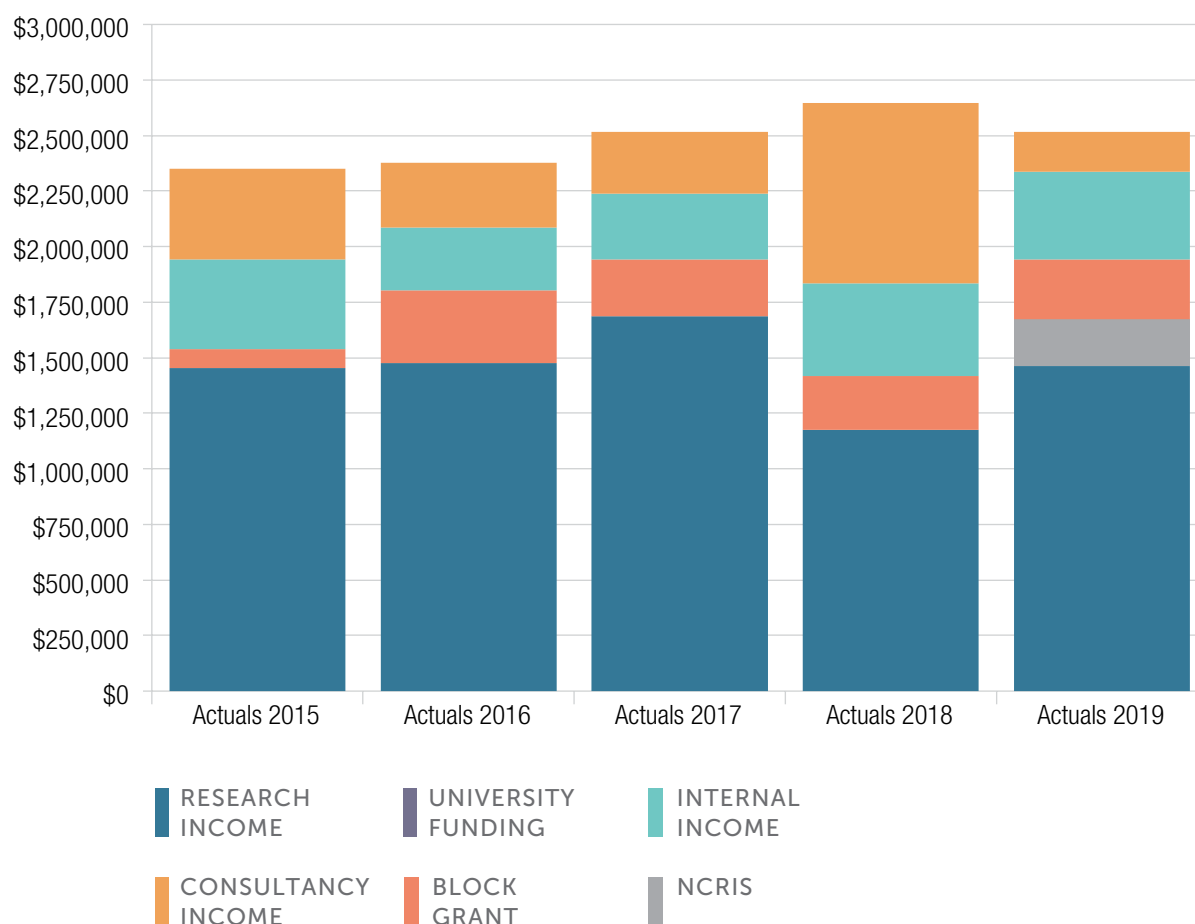


FIGURE 2. CeRDI INCOME BETWEEN 2015 AND 2019.

Note: The NCRIS (National Collaborative Research Infrastructure Strategy) funds the Australian Research Data Commons AgReFed project.

CeRDI Income across Six Research Themes

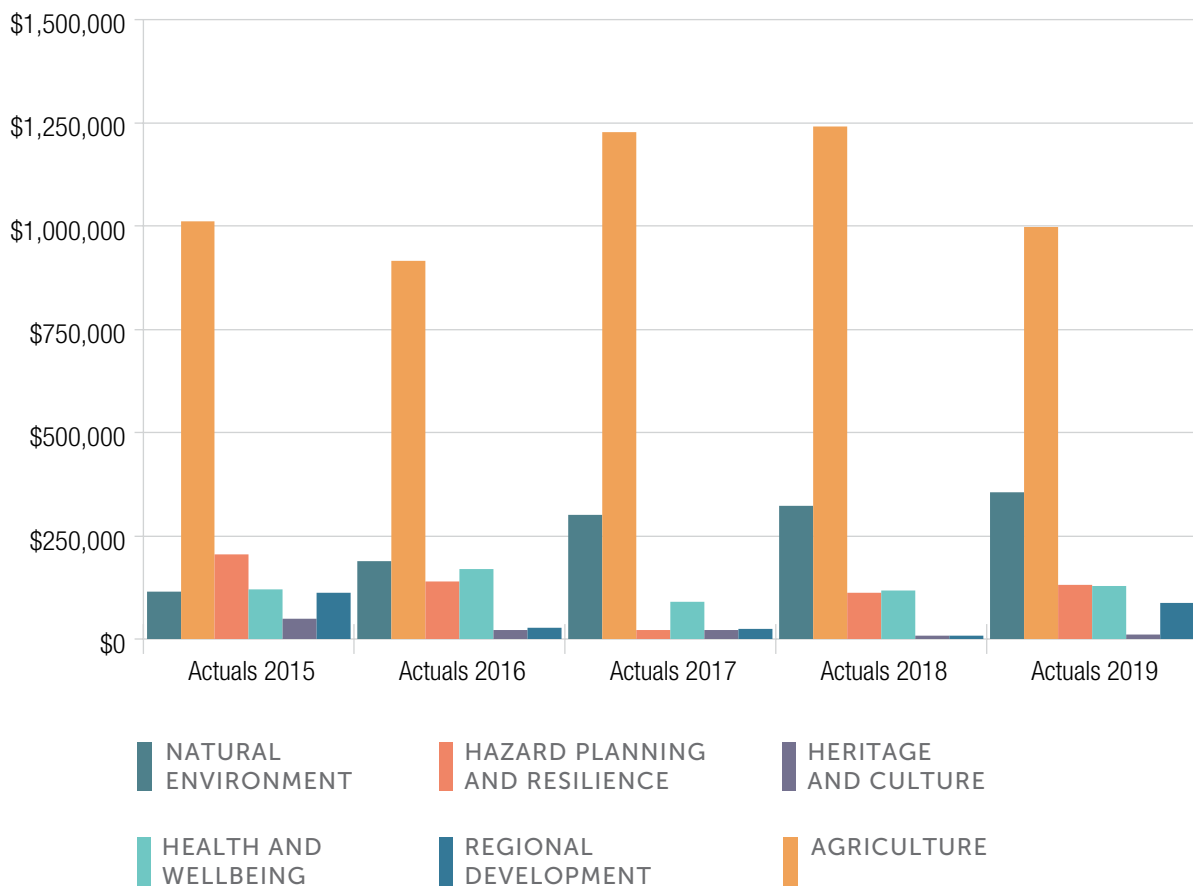


FIGURE 3.
CeRDI INCOME FROM 2015 TO 2019 ACROSS EACH OF THE SIX RESEARCH THEMES.

Research Partnerships and Collaborations

Ag Excellence Alliance (South Australia)

Ambulance Victoria

Arthur Rylah Institute for Environmental Research

Atlas of Living Australia

Australian National University

Australian Plant Phenomics Facility

Australian Research Data Commons

Ballarat Avenue of Honour Committee

Ballarat Community Health

Ballarat Hacker Space

Ballarat Health Services

Barwon Coast Committee of Management

Beach Patrol

Bellarine Catchment Network

Birchip Cropping Group

Brimbank City Council

Burdekin Productivity Services

Central Highlands Integrated Family Violence Committee

Central West Farming Systems Inc.

City of Ballarat

City of Greater Geelong

City of Kingston

City of Moonee Valley

Commerce Ballarat

Cooperative Research Centre for High Performance Soils

Cooperative Research Centre for Spatial Information (CRCSI)

Corangamite Catchment Management Authority

Country Fire Authority

CSIRO

Department of Environment, Land, Water and Planning

Department of Industry, Science, Energy and Resources

Department of Justice and Community Safety

Department of Premier and Cabinet

Earlham Institute

East Grampians Health Service

EnviroComm Connections

EcoCommons, Griffith University

Emergency Management Victoria

Food Agility Cooperative Research Centre

Food and Agriculture Organization of the United Nations

Foundation for Rural and Regional Renewal

Geological Survey of Victoria

Geoscience Australia

Gillamii Centre

Glenelg Hopkins Catchment Management Authority

Goulburn Murray Water

Grains Research and Development Corporation

Grampians Community Health

Griffith University

Grower Group Alliance

Gunaikurnai Traditional Owner Land Management Board

Herbert Cane Productivity Services Ltd

Hobsons Bay City Council

Holbrook Landcare Network

Horsham Rural City Council

International Plant Nutrition Institute

Law and Justice Foundation

Legal Services Commission of South Australia

Liebe Group

Love Our Street

Macquarie University

Maribyrnong City Council

MESHED

Monash University

Moorabool Shire Council	The University of Adelaide
Mornington Peninsula Shire Council	The University of Sydney
National Collaborative Research Infrastructure Strategy	University of New England
Natural Resources Canada	University of Southern Queensland
Net Balance Foundation	University of Tasmania
Nicon Rural Services	Victoria Police
North Central Catchment Management Authority	Victorian Department of Economic Development, Jobs, Transport and Resources
Northern Grower Alliance	Victorian Department of Environment, Land, Water and Planning
NSW Department of Primary Industries	Victorian Department of State Development, Business and Innovation
Nutrien (formerly Landmark)	Victorian eResearch Strategic Initiative (VeRSI)
Perennial Pasture Systems	Victorian Grower Group Alliance
Port Phillip Bay Fund	Waterwatch
Port Phillip EcoCentre	Western Australia Department of Primary Industries and Regional Development
Precision Agriculture	Western Australia No Till Farmers Association
Queensland Cyber Infrastructure Foundation	West Midlands Group
Queensland University of Technology	Wimmera Catchment Management Authority
Regional Universities Network	Wimmera Health Group
Riverine Plains Inc	Wimmera Primary Care Partnership
RMIT	Wimmera Regional Sports Assembly
Seeding Victoria	Wimmera Southern Mallee Local Learning and Employment Network
Senversa Pty Ltd	Wimmera Uniting Care
Southern Farming Systems	Women's Health Grampians
Southern Rural Water	Wyndham City Council
Strengthening Hospital Responses to Family Violence	Yarra Riverkeeper Association
Sustainability Victoria	Young People's Legal Rights Centre Inc.
SWIFFT	Zoos Victoria
TERN, The University of Queensland	
The Waterbug Company	
Thiess Services Pty Ltd	

Contact CeRDI

For further details about CeRDI's diverse portfolio of research please visit our website: www.cerdi.edu.au

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