

Introduction

The Natural and Built Environments Research Centre (NBERC) was established in 2016 and has four major research strands:

- Natural and Built Environments Education
- Environmental Stewardship
- Sustainable Infrastructure and Built Environments
- Water and Natural Resources

Our Centre's academics and researchers have diverse research backgrounds and complementary expertise in Civil Engineering, Construction Management and Economics, Environmental Science, Geospatial Science, Project Management, Water Science and Water Engineering. A key aim of the Centre is resolving significant real world problems and challenges in achieving progressive and sustainable futures for industries, communities, ecosystems and environments, both nationally and internationally. The Centre supports fundamental and applied research of short to long-term duration, funded through a wide range of sources including federal and state government agencies, councils and industries.

Collaboration between NBERC researchers and those of leading national and international research organisations and universities is extensive, and this enhances our research scope, relevance, cutting edge capacity and performance. NBERC research and development work is supported through our cooperation and collaboration with the UniSA Future Industries Institute (FII), the Barbara Hardy Institute, School of Engineering and School of Information Technology and Mathematical Sciences, where technologies, skills and expertise are complementary.

We welcome research and partnering opportunities with industries, councils, governments and agencies, communities and other research organisations to address the important knowledge gaps and problems of our natural and built environments.

Our Vision

NBERC will be internationally recognised for leading edge research knowledge and outcomes that contribute to sustainable:

- resource use and effective management of natural and modified environments
- infrastructure and development of progressive built environments.

Our Mission

NBERC undertakes interdisciplinary research, specialist research training, educational scholarship and consulting projects that contribute positively to graduate employment, human societies and natural and built environments.

Natural and Built Environments Research Centre



unisa.edu.au/nberc

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Acknowledgement of Country
UniSA respects the Kaurna, Boandik and Barngala peoples' spiritual relationship with their country. We also acknowledge the diversity of Aboriginal peoples, past and present.

Find out more about the University's
commitment to reconciliation at:
unisa.edu.au/RAP

Natural and Built
Environments Education



This strand facilitates the investigation, expansion and evaluation of contemporary teaching research and practice. Aligned with UniSA's Crossing the Horizon Strategic Plan 2013 – 2018, student experience, engagement and student-centred approaches are at the core of all activities. Based on the high importance of teaching and learning research and development, focus areas include the following:

- Development of experiential and learning technologies such as unmanned aerial vehicles for use in environmental sciences and augmented/virtual reality facilities for use in teaching in the natural and built environments
- Project-based learning pedagogies
- Development of professional skills and team building
- Digital learning initiatives
- Effectiveness of flipping classrooms
- Effectiveness of teaching-research nexus in postgraduate programs in facilitating student learning
- Evaluation of effectiveness of field experiences
- Program roadmap development to guide student progression through undergraduate programs
- Value of constructive alignment

Innovation within teaching and learning is important. Equally important is the measurement of successful implementation of research outcomes by a wide audience, such as new and ongoing grants along with high quality publications and conference presentations.

The strand strives for collaboration amongst centre academic staff, alongside other UniSA's Teaching Innovation Unit and external Higher Education research organisations

unisa.edu.au/nberc/naturalbuiltenvrionmentseducation

Environmental Stewardship



This strand aims to protect nature by studying it, finding innovative remedies to environmental degradation and improving management practices for all environments. We recognise the intrinsic value of nature as a complex and dynamic system, which includes human societies, and that our health and wellbeing depends on a healthy planet.

International research in multiple disciplines is conducted with other UniSA researchers across the organisation and a wide range of external organisations (private, NGO, government, universities and research institutions) and individuals (e.g. farmers).

Our experience in trans-disciplinary research positions us to tackle and find solutions to the most complex environmental research problems. Our research capacity includes:

- Ecology (seed ecology, fire ecology, landscape restoration, pollination, nectar chemistry, wildlife ecology, sustainable agriculture, plant community assembly, invasive species, climate change refugia, island biology, ecosystem services)
- Environmental engineering (ecological engineering, resource-use modelling, integrated and sustainable food production, industrial waste recycling and re-use, contaminant seepage analysis, soil mechanics)
- Remote sensing (mapping, spatio-environmental data processing)
- Social science (links between nature and health, impacts of wildfires, natural resource management, environmental interpretation, policy, project management, inclusive and integrated infrastructure systems, pollution policy)
- Water, wastewater and waste impacts on the environment (water quality, wastewater quality, catchment hydrology, water sensitive urban design, waste minimisation, applied microbiology)

unisa.edu.au/nberc/environmentalstewardship

Sustainable Infrastrucure and
Built Environments



In this strand, we embrace digital innovation to foster equitable, just, healthy, safe, thriving and sustainable communities. This is done through communities' stakeholders including national and international governments, private enterprises, charitable and not-for-profit and social organisations, media, and communities. We work with our research partners to generate new executable ideas and innovations, harnessing smart technologies to nurture innovative business and social policies, processes and models to shape the way we design, build and manage our communities. We believe it is vital to engage all our members and stakeholders to ensure smart and healthy communities, where all of us can feel free to live, learn, work and play with unhindered access to information to enrich the lives and experiences of our communities' members. Research of this strand includes the following topics:

- Facilities Management - Building Information Modelling (BIM), resource efficiency, asset management, integrated infrastructure systems
- Project and Risk Management - Project control methods, standards development, sustainable construction, project procurement, integrity of tendering system, sustainable development, program and portfolio management, strategic benefits realisation
- Smart Applications - Digital technologies and smart buildings, GIS applications, public transport planning, ageing and transport, smart and sustainable construction, big data analytics in built environment, sustainable communities, smart construction materials
- Structures - Structural engineering, reinforced crumbed rubber concrete, recycling materials, resilient infrastructures, non-destructive condition assessment, structural retrofitting
- Sustainable Construction - Energy efficient industries and communities, asset management, online sensing, sustainable buildings, urban precinct modelling, energy emissions of buildings and embodied energy, construction operations and safety management, human factors in construction management, green infrastructure
- Waste Management - Waste utilisation, sustainable construction materials, zero energy buildings, reverse logistics, supply chain

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Water and Natural Resources



The aims of this strand are to develop and conduct high quality interdisciplinary research on water and natural resources, including soils and minerals. Research is conducted through partnerships with industries, government agencies, other tertiary institutions and communities. Our goal is to achieve progressive and sustainable futures for our natural and built environments.

Our research specialisation areas include civil and industrial engineering, water and environmental sciences, and geophysical and geochemical sciences. Research is conducted in modern laboratories and experimental facilities with novel data processing and modelling techniques. Specialised instrumentation is used for a wide range of water and wastewater quality analyses, treatment efficiency assessment and optimisation, and for soils and minerals analyses. Specialised research capabilities include the following:

- Geological and hydrogeological procedures for identification and sustainable use of groundwater resources in arid regions of South Australia
- Geological and geochemical investigation of tectonic processes and the evolution of the continents
- Geotechnical solutions for water resource infrastructure (e.g. distribution networks, permeable pavements, development of WSUD technologies)
- Measurement and monitoring, recovery and optimised use of water and natural resources
- Optimisation of quality, treatment and management of fresh and saline water sources (surface water, industrial and domestic wastewater, recycled water, ground water, urban water, storm water) for fit-for-purpose use.

unisa.edu.au/nberc/waterandnaturalresources

Commercial and Research Facilities



Australian Flow Management Group (AFMG)

The Australian Flow Management Group (AFMG) services specialised testing needs of the water industry. It advances irrigation and engineering hydraulics technology through fundamental and applied research.

The facility consists of a range of unique infrastructure suited to the testing and research of water-related equipment and technology.

In 2011 the AFMG (then known as the Australian Irrigation and Hydraulics Testing Facility) achieved internationally-recognised National Association of Testing Authorities (NATA) accreditation for water equipment testing in the fields of calibration, mechanical testing and performance and approvals testing. In 2012 the facility was appointed by the National Measurement Institute (NMI) as an Approving and Verification Authority for water meters in accordance with Standards NMI M 10 and NMI R 49.

As an internationally accredited facility we are in a unique position to engage with the water industry and to support and produce high quality research outputs.

AFMG can test a wide range of products including flow meters, smart meters, pipes, pipe fittings, valves, emitters, drippers, timer taps, moisture sensors, drainage systems, EMC electrical equipment compliance, gross pollution traps, stormwater treatment, and other hydraulic components.

We house a number of state-of-the-art research and testing facilities for conducting:

- Electromagnetic compatibility (EMC) testing
- Radio Frequency immunity testing
- Full-scale hydraulic testing (up to 510 L/s)
- Physical hydraulic model studies
- Irrigation equipment testing
- Water meter testing and calibration
- Valve type testing

unisa.edu.au/afmg

SMAG - Specialised Testing & Research Unit

The SMAG - Specialised Testing & Research Unit was established in 1980 by a team of academics specialising in civil engineering. It provides specialised testing and industrial research services for industry, government agencies and individuals. Testing capability of SMAG includes the following:

- Static and repeated loading of structures and structural elements (beams, columns, slabs, walls and cladding)
- Creep testing of concrete for research purposes
- Concrete properties including compression and tensile strength, absorption, permeability, carbonation, abrasion and chloride content
- Soil suction and permeability
- Triaxial tests on soil and rock with pore pressure measurement

SMAG draws on expertise within the research hub located at UniSA's Mawson Lakes campus to deliver independent specialist testing and research on structures, concrete technology and construction materials. The group provides geotechnical services to the wider community and industry.

Research and development work has included projects with the City of Salisbury, Revolution Roofing, ElectraNet, Adelaide Brighton Cement and the Department of Planning, Transport and Infrastructure.

unisa.edu.au/smag