Australia's National
Science Agency

Solving the greatest environmental challenges

Delivering science and technology to help us navigate to sustainability, in a rapidly changing world

Our natural and built environments face increasing pressure from the combined effects of climate change, disasters such as bushfires and drought, and other disruptions.

Together, these present profound social and economic challenges, but they also offer an unprecedented opportunity to shape society for the next century.

To help navigate this rapidly changing world, CSIRO's Land and Water delivers outcome-focussed biophysical and socio-economic research, finding new ways to understand and make decisions around our natural and managed landscapes and our built environments.

We work across the domains of land, water, ecosystems and communities in one of the world's largest mission-driven, multidisciplinary science and research organisations. We support government, industry and community in developing science to build environmental and social resilience.

Making an impact

Our research is focused around four impact areas: water security, thriving natural systems, sustainable industries, and integrated sustainability.

We aim to provide trusted solutions to share and secure water for people, industry and ecosystems, and support adaptation into the future. This is achieved through the co-production, design and delivery of water and related services, tools and technologies.

Our thriving natural system research aims to enable more effective policy and investment to protect and manage our natural systems, supporting a diversity of livelihoods for all Australians now and into the future.

Through our sustainable industries research, we promote responsible industrial development within resilient environments; securing, recovering value and re-purposing waste; and improved and safe water quality.

We work towards integrated sustainability by reducing the inter-connected and cascading risks from climate change and disaster and promoting sustainable consumption and production. We help regional communities develop more diversified, resilient economic bases to sustain their social wellbeing and environmental health, and support Indigenous peoples to drive land and sea development aligned with their eco-cultural aspirations.

CASE STUDY:

Saving lives in bushfires

When it comes to research impact, it doesn't get more important than saving lives.

Thanks to the applied research of our Bushfire Urban Design team, all firefighting vehicles in Victoria have been retrofitted with a proven system to protect occupants when they are trapped in a fire that burns over the top of them.

During Victoria's Black Saturday bushfires in 2009, lives were saved when the retrofitted trucks were caught in burn-overs. Research leader Mr Justin Leonard says it was a tribute to the design and validation research.

The team has also developed the most comprehensive database on circumstances of Australian life and property loss due to bushfires. "This helps guide policy and community advice," he says.

"By studying losses from past fire events, we can educate the community about what to expect in a bushfire and how to prepare for and take action during a fire. The broader work in community education and warning systems has contributed to many lives saved."

The efforts are part of almost 70 years of bushfire research, from understanding and modelling the impact of fire on the environment to post-fire assessments and improving infrastructure design.

Our scientists are developing reliable tools to predict bushfire behaviour, and advance fire spread prediction and bushfire suppression systems. Working collaboratively, we train all state fire agencies in fire behaviour and prediction and use world-class facilities and models to understand and manage fires under future climate conditions.

CSIRO was the first agency internationally to link an increase in bushfire weather severity to climate change in 1988. Our research and practical resilience measures in relation to bushfires and climate change are more important than ever before as Australia faces continued extreme fire weather into the future.

Scientists test the fire truck bushfire protection system.

Collaboration is key

CSIRO researchers work with a broad range of industries, regulators, and other researchers to better understand problems facing Australia. Deep engagement with stakeholders ensures the right questions are being asked and that there is understanding and uptake of the results. Together, we produce outcomes, products and tools that help decision makers.

By combining our leading biophysical, social and economic science and technology capability with the complementary skills of our partners, we use our understanding of the inter-related environmental and social challenges to help design a sustainable future in a world of accelerating change.

Justin Perry, CSIRO Research Scientist, works with Indigenous land management organisations to track feral animals.

CASE STUDY:

AI transforms Kakadu management

Kakadu National Park Indigenous custodians, together with scientists, have developed exciting new ways to apply science and Indigenous knowledge to managing the World Heritage Area.

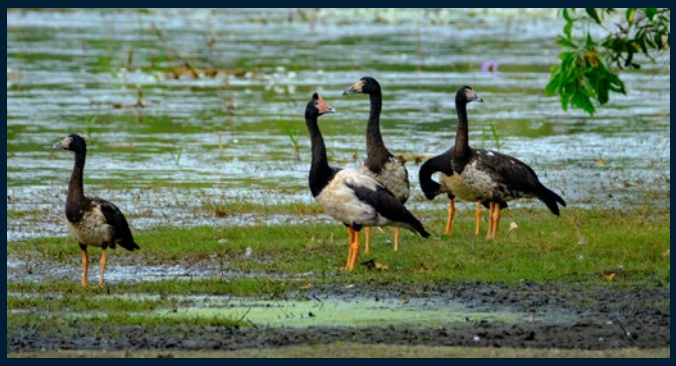
More than 80 Traditional Owners and Rangers are now using Artificial Intelligence (AI), drones, time-lapse cameras and participatory videos to adaptively co-manage important landscapes.

In this innovative co-management project, Bininj/Mungguy (local Indigenous people in Kakadu) Traditional Owners and Rangers are working with scientists to co-design ethical AI for managing and monitoring complex environmental problems.

The unique project has been Indigenous-led from start, from its design to carrying out the science. The user-friendly technology has been designed to complement Indigenous knowledge. Traditional Owners and Rangers drive the collection of information from drones, motion-sensor cameras and on-ground monitoring to assess the health of significant species and habitats, and inform adaptive approaches to caring for country.

Through the Northern Australia National Environmental Science Program (NESP), this initiative has brought together a multi-disciplinary team of academic scientists who are skilled in monitoring and evaluating environmental management activities, Bininj/Mungguy Traditional Owners who use their knowledge to monitor the health of their country and its care, and Bininj and non-Bininj Rangers.

With 80 per cent of the world's remaining biodiversity safeguarded by Indigenous people but facing rapidly growing threats, these kinds of partnerships hold great potential to inspire other Indigenous groups to use ethical AI support their environmental management.



Magpie geese are an important indicator species.

CASE STUDY:

Engineering microscopic solutions

The world is transforming the way it does science, through new technologies and lots of complex data.

“To make the transition, we need a conceptual shift in how we as researchers do science,” says Dr Claudia Vickers, leader of the Synthetic Biology Future Science Platform at CSIRO Land and Water.

Dr Vickers works in a rapidly growing area of science, which involves engineering the genome of organisms to develop synthetic biological systems and devices to solve a range of problems in the environment, health and resources.

“By combining biology with engineering, synthetic biology has the power to provide sophisticated solutions in many areas, from sustainable chemicals that can replace unsustainable petrochemicals, through to tackling environmental issues such as invasive pests and diseases,” she says.

“We can use engineered biological processes to decrease the costs of monitoring and remediating the environment, reduce methane emissions from agriculture, improve efficiency in food production, and build ecological and agricultural resilience in the face of a rapidly changing environment.”

Dr Claudia Vickers

CSIRO has led the establishment of an automated assembly line, called a biofoundry, to build and analyse high volumes of tailored synthetic organisms that are made to suit a particular purpose.

“This allows us to create solutions and deliver impact within weeks and months instead of years,” she says.

Built on a philosophy of responsible development, research in synthetic biology has a strong focus on ethical and socially acceptable outcomes, Dr Vickers says. “This initiative provides national leadership to catalyse innovation and develop capability so Australia remains competitive in a responsible manner.”

As Australia’s national science agency and innovation catalyst, CSIRO is solving the greatest challenges through innovative science and technology.

CSIRO. Unlocking a better future for everyone.

Contact us

1300 363 400
+61 3 9545 2176
csiroenquiries@csiro.au
csiro.au

For further information

CSIRO Land and Water
Jane Coram
Director
+61 2 6246 4383
Jane.Coram@csiro.au
csiro.au/en/Research/LWF

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