Griffith UNIVERSITY
Queensland, Australia

CAPABILITY STATEMENT

Coastal and Marine Research Centre

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Coastal and Marine Research Centre

Profile

The Coastal and Marine Research Centre (CMRC) brings together experts in science and engineering from across the marine and coastal fields. The Centre is headquartered within the G51 Smart Water Research Centre at Griffith University's Gold Coast Campus, with staff located across the Gold Coast Campus, Nathan Campus and remote sites.

The CMRC has developed a national and international reputation for undertaking targeted research that contributes to all aspects of sustainable management of coastal regions, particularly for urban environments. Research at the Centre highlights the importance of integration of coastal specialists, government, academia and industry professionals across engineering, environmental science, humanities, information technology, tourism, community engagement and planning.

Our Mission

The Centre's overarching goal is to drive optimisation and efficiency in conservation management, ecosystem restoration and the underpinning of good policy, planning and management decisions to improve local and global outcomes for communities, oceans and coasts.

Our Impact

Our work includes:

- contributing to the monitoring and management of Southeast Queensland's famous surf beaches and estuaries
- providing data and subject matter expertise that informs significant policy and funding decisions in the Queensland Government's management of the Great Barrier Reef and catchment zones
- developing more efficient and effective aquaculture systems to sustainably meet the food needs of our expanding population
- participating in worldwide coastal restoration efforts to repair the loss of biodiversity and ecosystem services that has occurred over the last 100 years.

Our Place Within Griffith University

The CMRC benefits from its role within the Cities Research Institute, with access to engineering, architecture and planning expertise. The Centre operates autonomously in terms of setting its research agenda and in the management of its research projects.

Along with the Cities Research Institute, the CMRC has close ties with the Australian Rivers Institute (ARI), School of Environment and Science (ESC), School of Engineering and Built Environment (EBE), and the Griffith Climate Change Response Program. The Centre's ability to access expertise from across other University research organisations makes it one of the most comprehensive, all-encompassing coastal and marine advisory services in Australia.

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Expertise

With twelve specialist teams across four primary research programs, the CMRC's research expertise spans coastal engineering, coastal dynamics, river catchments, erosion, water resource management, sustainable aquaculture, estuarine ecosystems, coral reef restoration, sea-life monitoring, chemical analysis, human impact assessments and climate change modelling.

Research work across the centre is underpinned by three key strategic goals:

Coastal resilience
Studying and developing strategies to address the way coasts are responding to a constantly changing world, including changing climate conditions and sea-level rise.

Coastal restoration
Supporting the massive global restoration work currently underway to increase the efficiency and effectiveness of conservation and regeneration efforts.

Strategic data science
Automation, machine learning, statistical modelling, and utilising large datasets and public resources to increase precision understanding and inform better decision-making.

Our research aims to help communities build coastal resilience, protect the environment and plan for the future.

Marine Biology Program

Rivers, estuaries and oceans are home to a diverse range of flora, fauna and microorganisms, which play important roles in ecosystem function, ecological restoration and the aquaculture industry. Using a combination of molecular techniques and unique datasets, the Marine Biology Program seeks to understand the genetics, biodiversity, distribution and behaviours of aquatic organisms.

Coral Reef Algae
Providing fundamental knowledge on coralline algae—a group of calcareous algae critical to reef building, coral resilience and reef restoration – to inform critical management strategies for the conservation of reef ecosystems

Phycology & Biogeochemistry
Practical catchment-to-coast research into aquatic processes, with a key focus on nutrient cycling and algal ecology, for improved environment management and to meet the needs of government and industry.

Marine Invertebrates
Investigation of the molecular biology and evolution of molluscs, pearl and shell synthesis, ecological significance and function of shellfish reefs, and molluscan aquaculture.

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Marine Ecology Program

Teams in the Marine Ecology Program seek to understand the ecological relationships between various forms of marine life and how these systems respond to changing conditions, with the aim of facilitating more effective preservation and management of coastal and ocean environments.

Global Wetlands Project
Elevating scientific understanding of critical issues facing coastal wetlands, building online support tools, producing scientifically credible targets and guiding effective investment for ecosystem protection and restoration.

Marine Megafauna
Research, monitoring and modelling of the feeding, migration, and habitat use of marine megafauna, in support of better conservation and protection of marine animals in coastal and Antarctic waters.

Sea Jellies Research Lab
A state-of-the-art laboratory collaboration with Sea World, dedicated to research and community education on jellyfish, jellyfish responses to changing ocean conditions and interactions with people and coastal industries.

Marine Chemistry & Toxicology Program

Marine environments are often the ultimate sink for a wide range of anthropogenic contaminants, including trace metals, pharmaceuticals and persistent organic pollutants. The Marine Chemistry and Toxicology Program seeks to understand the sources, transport, fate and environmental impacts of these contaminants in coastal and marine environments.

Australian Rivers Institute (ARI) Toxicology Lab
Researching the presence, movement and impacts of toxic contaminants in the aquatic environment and on endangered wildlife, using ethical cell-based and computer-based alternatives to animal testing.

Coastal Water Quality
Specialising in water quality monitoring-program design, development of novel sampling methodology and data analysis to improve the understanding and management of coastal water quality.

Southern Oceans Persistent Organic Pollutants Program
Understanding the transport mechanisms of Persistent Organic Pollutants to polar regions, their behaviour once incorporated into high latitude environments and ultimately their impact on biota in changing polar ecosystems.

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Coastal Processes & Management Program

Over 80% of Australians live on the coast. Teams in the Coastal Processes and Management Program are interested in studying the dynamics of coasts, estuaries and river catchment systems, how they change over time and how issues of erosion, sediment transport, flooding, weather hazards, sea levels and climate change impact both coastal communities and downstream ecosystems.

Precision Erosion and Sediment Management
Developing strategies to precisely define, target and manage erosion and sediment sources in our catchments, waterways and downstream ecosystems – especially the Great Barrier Reef.

Coastal Dynamics and Management
Delivering applied coastal research, management, engineering, and resilience outcomes to local and regional communities at all levels of government.

Water Management
Monitoring and management of water resources, including catchment hydrology, groundwater resources, estuarine dynamics, pollutant monitoring, desalination, water resource management and the impacts of climate change.

Independent Research Projects

Members of our centre also lead independent projects and collaborative research work, expanding our knowledge and impact into adjacent fields such as drug discovery and development of the 'blue economy'—the economic use of marine environments.

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Services

The Coastal and Marine Research Centre offers one of the most comprehensive, all-encompassing coastal advisory services in Australia. The Centre's wide range of industry-facing collaborations and consultancy services sets it apart from many other research groups at Griffith University.

The Centre offers expert consultancy services across a range of fields and industries, including the following:

Coastal Modelling and Management

Coastal Management Consultancy

- Expert interpretation, review and guidance for complex coastal management and environmental problems
- Management and monitoring guidance, reviews of consultants reports and development of coastal management and surf management plans and large-scale monitoring programs
- Workshops for local and state government and community engagement presentations

Coastal and Ocean Engineering

- Physical modelling of coastal structures (waves and currents)
- Integrated Coastal Zone Management studies

Storm Surge and Sea Level Modelling

- Field-based and remotely-sensed data collection and interpretation
- Numerical modelling of complex problems
- Guidelines for modelling and monitoring of storm surge events and sea level rise

Catchment and Water Management

Catchment Management Science

- Fluvial geomorphology and remediation
- Gully geomorphology and remediation
- Erosion and sediment transport analysis and modelling
- Catchment management prioritisation

Water Resource Engineering

- Hydraulic and hydrology analysis and modelling
- Erosion and sediment transport analysis and modelling
- River, estuaries and catchment flooding studies and modelling
- Stormwater management

Water Quality Monitoring

- Trace metal analysis in fresh and marine waters
- Suspended sediment monitoring in rivers, streams and gullies
- Design and implementation of large-scale water quality monitoring programs
- Catchment discharge monitoring and estimation/predictive modelling

Chemical Analysis and Toxicology Testing

- Chemical analysis of metals and organic pollutants
- Toxicological testing (*in vitro* and invertebrate *in vivo*)

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Ecological Monitoring and Management

Automated Monitoring and Blue Carbon

- Marine monitoring (specialising in underwater computer vision)
- Spatial planning optimisation (siting of aquaculture, mining, marine protected areas in contested coastal areas)
- Blue carbon restoration advice, including maximising stacking of financial credits

Marine Impact studies

- Marine mammal monitoring (biodiversity, acoustics, abundance, behaviour)
- Species distribution modelling
- Habitat surveying, monitoring and assessment
- Shark management, safety and research
- Risk assessments
- Vessel and noise impact studies
- Marine debris surveys and mitigation

Marine Algae Identification and Aquaculture

- DNA molecular identification of marine algal species
- Advice on project development of seaweed aquaculture in tropical reefs
- Advice on the role of macroalgae and influence of nutrient pollution on reefs
- Biogeochemical analysis of coralline algae

Jellyfish Identification and Monitoring

- Sea jelly identification and sampling
- Staff training workshops

Marine Science Education

Marine Science Education

- Community engagement and consultancy
- Classes and workshops
- Documentary and film making

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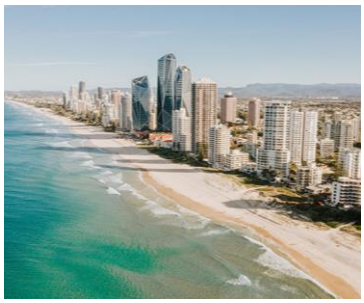
Major Projects

Recent contract work undertaken by Centre staff includes the following:

City of Gold Coast research program



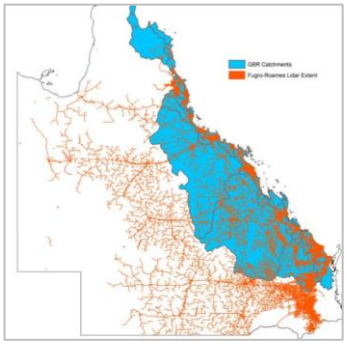
Members of the Coastal Dynamics and Management team have project managed and carried out a minimum of three major research projects for the City of Gold Coast, Transport and Infrastructure each financial year since 1999. Projects are varied but require expert and corporate knowledge of the City of Gold Coasts coastal and estuarine environments and assets. Outputs include professional workshops, community engagement exercises, operational management and monitoring programs, expert review of consultant works and historical literature, operational decision support tools/ systems, cost-benefit analysis on a wide range of coastal management issues.

Gold Coast Broadwater receiving environment monitoring program

The Centre has provided water quality monitoring services, both regulatory and research related, for the City of Gold Coast Water and Waste Directorate (GCWW) since 2016. Through this partnership, the Centre and GCWW have developed an extensive baseline water quality dataset for the estuarine and coastal region of the Gold Coast spanning over 4 years (2016-2021). The Centre currently provides the GCWW with monitoring, analytical, and interpretive services through a Receiving Environment Monitoring Program (REMP). The aim of the REMP is to provide a structed, robust and repeatable water quality monitoring program associated with the release of recycled water generated by the GCWW's sewage treatment plants.

Monitoring the toxicology and health of green turtles in Cleveland Bay

Funded by Port of Townsville Limited (POTL), members of the ARI Toxicology Lab were contracted to provide a comprehensive assessment of the toxicology and health of green turtles (*Chelonia mydas*) foraging in Cleveland Bay, in relation to known baseline levels and seasonal events (such as high rainfall during the wet season) to assist with guiding activities proposed in the Port of Townsville Channel Upgrade (CU) Project.



Extracting riverbank and gully erosion data from the Queensland power grid

Aerial laser imaging, detection and ranging (lidar) has been used to survey, assess and manage above-ground power line assets in Queensland. The Precision Erosion and Management team processed an extremely large lidar dataset (~620TB or 45757 km2 x 6 annual repeats from 2013 -2018), making the data accessible for use in Natural Resource Management applications. Through this project, lidar data will now provide a 0.5m digital elevation model (DEM) with coverage across ~7% of the Queensland land area or ~12% of the stream network in the GBR catchments (which were the initial project focus). Processes are also being developed for extracting channel metric data from the 12% of the stream network captured by the lidar dataset, and this will form the basis for a river classification system and an improved channel erosion model.

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Partners & Collaborators

Industry

AECOM Middle East
Australian Institute of Marine Science
Boattime Yacht charters
DHI Water and Environment
DNV
Eco Logical Australia
Gladstone Ports Corporation
Great Barrier Reef Foundation
Huon Aquaculture
JB Pacific
Moreton Bay Environmental Education Centre
Petuna
Port of Townsville Ltd
Royal Haskoning DHV
Sea World
Sea World Cruises
Seqwater
SMEC
Spirit of The Gold Coast
Sunshine Coast Afloat,
Surf Life Saving Australia
Tangalooma Resort
Tassal
Water Technology
World Wildlife Fund USA
Cape York NRM
NQ Dry Tropics
Palladium
RRRC (Reef & Rainforest Research Centre)

Government

Brisbane City Council (QLD)
Byron Shire Council (NSW)
City of Gold Coast (QLD)
Department of Agriculture, Water and the Environment (National)
Department of Environment and Science (QLD)
Department of Fisheries (QLD)
Department of Planning and Environment (NSW)
Department of Primary Industries (NSW)
Department of Primary Industries and Regional Development (WA)
Geoscience Australia
Gold Coast Waterways Authority (QLD)
Great Barrier Reef Marine Park Authority
Logan City Council (QLD)
MidCoast Council (NSW)
Morton Bay Regional Council (QLD)
Noosa Shire Council (QLD)
Redland Shire Council (QLD)
Sunshine Coast Council (QLD)
Transport for NSW
Tweed Sand Bypass (QLD/NSW)
Tweed Shire Council (QLD)

International

Deltares, Netherlands
Delft University of Technology, Netherlands
University of Bordeaux, France
University of Toulon, France
Federal University of Santa Catarina, Brazil
Norwegian University of Technology
Aalborg University, Denmark
University of Southern Denmark
Cranfield University, UK
The Coordinated Ocean Wave Climate Project (COWCLIP)

Community Partners

Friends of Currumbin
Friends of Rainbow Bay
Gold Coast Catchment Association
Humpbacks and High-rises
Keep Australia Beautiful Queensland
Landcare Queensland
Surfrider Australia

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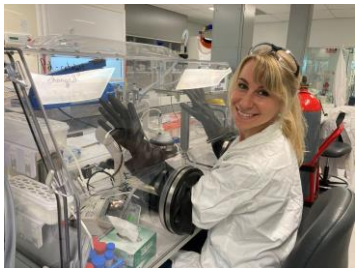
Learning & Teaching

Higher Degree by Research



Over 70 HDR students - enrolled through Griffith's School of ESC and School of EBE - are currently being supervised by CMRC research staff from across all research fields at the Centre.

The CMRC's collaborative culture encourages students to share their ideas, progress and findings, and provides additional opportunities for professional development and volunteer work.

Coastal Resilience Short Course

The Coastal Resilience Short Course is a yearly professional development series consisting of two program levels (Level I: Foundations and Level II: Advanced Applications) offered each May.

The course is designed to improve the understanding of coastal dynamics and impacts on settlements, infrastructure and ecosystems, and to develop skills for coastal hazard and climate change adaptation.

Beginning with the former Griffith Centre for Coastal Management, the Coastal Resilience Short Course has welcomed more than 350 participants from local government, industry and universities since 2013.

Coast Ed

The Coast Ed program aims to increase school and community awareness and participation in coastal management by providing valuable information and resources for understanding and caring for coastal environments.

A wide range of incursion and excursion sessions, as well as lesson plans and pocket guides are offered at a kindergarten, primary school, secondary school and community group level.

Volunteer Opportunities

Student volunteers can apply to undertake a custom research, conservation or community engagement project at the Centre.

Volunteer opportunities are co-ordinated individually between the student and the relevant academic staff member or program coordinator.

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Equipment

Research Craft

Through the Griffith Sciences Group, the Coastal and Marine Research Centre has access to a range of research vehicles and vessels:

Research Vehicles

Isuzu D-Max
4x4 All-terrain utility vehicle
140kW turbo diesel engine

Toyota Hilux
4x4 All-terrain utility vehicle
150kW turbo diesel engine

Toyota Land Cruiser 200 Series
4x4 All-terrain wagon
200kW twin turbo diesel engine

Research Vessels

RV Medusa
Class 2C
7.0m

Half-cabin vessel

6-person capacity
2 x 135hp outboards

RV Triton
Class C
4.7m

Dual-hulled work boat

5-person capacity
80hp outboard

RV Rachel Carson
Class 2D
4.65m
Polyethylene centre-console
4-person capacity
60hp outboard

RV Scylla
Class 2E
3.75m

Aluminium dingy

4-person capacity
15hp outboard

Centre Research Craft

The Coastal and Marine Research Centre owns and has exclusive access to the following:

RV Frank Goetsch
Class C
3.22m
Yamaha VX jet ski
2-person capacity
1052CC Engine

Sam Smith
Polaris Sportsman
4x4 All-terrain quad bike
1-person capacity

Mobile Instrumentation Buggy
Parklander Hisun
4x4 All-terrain quad bike
2-person capacity

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Research Equipment

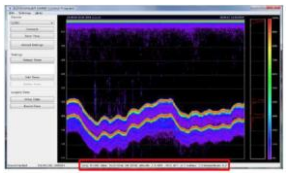
The CMRC maintains and makes use of a large collection of research instruments, including:

Drones
eBee SenseFly RTK Drone

Remotely Operated Vehicles
Metocean Deep trekker DTG2
Sea Otter

Radar and Lidar
Furuno FAR-2127 Radar
Furuno M-1835
Nortek SeaDarq System
Merlin Lidar mapping system
SICK Beach Lidar

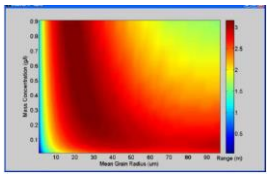
Surface Instrumentation
1.5m Imbros Buoy
Big Bird Nautilus Buoy
Spoondrift wave buoy
Lagrangian deep water drogue
Lagrangian surface drogues
Lagrangian surf zone drogues



Marine Survey
Humminbird Echosounder
Starfish 452 Pro Sonar System
Bathy PC2010PC Array Chirp Sys
Ceescope 200 Hydrographic Syst
Echologger EA400 Echosounder
Wassp Multibeam Sonar

Land Survey
Nikon Total Station
Trimble DGBS system
Leica Viva GNSS GPS system
Garmin Handheld GPS
Leica Laser System C10
Link Bunker, Jetty and VMR tower

Water Quality Sensors
YSI 6600 V2 sonde
YSI 6600 V2 DO probe, Rhodamine probe, Turbidity probe, PH and Redox probe and Flowthrough cell
YSI ProDSS Handheld Instrument
Seabird SBE23 Dissolved Oxygen Sensor
SEA-BIRD SBE19PLUS V2 Profiler
StarOddi Seastar
Odyssey salinity probes
Spectrophotometer
Fluoroprobe Measuring Unit
Hobo Lux meters
Portable Water Quality Laboratory
RBR MS-310 Micro-Salinometer
DMA 5000 Density Meter



Current Meters and Acoustics
Argonaut XR.750 MHZ SYSTEM,
Sontek ADCP 1.5Mhz XR
Sontek SL500 Side looker
Sontek ADP 1.0 Mhz
Flowquest 1.0Mhz
FLOWQUEST 600 Profiler
LinkQuest UWM1000 modem
RDI Sentinel 600 Khz ADCP
RDI Workhorse 300Khz & 1200Khz
Aquascat 1000R Acoustic Device
AURAL M2 Underwater Unit

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Contact Us

If you would like to find out more information or to find out how the Centre may be of service to you, do not hesitate to contact us via the following details:

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Coastal Resilience Short Course

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Precision Erosion and Sediment Management

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Social Media

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