GISERA
Gas Industry Social and Environmental Research Alliance

CSIRO's Gas Industry Social and Environmental Research Alliance (GISERA)

Annual Research & Development Plan and Budget

2019-20

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COVER PHOTOGRAPH

CSIRO air quality monitoring instrumentation adjacent to a CSG well (in background) in Combabula, near Roma, Queensland, 2017.

Information gathered at this site feeds into the GISERA Surface and Groundwater project entitled 'Air, water and soil impacts of hydraulic fracturing: Phase 2'. This project involves undertaking a comprehensive monitoring campaign to measure the air, surface water groundwater and soil impacts of hydraulic fracturing of gas production wells in the Surat Basin, Queensland.

1 Director's summary

The 2018-19 financial year progressed the national expansion of CSIRO's Gas Industry Social and Environmental Research Alliance (GISERA), with the Northern Territory Government investing $450,000. A funding agreement between the Northern Territory Department of Chief Minister and CSIRO was fully executed on 4 September 2018. The purpose of this agreement is to facilitate the establishment of the GISERA model into the NT and conduct research through three types of projects:

- Projects that address community concerns as per Northern Territory Hydraulic Fracturing Inquiry recommendations including contribution to the Strategic Regional Environmental and Baseline Assessment (SREBA) of the Beetaloo Sub-basin;
- Projects that address community concerns outside of the Northern Territory Hydraulic Fracturing Inquiry recommendations; and
- Projects directly commissioned by the Northern Territory Government.

The Northern Territory Government (through the Northern Territory Department of Primary Industry and Resources) also contributed $305,297 to carry out a Baseline measurement and monitoring of methane emissions in the Beetaloo Sub-basin.

Australian exploration and production company Pangaea Resources joined GISERA, along with existing industry partners Origin and Santos, which also have an interest in Beetaloo Basin shale gas exploration activities the Northern Territory. Pangaea's diverse portfolio of oil and natural gas operations across onshore Australia include Northern Territory exploration permits in the western McArthur and central Beetaloo Basins southeast of Darwin.

Over the year, a total of 9 new projects were approved, taking the total number of GISERA projects to 53 and total research investment to $25,210,652[1].

GISERA's primary objectives remain to:

- carry out independent research and improve and extend knowledge of social and environmental impacts and opportunities of onshore gas projects primarily for the benefit of communities living in gas development regions and the broader public
- inform governments, regulators and policy-makers on key issues regarding policy and legislative frameworks for the gas industry
- improve gas industry operations in regions where exploration and production activities are occurring.

All output and activities during the year contribute to GISERA's credibility, trust and respect through the open and transparent conduct and communication of its research and synthesis activities. All GISERA results and research outputs including scientific reports, journal papers and

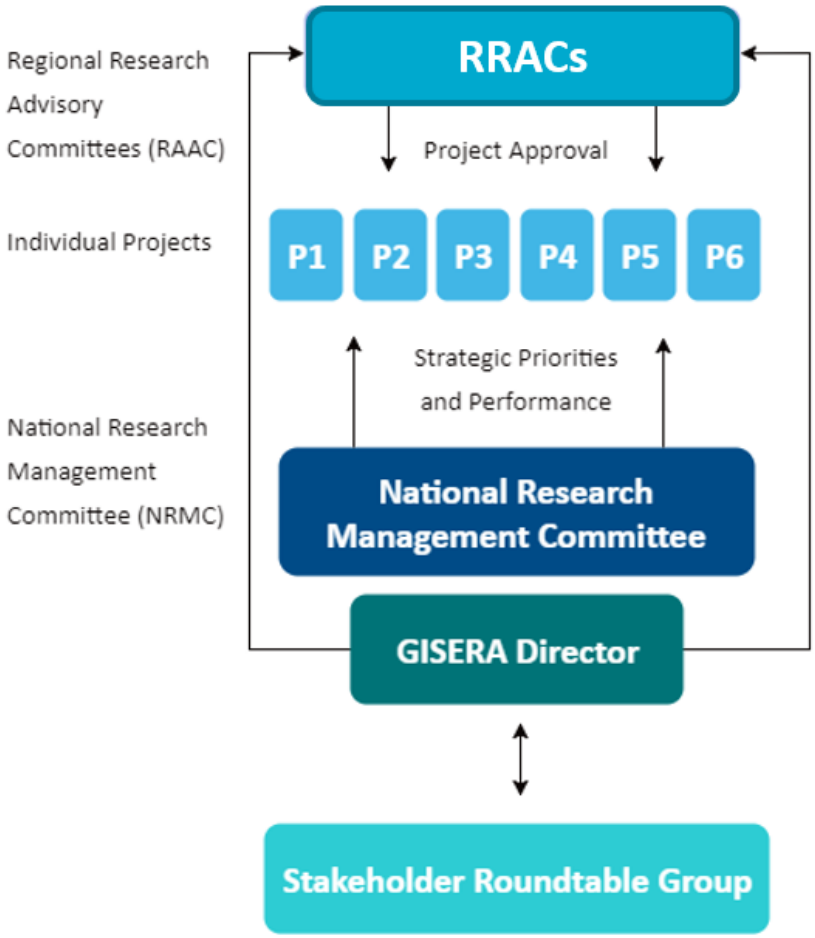
[1] This includes CSIRO in-kind contribution.

supporting communication products such as factsheets, communiques and online articles, are available to view and download at www.gisera.csiro.au.

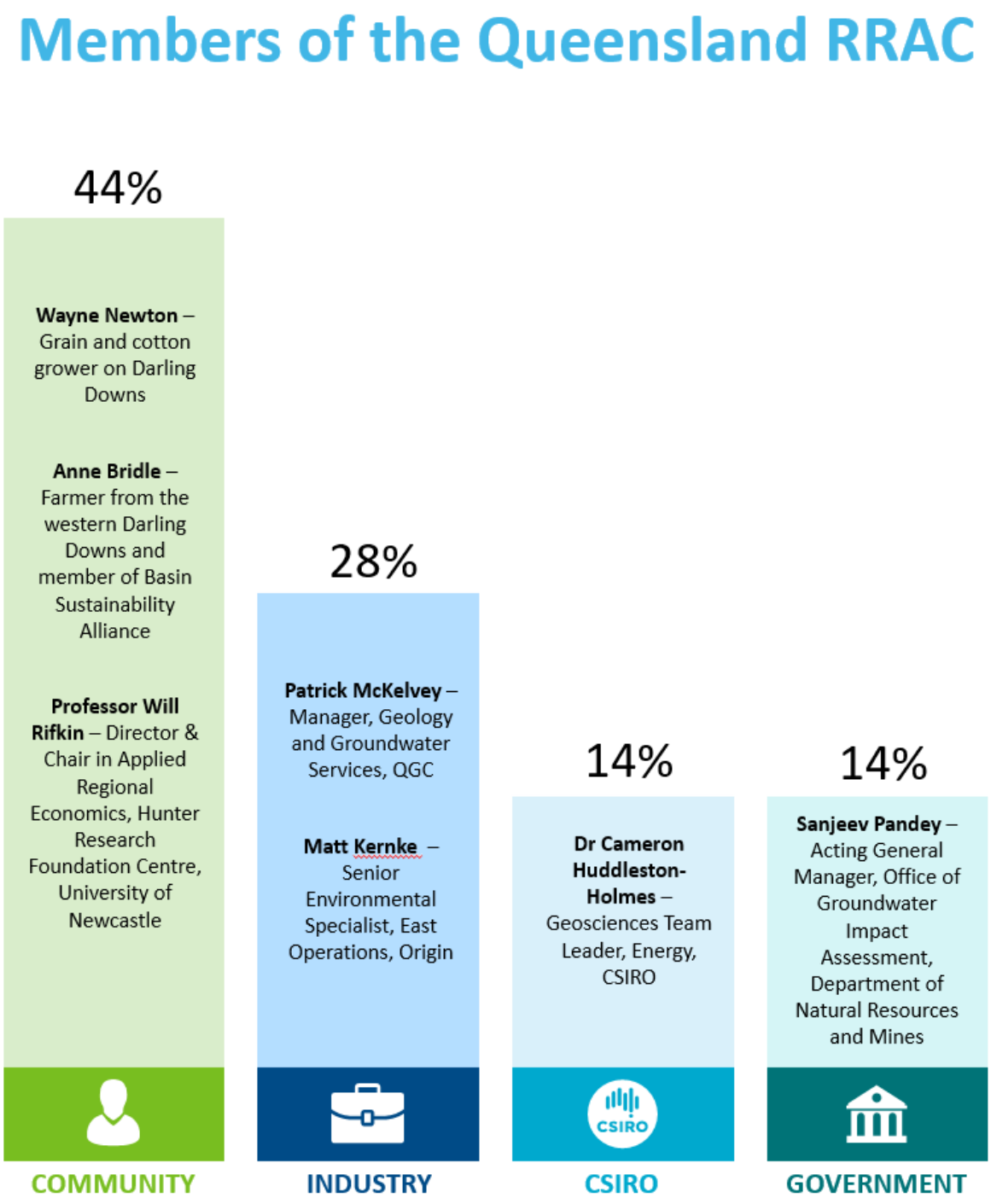
2 Governance

A key function of CSIRO's GISERA is to undertake research on issues of direct community interest using funding supplied by the gas industry and Commonwealth and state governments. To ensure independence of CSIRO research, a rigorous governance structure is imposed utilising external stakeholder-dominated Regional Research Advisory Committees (RRAC) in New South Wales, Queensland, South Australia and Northern Territory.

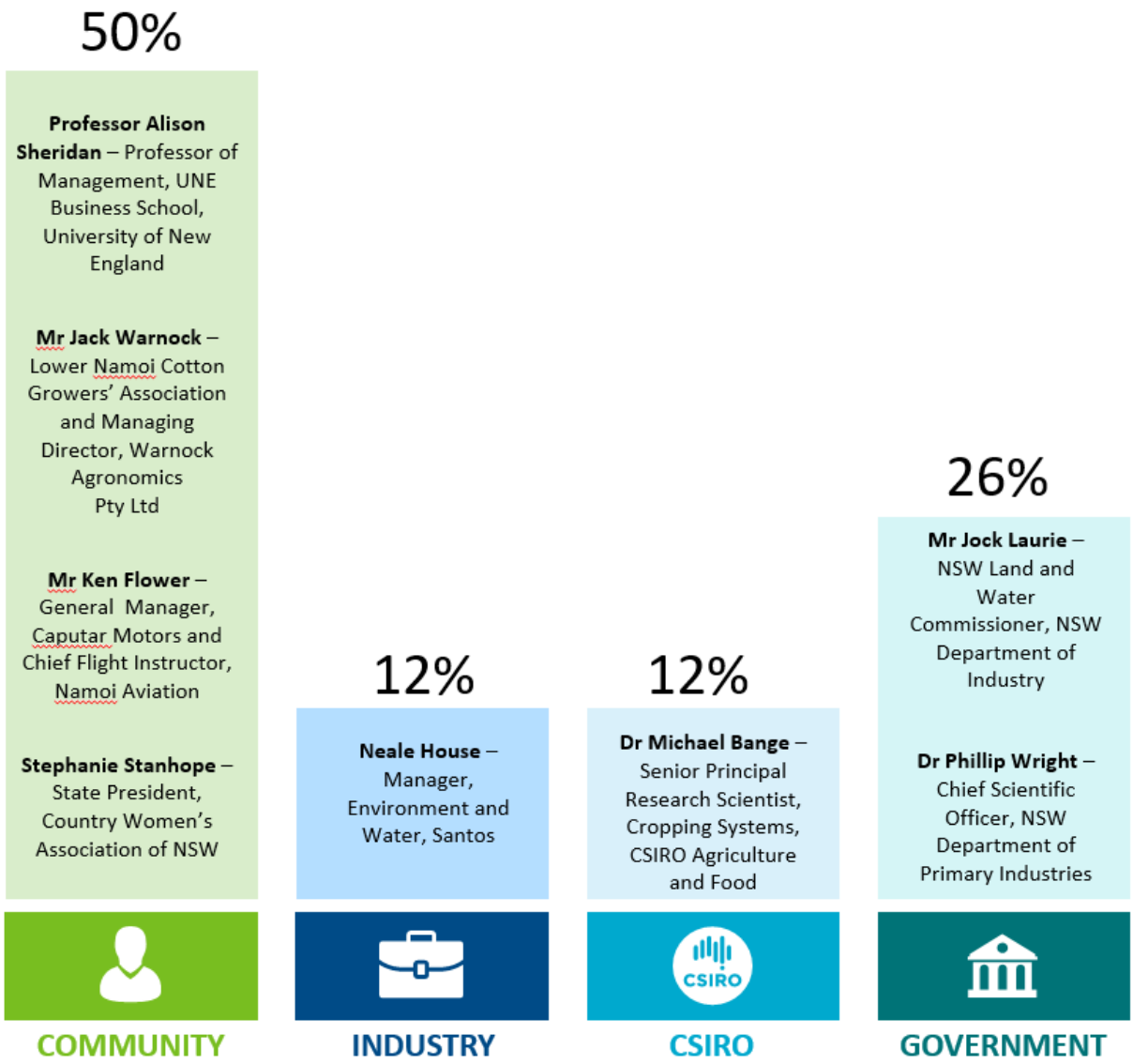
The RRACs are responsible for approving the allocation of research funds to projects which meet the community objectives of addressing issues of concern. The National Research Management Committee ensures fiscal and project level responsibilities are met but does not determine where research funds are spent. The governance structure is shown below:



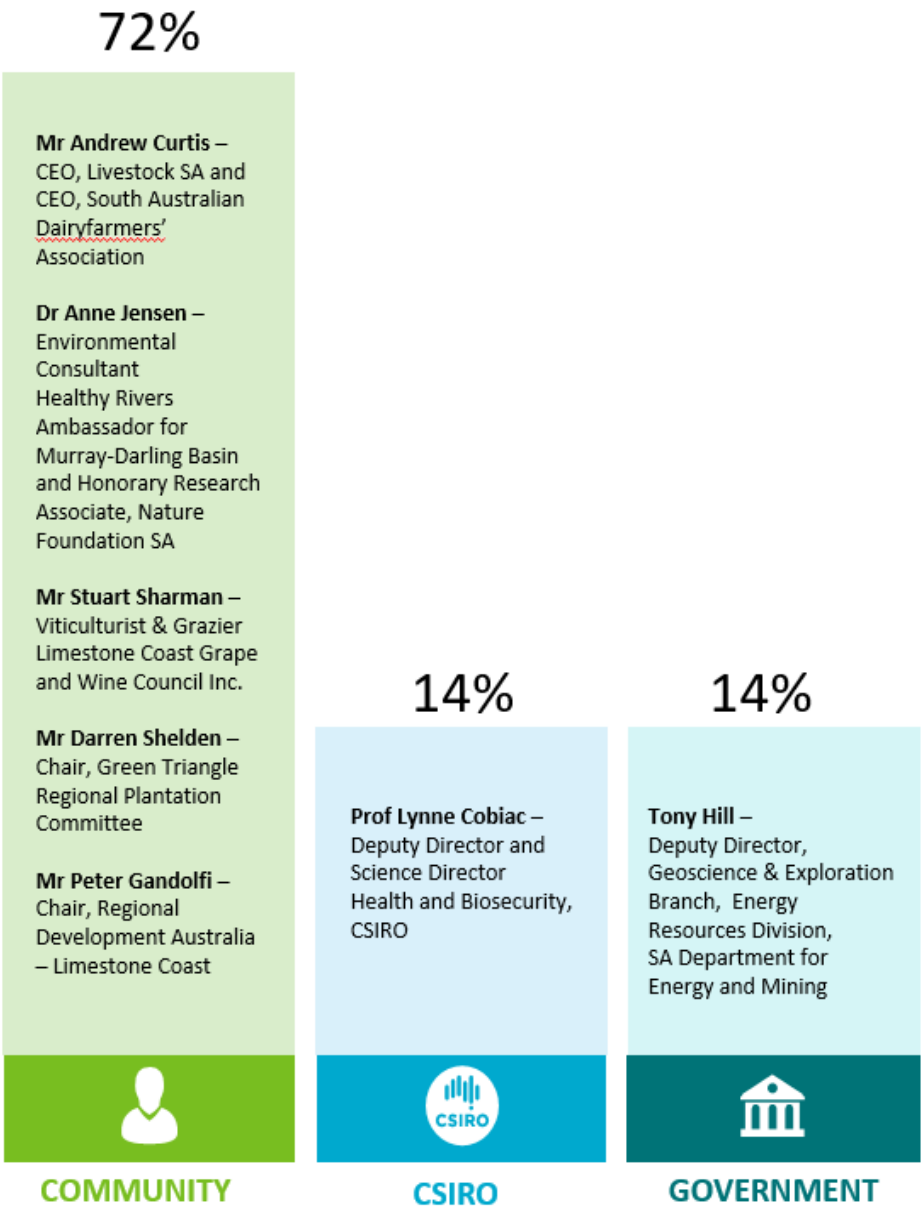
The composition and membership of the Queensland, New South Wales, South Australia and Northern Territory RRACs are critical to the success of GISERA and, as shown below, are dominated by esteemed and respected independent participants from the communities in which gas development is occurring:



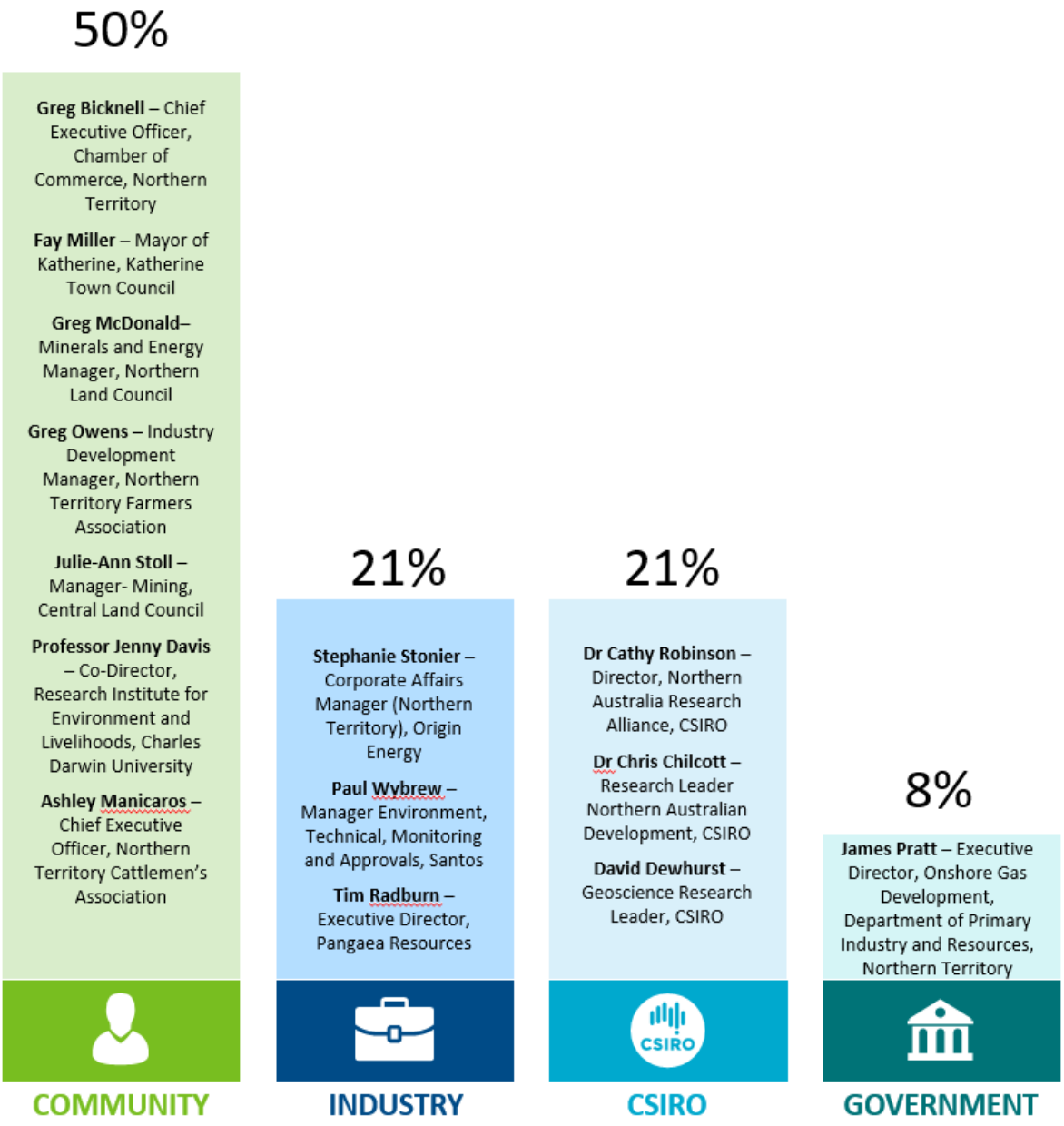
Members of the NSW RRAC



Members of the South Australian RRAC



Members of the Northern Territory RRAC



Regional Research Advisory Committees' activities

Queensland

Two Queensland projects were completed during this reporting period:

- Whole of life cycle GHG assessment of the exploitation of the Surat Basin gas reserve
- Ambient air quality in the Surat Basin

Overall, 29 projects are now complete in Queensland.

New South Wales

The New South Wales RRAC met in June 2019, resulting in the following projects being approved:

- A social and economic project titled 'Assessing and projecting on-shore gas effects on regional economic activity in NSW'. The study will analyse the influence of the NSW on-shore gas industry on regional economic and social indicators and use economic models to generate descriptions of potential future effects for NSW.
- A surface and groundwater project titled 'Assessment of faults as potential connectivity pathways in NSW'. The study results will help address public concerns regarding potential impacts on groundwater by improving understanding of sub-surface structures and potential fault zones that may act as pathways between target coal seams and shallow aquifers or surface water systems, and by helping to further improve the accuracy of future groundwater models in the Narrabri region.
- A social and economic project titled 'Monitoring changes in community wellbeing and local attitudes to CSG development in Narrabri, NSW'. This project will investigate the social impacts of unconventional gas development on local communities over time, and focus on the Narrabri region of NSW. Research activities will monitor indicators for community wellbeing, resilience, and perceptions of gas development over six to twelve months during the Narrabri gas project construction phase, if approved. This research proposal is contingent on the construction phase of gas development in the Narrabri Shire commencing by 30 March 2020, if approved.

The following 3 New South Wales projects were completed during this reporting period:

- Decommissioning CSG Wells
- Impacts of Coal seam gas depressurization on the GAB flux
- Improving groundwater models to better represent CSG extraction impacts in the Namoi region

Overall, 9 projects are now complete in New South Wales.

South Australia

The South Australia RRAC met in August 2018, resulting in the following project being approved:

- A surface and groundwater project titled 'Microbial degradation of onshore gas-related chemical compounds'. This project aims to provide information about which chemical compounds are degraded by microbes living in the soils and subsurface aquifers, and the impact on these microbial communities. This data can be used to assess the health of an ecosystem.

The South Australia RRAC approved the following project out of session in August 2018:

- A surface and groundwater project titled Groundwater balance in gas development regions of South East South Australia'. This research aims to improve groundwater balance models in the onshore gas development regions of south east South Australia. Through this study, an improved understanding of groundwater flow regimes in selected gas development areas of the Otway Basin will help inform decision making and community understanding of water used by the gas industry in relation to other water uses and management measures required for optimal water use.

Northern Territory

The Northern Territory RRAC met in July 2018, resulting in the following projects being approved:

- A Greenhouse Gas Footprint project titled 'Baseline measurement and monitoring of methane emissions in the Beetaloo Sub-basin' to provide a better understanding of the natural methane levels, over the various seasons, a baseline for accurately quantifying any future onshore gas impacts. This project has now been completed.
- A surface and groundwater project titled 'Baseline monitoring of groundwater properties in the Beetaloo Sub-basin, NT'. This project will assist in understanding the geochemical properties, recharge rates and recharge mechanisms of groundwater. The aims of this project are to sample and analyse groundwater in the Beetaloo Sub-basin, and create a set of baseline data against which any potential impacts caused by the gas industry can be measured. It will provide information about the baseline geochemistry and groundwater flow characteristics in the Cambrian Limestone Aquifer.

The Northern Territory RRAC met again in April 2019, resulting in the following projects being approved:

- A surface and groundwater project titled 'Characterisation of the stygofauna and microbial assemblages of the Beetaloo Sub-basin, NT'. This project will undertake a broad spatial pilot-scale survey of water bores in the Beetaloo Sub-basin, using direct sampling and DNA-based approaches to determine the distribution and abundance of stygofauna and characterise subterranean groundwater-dependent ecosystems.

- A surface and groundwater project titled 'Environmental monitoring and microbial degradation of onshore shale gas activity chemicals and fluids, NT. This project will provide information to better understand how typical onshore gas chemicals biodegrade in relevant aquifers and soil types in the Northern Territory.

Overall, one project is now complete in the Northern Territory.

Project modifications and progress reporting

An approved research project consists of a Project Order and Budget that has been approved by the Regional Research Advisory Committee.

During the execution of an approved project, changes and modifications to the Project Order and Budget may be submitted to the Director for consideration. The Director may approve minor modifications to Project Orders that do not significantly alter the proposed outcomes, and do not have significant financial consequences for the project. The Director may consult the Regional Research Advisory Committee about these modifications.

Major modifications to Project Orders that may involve significant financial consequences or significant change in project scope will be prepared in consultation with the Director and presented to the Regional Research Advisory Committee for approval. Any changes made to Project Orders are available for public perusal.

Research updates and progress against project milestones are reported quarterly. Variations, if any, are also included as this allows any variations/modifications to the Project Order to be tracked easily. Summaries of each project's progress against milestones and variations, as well as the original Project Order, are available on the GISERA website: https://gisera.csiro.au/research/

National Research Management Committee

The National Research Management Committee (NRMC) comprises five industry, three CSIRO and one government representative including:

- Tim Finnigan: Director, Energy (CSIRO)
- Dr Paul Bertsch: Deputy Director-Science, Land and Water (CSIRO)
- Mike Grundy: Research Director, Agriculture (CSIRO)
- Robert Hirst: Health, Safety and Environment, Manager (APLNG)
- Stephanie Stonier: Corporate Affairs Managers (Northern Australia) (Origin Energy)
- Patrick McKelvey: Hydrogeology & Geology Operations Manager (Shell/QGC)
- Matthew Sherwell: Manager Policy & Regulatory Affairs (Santos)
- Tim Radburn: Executive Director (Pangaea Resources)
- Daniel Quinn: A/General Manager – Onshore Energy Branch, Resources Division (Department of Industry, Innovation and Science) – Government representative

Dr Damian Barrett, GISERA Director (CSIRO), is the NRMC Chair and has no voting rights.

The NRMC met 3 times during the 2018-19 financial year:

- Meeting #10 was held on 23 August 2018 at Origin offices;
- Meeting #11 was held on 6 November 2018 at Santos offices; and
- Meeting #12 was held on 7 May 2019 at CSIRO offices.

Looking ahead

Plans for the 2019-20 year include the development of the next tranche of research projects in Queensland, New South Wales, South Australia and the Northern Territory.

The scale of GISERA research activity in CSIRO continues to increase, with the involvement of over 180 researchers across our Energy, Land & Water, Mineral Resources, Oceans & Atmosphere, Agriculture & Food, Health & Biosecurity, Manufacturing and Data 61 business units over the life of GISERA. We seek to recruit and retain researchers of the highest distinction and potential, and we also explore broader research collaboration opportunities as we continue our planned activities in Queensland, New South Wales, South Australia and the Northern Territory.

Effective government engagement continues to assist in understanding relevant research challenges, to promote adoption of research outcomes and inform policy, and support positive impact from GISERA science.

3 National Budget

This is the eighth *Annual research & development plan and budget* and covers the financial year 2019-20.

The *Annual research & development plan and budget*:

- Details the contribution of each Partner to GISERA.
- Details the contribution of government departments to GISERA.
- Includes the committed research investment and expenditure for existing projects.
- Identifies proposed research projects to be undertaken in the financial year, including draft project objective and project budget.

3.1 National Budget

3.1.1 Contributions and Grants

The committed financial contributions received from membership, in-kind, grants, funding agreements, APPEA and other industry contributions (separate from membership) over the life of GISERA is outlined in Table 3.1.

Table 3.1 Incoming contributions and grants, by contributor, 2011/12-2018/19

GROUP	PAYMENT TYPE	CONTRIBUTOR	INITIAL ALLIANCE AGREEMENT (2011/12 – DEC 15)	NATIONAL ALLIANCE AGREEMENT (JAN 16 - 2018/19)	TOTAL
Industry	Membership	APLNG	$10,000,000	$300,000[2]	$10,300,000
		QGC	$1,250,000	$300,000[3]	$1,550,000
		Santos	$0	$750,000	$750,000[4]
		AGL	$0	$287,500	$287,500
		Origin	$0	$450,000	$450,000
		Pangaea	$0	$150,000	$150,000
	Contribution to water 11 (Air, water and soil impacts of hydraulic fracturing: Phase 1 project)	APLNG	$0	$245,670	$245,670
	Contribution to water 12 (Air, water and soil impacts of hydraulic fracturing: Phase 2 project)	APLNG	$0	$1,285,000	$1,285,000
	Contribution via APPEA (GHG 1 - Methane Seepage fluxes project)	APLNG, Santos, Arrow Energy & QGC	$1,121,707	$0	$1,121,707
Government	Grant	Federal Government	$0	$5,500,000	$5,500,000
		NSW Government	$0	$1,500,000	$1,500,000
		SA Government	$0	$1,000,000	$1,000,000
		QLD Government[5]	$0	$500,000	$500,000
		NT Government	$0	$450,000	$450,000
	Contribution to GHG 5 (Baseline measurement and monitoring of methane emissions in the Beetaloo Sub-basin project)	NT Government	$0	$305,297	$305,297
CSIRO	In-kind	CSIRO	$5,297,866	$4,277,936	$9,575,802
Other	In-kind	USQ	$79,990	$0	$79,990

[2] The figure does not include APLNG's first annual contribution of $150,000 towards National GISERA. As per clause 7.1 (d) of National Alliance Agreement, the parties agreed that this contribution was made under the Initial Alliance Agreement.

[3] The figure does not include QGC's first annual contribution of $150,000 towards National GISERA. As per clause 7.1 (d) of National Alliance Agreement, the parties agreed that this contribution was made under the Initial Alliance Agreement.

[4] This includes Santos' $450,000 contribution to research activities in NSW and $300,000 in the NT. Santos have also agreed to provide a further $150,000 if the current Alliance Term is extended beyond 30 June 2020.

[5] QLD Government's grant to go towards the 'Potential health impacts from CSG' project.

	(L5 - Without a Trace project)				
	In-kind (W18 – Stygofauna and microbial assemblages of the Beetaloo Sub-Basin project)	CDU	$0	$53,858	$53,858
TOTAL			$17,749,563	$17,355,261	$35,104,824

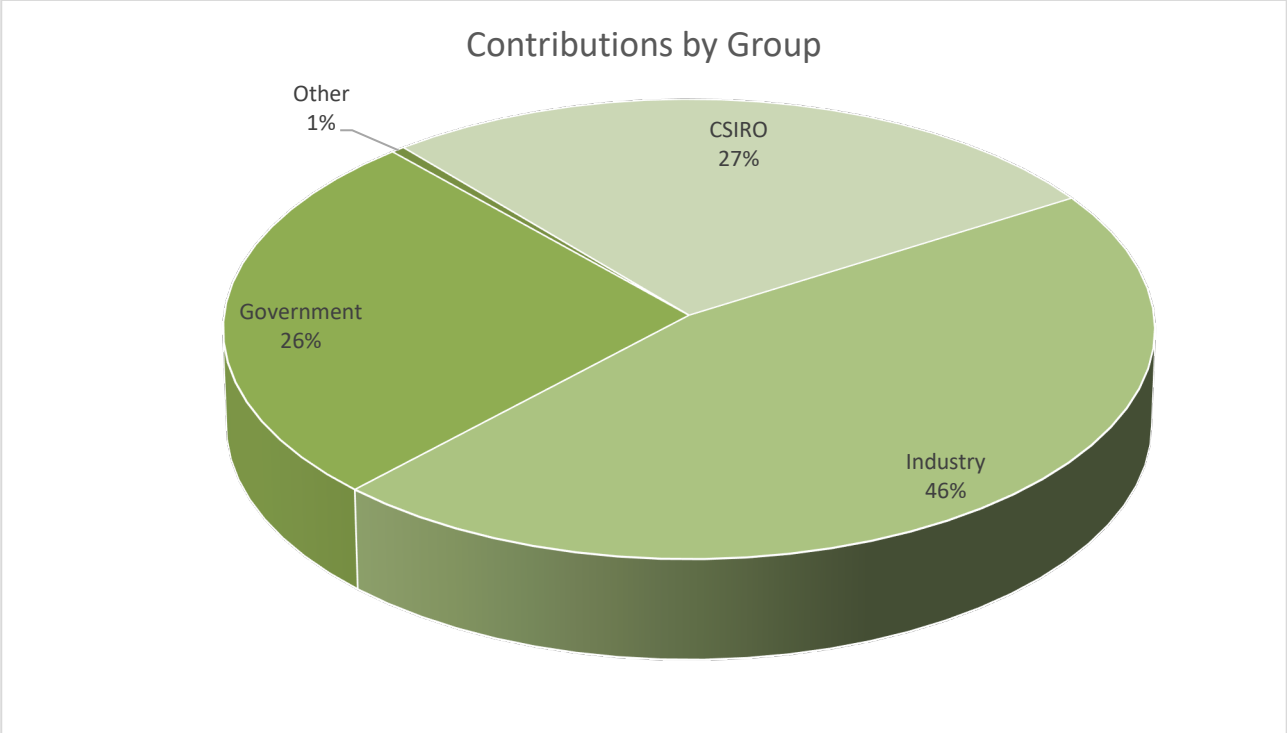


Figure 1 Committed contribution over life of GISERA, by group

3.1.2 Committed Research Investment

The committed budget for projects across all regions for 2011/12-2021/22 now stands at $25,210,654. A breakdown of the committed research budget for the various subject areas is illustrated in Table 3.2 and Figure 2 shows the percentage committed to each subject area.

Table 3.2 Committed research investment across all regions, by topic, 2011/12-2021/22

TOPIC / YEAR	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	TOTAL
Water	$1,102,043	$1,467,580	$712,245	$100,000	$579,672	$1,435,322	$2,563,862	$1,479,600	$883,594	$31,037	$0	$10,354,955
Greenhouse gas	$0	$0	$111,553	$627,286	$740,638	$991,891	$483,410	$305,297	$0	$0	$0	$3,260,075
Agriculture	$0	$732,594	$863,669	$533,301	$273,747	$245,384	$160,471	$175,133	$0	$0	$0	$2,984,299
Biodiversity	$0	$414,761	$663,163	$503,048	$290,265	$297,159	$130,162	$0	$0	$0	$0	$2,298,558
Marine	$0	$857,142	$357,143	$478,914	$0	$0	$0	$0	$0	$0	$0	$1,693,199
Social & economic	$0	$420,365	$434,000	$300,581	$266,933	$713,777	$270,413	$380,065	$422,802	$218,941	$68,874	$3,496,751[6]
Health	$0	$0	$0	$0	$0	$224,424	$100,024	$494,004	$304,365	$0	$0	$1,122,817
Total	$1,102,043	$3,892,442	$3,141,773	$2,543,130	$2,151,255	$3,907,957	$3,708,342	$2,834,099	$1,610,761	$249,978	$68,874	$25,210,654[7]

[6] This includes $254,869 allocated to a social and economic project 'Monitoring changes in community wellbeing and local attitudes to CSG development in Narrabri, NSW'. This research proposal is contingent on the construction phase of gas development in the Narrabri Shire commencing by 30 March 2020, if approved. If project does not proceed, funds will be returned for future reallocation.

[7] These figures do not include funds for the GISERA Director's office and communications.

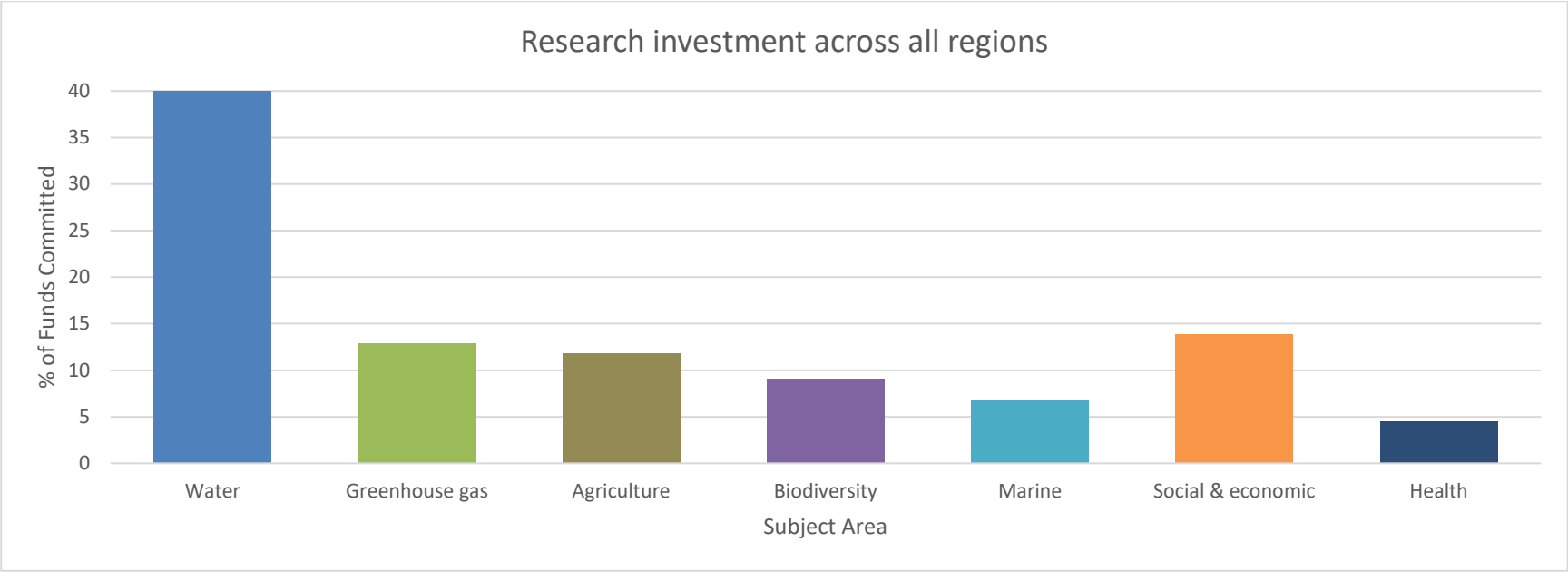


Figure 2 Committed research investment across all regions, by subject area, 2011/12-2021/22

4 Queensland R&D Plan & Budget

4.1 Queensland Investment profile

4.1.1 Committed research investment for 2011/12-2019/20

The committed budget for projects in Queensland for 2011/12-2019/20 now stands at $19,391,031. A breakdown of the committed research budget across the various subject areas is illustrated in Table 4.1 and Table 4.2 shows the investment committed by contributor.

Table 4.1 Committed research investment in Queensland by topic, 2011/12-2019/20

TOPIC / YEAR	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	TOTAL
Water (37%)	$1,102,043	$1,467,580	$712,245	$100,000	$579,672	$970,311	$1,975,116	$179,754	$0	$7,086,720
Greenhouse gas (14%)	$0	$0	$111,553	$627,286	$740,636	$836,528	$483,413	$0	$0	$2,799,416
Agriculture (14%)	$0	$732,594	$863,669	$533,301	$273,747	$245,384	$160,471	$0	$0	$2,809,166
Biodiversity (12%)	$0	$414,761	$663,163	$503,048	$290,265	$297,159	$130,162	$0	$0	$2,298,558
Marine (9%)	$0	$857,142	$357,143	$478,914	$0	$0	$0	$0	$0	$1,693,199
Social & economic (10%)	$0	$420,365	$434,000	$300,581	$266,933	$191,326	$118,001	$122,473	$0	$1,853,679
Health (4%)	$0	$0	$0	$0	$0	$0	$51,924	$494,004	$304,365	$850,293
Total	$1,102,043	$3,892,442	$3,141,773	$2,543,130	$2,151,253	$2,540,707	$2,919,087	$796,231	$304,365	$19,391,031

Table 4.2 Committed research investment in Queensland by contributor, 2011/12-2019/20

PARTNER	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	TOTAL
CSIRO (29.6%)	$220,410	$1,000,459	$862,590	$812,376	$682,819	$853,083	$1,060,160	$193,464	$53,693	$5,739,055
USQ (0.4%)	$0	$37,958	$42,032	$0	$0	$0	$0	$0	$0	$79,990
Australia Pacific LNG (55.3%)	$881,633	$2,854,025	$1,950,355	$987,982	$1,023,486	$792,418	$365,032	$47,803	$3,042	$8,905,776 (GISERA Membership)
	$0	$0	$18,574	$104,443	$52,470	$52,470	$52,470	$0	$0	$280,427 (Methane Seepage project)
	$0	$0	$0	$0	$0	$245,670	$0	$0	$0	$245,670 (HF phase 1 project)
	$0	$0	$0	$0	$0	$0	$1,174,821	$110,179	$0	$1,285,000 (HF phase 2 project)
QGC (8.3%)	$0	$0	$212,500	$325,000	$235,068	$439,656	$67,467	$47,803	$3,042	$1,330,537 (GISERA Membership)
	$0	$0	$18,574	$104,443	$52,470	$52,470	$52,470	$0	$0	$280,427 (Methane Seepage project)
Santos (1.4%)	$0	$0	$18,574	$104,443	$52,470	$52,470	$52,470	$0	$0	$280,427 (Methane Seepage project)
Arrow Energy (1.4%)	$0	$0	$18,574	$104,443	$52,470	$52,470	$52,470	$0	$0	$280,427 (Methane Seepage project)
Federal Government (1.0%)	$0	$0	$0	$0	$0	$0	$11,193	$106,491	$65,611	$183,295
Qld Government (2.6%)	$0	$0	$0	$0	$0	$0	$30,533	$290,490	$178,977	$500,000
Total	$1,102,043	$3,892,442	$3,141,773	$2,543,130	$2,151,253	$2,540,707	$2,919,087	$796,231	$304,365	$19,391,031

4.1.2 Queensland Current Research Portfolio

A summary of all approved research projects in Queensland is provided in table 4.3 (* = completed projects).

Table 4.3 Approved Queensland Research Projects

RESEARCH SUBJECT AREA	PROJECT	SCOPE	OUTCOMES
Surface and groundwater	Geochemical responses to re injection*	Understand and quantify aquifer reactions occurring due to re-injection of CSG water, and their impacts on water quality.	Methods for predicting water quality changes resulting from CSG water re-injection.
	Re-injection of CSG water*	Understand, quantify and manage clogging of injection wells during re-injection of CSG water permeates, brines and blends.	Strategies to manage clogging of re-injection wells to maximise re-injection volumes.
	High performance groundwater modelling*	Determine the feasibility of large scale re-injection schemes.	Models that assess the feasibility of large re-injection schemes and predict how re-injection may reduce impacts from CSG development.
	Isotope and geochemical groundwater baseline study*	Characterise the baseline geochemistry of groundwater and formation water prior to and during initial stages of development to understand groundwater age and origin.	Baseline measures of groundwater quality and protocols for monitoring changes in groundwater quality, during and after development.
	Hydrocarbons in groundwater, Surat and Bowen basins*	Review and assess the presence of organic compounds in groundwater found in the Surat and Bowen basins using existing open source and company held data.	Information and methods to assess possible sources of hydrocarbons in groundwater to help differentiate naturally occurring hydrocarbons and those potentially introduced during gas extraction process.
	Constraining water flows in the Surat Basin*	Measuring and modelling specific chemicals called environmental tracers to gain a better understanding of the speed and direction of groundwater flow.	New data and modelling approach to assess flow rates and volumes of usable groundwater resources in CSG regions in Queensland.
	Groundwater contamination risk assessment*	Assess the likelihood of groundwater contamination from hydraulic fracturing and wellbore damage.	Quantitative estimate of the risk of groundwater contamination at a basin/sub-basin scale. This will help management plans and strategies to reduce the risk of surface and groundwater contamination and provide communities a better understanding of potential impacts to local water resources.
	Air, water and soil impacts of hydraulic fracturing (Phase 1) *	To design an intensive monitoring campaign that will measure the air, water and soil impacts of hydraulic fracturing of production wells in the Surat Basin.	A report summarising the current state of knowledge regarding sources of air, water and soil pollutants associated with CSG extraction using hydraulic fracturing, a peer-reviewed design for a measurement program that will provide enhanced information of the impacts of hydraulic fracturing and a

RESEARCH SUBJECT AREA	PROJECT	SCOPE	OUTCOMES
			report presenting an analysis of air, water and soil quality before commencement of hydraulic fracturing activity.
	Air, water and soil impacts of hydraulic fracturing (Phase 2)	This project involves undertaking a comprehensive monitoring campaign to measure the air, surface water groundwater and soil impacts of hydraulic fracturing of gas production wells in the Surat Basin, Queensland.	A series of reports summarising the impacts of hydraulic fracturing on of air, water and soil quality, based on data from a comprehensive measurement program air, water and soil quality before, during and after hydraulic fracturing activity.
Social and economic	Monitoring regional transition*	Synthesise existing knowledge on the nature of rural socio-economic transitions occurring as a result of resource developments, and track the social impacts of regional economic change.	Identify ways to help local communities in responding to resource development in order to maximise social benefit.
	Community functioning and well-being*	Identify principal indicators of community function and well-being, the resources and strategies necessary for enabling and enhancing community responses, and how communities respond to major developments in their region.	Inform strategic investments that will help maintain or enhance community function and well-being.
	Economic assessment and forecasting project*	Understand future impacts on regional economies and how local businesses can respond.	Forecasts calculating likely economic effects during the operations phase and lessons to support local businesses.
	Understanding community aspirations*	Identify community aspirations and their overlaps and/or disparities with existing resources, industry, and policy trajectories. Specifically, to understand how different community segments see the future of the region and how these reflect the economic and policy avenues for the region.	Help inform sound industry and policy activities to satisfy the social licence to operate.
	Community function and well-being survey 2*	Conduct a community well-being survey to measure the changes since the end of the construction and start of the operations phases and compare results with the Survey 1 in 2014.	Identify strategies that can be enacted by local and state government to proactively reduce stresses associated with rapid change and also to take advantage of opportunities arising from resource development.
	Trends in community wellbeing and attitudes to CSG development – Survey 3	This project involves monitoring and communicating the changes and trends in community wellbeing, resilience and attitudes to CSG development across different phases of industry operation in south west Queensland, and identifies how these vary between the construction, post-construction, and operations phases of development.	The project will inform the community, industry and government understanding of how and why community wellbeing and attitudes to CSG vary between regions and phases of CSG activity for planning and approval purposes. A more comprehensive understanding of these dynamics across time and space will enable more strategic and proactive policy and planning around CSG development.
Marine environment	Sustaining turtles and their homes*	Understand how sediments from dredging and discharges affect seagrass and turtles.	Quantifying the risks to turtle populations from dredging and increased boat traffic.

RESEARCH SUBJECT AREA	PROJECT	SCOPE	OUTCOMES
Greenhouse gas footprint	Methane seepage in the Surat Basin*	Detect and measure methane seeping from underground in the Surat Basin, and identify sources of methane to provide a baseline of methane emissions on a regional scale.	A methane emissions data set that can be used to compare changes in methane concentrations as coal seam gas production in the Surat Basin increases.
	Greenhouse gas emission assessment of the Surat Basin Gas Reserve*	Analysis of the whole of life cycle GHG emissions, including extraction, transportation and usage of CSG in the Surat Basin.	Assessments of benefits and risks related to the extraction, transport and usage of gas in terms of their GHG emission footprint.
	Ambient air quality in the Surat Basin*	Comprehensive assessment of air quality in the Surat Basin region in Queensland using air quality measurement network and modelling.	Identify the impact of CSG production activities on air quality in the Surat region.
Agricultural land management	Preserving agricultural productivity*	Assist in the preservation of agricultural productivity during land use change.	Developing methods for most equitably and/ or cost-effectively preserving agricultural productivity.
	Shared space*	Understand how farmers from a range of production systems (extensive grazing to intensive cropping) perceive and value CSG developments on their and others' farms.	Information that assists farmers and developers to negotiate means of co-existence that maximise benefits and minimise social and economic costs.
	Gas farm design*	Understand how to design farms for a new mixed land use.	Design principles and practices that optimise farm and gas infrastructure and operations, minimising negative impacts and maximising benefits.
	Making tracks, treading carefully*	Understand the direct and indirect impacts of tracks and traffic on invasive species and erosion in agricultural landscapes.	Guidelines for quantifying, monitoring and managing weed and erosion threats.
	Without a trace*	Identify the nature and likely extent of damage to agricultural soils, and methods for avoiding and improving soils.	Methods for installing and operating gas infrastructure that avoids soil damage, and novel methods for rehabilitating damage that does occur.
	Telling the story*	Share understanding of changes on farms and in towns during CSG development in the Surat area.	Development of a detailed landscape map showing changes during CSG developments and face-to-face engagements at local shows or community events in the Surat region.
	CSG and Livestock – Inside the Herd*	Monitoring grazing land with CSG infrastructure to better understand the impacts of CSG infrastructure, traffic and dust on animals and pastures.	A detailed study of livestock behaviour, pastures, soil processes, and dust deposition for a real CSG property.
Terrestrial biodiversity	Priority threat identification, management and appraisal*	Identify and understand the broad range of existing and new threats to biodiversity across a CSG development region.	Determine which conservation management activities will best mitigate the risks to biodiversity.

RESEARCH SUBJECT AREA	PROJECT	SCOPE	OUTCOMES
	Fire ecology of grassy woodlands*	Determine the sensitivity of the region's flora and fauna to changed fire regimes, and the thresholds at which changed fire regimes cause substantial ecological impact.	Advice on how to best manage the biodiversity impacts of altered fire regimes associated with CSG development.
	Habitat selection by two focal species*	Study two species, the Golden-tailed gecko and Glossy black-cockatoo, to assess the range of impacts from CSG development in south-west Queensland on their habitat.	Management options for the Golden-tailed gecko and Glossy black-cockatoo habitats to ensure their long-term endurance.
	Ensuring biodiversity offset success: the right kind of seed for a rare daisy*	Identify genetic and demographic factors that may limit the success of establishing a rare daisy (*Rutidosis lantana*) in a new location.	Best practice guidelines for moving the *Rutidosis lantana*, a rare daisy, to a new location. The guidelines will help to minimise biological limits to reproductive success and maximise population viability of the daisy.
	Guidelines for offset population sizes*	Improve the understanding of how ecological and biological traits of rare species of plants, commonly encountered in restoration projects, and different environmental factors determine viable population sizes by using computer models.	Evidence-based guidelines for the size of plant populations needed to maximise establishment and persistence of rare plant species.
Health	Potential health impacts from CSG	Establish processes and governance to ensure research quality, define the project boundary, conduct hazard identification and exposure pathways, and screen data.	Identify potential chemical and physical hazards and exposure pathways, assess the quality of existing data, and gaps in the data collected. Key issues will be selected for further in-depth assessment as part of the project to enable the health study framework to be demonstrated in its entirety.

**These projects have been completed and their reports are available at* www.gisera.csiro.au

4.1.3 Queensland Research Progress and Expenditure

The committed Queensland research budget, expenditure and milestones completed for each project is provided in table 4.4 (* = completed projects).

Table 4.4 Committed research investment, expenditure and progress in Queensland, by project

RESEARCH SUBJECT AREA	PROJECT	ALLOCATED BUDGET	EXPENDITURE UP TO 30 JUNE 2019	PERCENTAGE OF BUDGET SPENT UP TO 30 JUNE 2019[8]	PERCENTAGE OF MILESTONES COMPLETED UP TO 30 JUNE 2019
Surface and groundwater	Geochemical responses to re-injection*	$1,061,242	$1,126,356	106%	100%
	Re-injection of CSG water*	$1,039,989	$1,085,085	104%	100%
	High performance groundwater modelling*	$928,215	$1,024,173	110%	100%
	Isotope and geochemical groundwater baseline study*	$667,053	$709,848	106%	100%
	Hydrocarbons in groundwater, Surat & Bowen basins*	$257,694	$568,722	221%	100%
	Constraining groundwater flow models*	$588,957	$732,651	124%	100%
	Water contamination risk assessment on hydraulic fracturing in unconventional gas extraction*	$290,624[9]	$293,542	101%	100%
	Air, water and soil impacts of hydraulic fracturing (Phase 1)*	$330,795[10]	$351,433	106%	100%
	Air, water and soil impacts of hydraulic fracturing (Phase 2)	$2,111,055[11]	$2,152,457	102%	86%
Social and economic	Monitoring regional transition*	$376,088	$404,084	107%	100%
	Community functioning and well-being*	$417,438	$457,314	110%	100%
	Economic assessment and forecasting project*	$296,508	$299,971	101%	100%

[8] Any expenditure exceeding 100% represents an additional CSIRO contribution.

[9] This is a jointly funded QLD and NSW project. The figures presented in this table are for 'total project costs' and not split by region.

[10] This includes $245,670 contribution from APLNG (separate from membership).

[11] This includes $1,285,000 contribution from APLNG (separate from membership).

RESEARCH SUBJECT AREA	PROJECT	ALLOCATED BUDGET	EXPENDITURE UP TO 30 JUNE 2019	PERCENTAGE OF BUDGET SPENT UP TO 30 JUNE 2019[8]	PERCENTAGE OF MILESTONES COMPLETED UP TO 30 JUNE 2019
	Understanding community aspirations*	$342,692	$341,821	100%	100%
	Community function and well-being survey 2*	$180,479	$190,269	105%	100%
	Trends in community wellbeing and attitudes to CSG development - Survey 3	$240,474	$243,576	101%	75%
Marine environment	Sustaining turtles and their homes*	$1,693,199	$1,802,905	106%	100%
Greenhouse gas footprint	Methane seepage in the Surat Basin*	$2,015,937	$2,293,692	114%	100%
	Greenhouse gas (GHG) emission assessment of the Surat Basin Gas Reserve*	$241,708	$318,256	132%	100%
	Ambient air quality in the Surat Basin*	$541,771	$605,517	112%	100%
Agricultural land management	Preserving agricultural productivity*	$547,756	$538,532	98%	100%
	Shared space*	$140,445	$138,805	99%	100%
	Gas farm design*	$651,329	$626,057	96%	100%
	Making tracks, treading carefully*	$564,089	$578,197	103%	100%
	Without a trace*	$339,990	$339,990	100%	100%
	Telling the story*	$332,224	$329,234	99%	100%
	CSG and Livestock- Inside the herd*	$233,333	$239,628	103%	100%
Terrestrial biodiversity	Priority threat identification, management and appraisal*	$945,400	$995,144	105%	100%
	Fire ecology of grassy woodlands*	$789,042	$840,016	106%	100%
	Habitat selection by two focal species*	$167,432	$204,990	122%	100%
	Ensuring biodiversity offset success: the right kind of seed for a rare daisy*	$198,055	$225,232	114%	100%
	Guidelines for offset population sizes*	$198,630	$200,326	101%	100%
Health	Potential health impacts from CSG	$850,293	$228,519	27%	33%
TOTAL ALLOCATED BUDGET		$19,391,031			

**These projects have been completed and their reports are available at* www.gisera.csiro.au

4.2 Queensland research ideas being discussed for 2019/20

Approximately $253,931[12] cash remains available for new project proposals to be initiated in FY 2019/20.

The following projects ideas are being discussed, but are yet to be ratified and are subject to review by the relevant Regional Research Advisory Committee. Over coming months further stakeholder consultation will occur aiming to prioritise these research ideas in relation to other community issues.

Table 4.5 Future research ideas in Queensland for 2019/20

SUBJECT AREA	IDEA	POTENTIAL REGION	ESTIMATED COST
Communications	Communication wrap-up for Queensland - to provide a summary of the work undertaken and the lessons learnt in Queensland	QLD	$20K

[12] This figure is total GISERA funding for Queensland, less $19,391,031 already committed to research (tables 3.1 and 3.2) and less anticipated costs for the Director's Office/Communication for the life of GISERA. The remaining research budget does not include any future Federal or State Government contributions or CSIRO in-kind contributions.

5 NSW R&D Plan & Budget

5.1 NSW Investment profile

5.1.1 Committed research investment for 2016/17-2021/22

The committed budget for projects in New South Wales for 2016/17-2021/22 now stands at $2,968,780. A breakdown of the committed research budget across the various subject areas is illustrated in Table 5.1 and Table 5.2 shows the investment committed by contributor.

Table 5.1 Committed research investment in NSW by topic, 2016/17-2021/22

TOPIC / YEAR	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	TOTAL
Water (45%)	$465,011	$588,746	$73,571	$182,893	$31,037	$0	$1,341,258
Greenhouse gas (5%)	$155,363	$0	$0	$0	$0	$0	$155,363
Social & economic (41%)	$522,451	$152,412	$0	$236,957	$218,941	$68,874	$1,199,635
Health (9%)	$224,424	$48,100	$0	$0	$0	$0	$272,524
TOTAL	$1,367,249	$789,258	$73,571	$419,850	$249,978	$68,874	$2,968,780

Table 5.2 Committed research investment in NSW by contributor, 2016/17-2021/22

PARTNER	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	TOTAL
CSIRO (24%)	$331,472	$189,490	$18,392	$104,962	$62,494	$17,219	$724,029
Santos (13%)	$178,144	$104,135	$9,196	$20,993	$12,499	$3,444	$328,411
AGL (10%)	$178,144	$42,993	$0	$0	$0	$0	$221,137
Federal Government (26%)	$348,016	$202,010	$18,392	$251,911	$149,986	$41,324	$1,011,639
NSW Government (27%)	$331,473	$250,632	$27,589	$41,984	$24,999	$6,887	$683,564
TOTAL	$1,367,249	$789,258	$73,571	$419,850	$249,978	$68,874	$2,968,780

5.1.2 NSW Current Research Portfolio

A summary of all approved research projects in NSW is provided in table 5.3 (* = completed projects).

Table 5.3 Approved NSW Research Projects

RESEARCH SUBJECT AREA	PROJECT	SCOPE	OUTCOMES
Surface and groundwater	Impacts of CSG depressurization on Great Artesian Basin flux*	Improve the understanding of the GAB groundwater flow in the Pilliga region through integration of existing information from models, hydrochemical data and environmental tracers.	Assess the chances of extreme changes in GAB groundwater flux (flow volumes) as a result of CSG development using state of the art uncertainty analysis and modelling.
	Spatial design of groundwater monitoring network in the Narrabri Gas Project area*	Analysis and design of groundwater bore networks for optimal groundwater monitoring and early detection of changes.	Optimal spatial design of groundwater monitoring networks to improve confidence around predicted groundwater impacts, and help minimise the risk of environmental damage.
	Improving groundwater models to better represent coal seam gas extraction impacts in the Namoi region*	Develop more representative models for estimating the groundwater impacts from coal seam gas well fields.	Improving the prediction of groundwater impacts by ensuring accurate representation of the effects of CSG production in the groundwater models being developed for the Namoi region.
	Groundwater contamination risk assessment*	Assess the likelihood of groundwater contamination from hydraulic fracturing and wellbore damage.	Quantitative estimate of the risk of groundwater contamination at a basin/sub-basin scale. This will help inform management plans and strategies to reduce the risk of surface and groundwater contamination and provide communities a better understanding of potential impacts to local water resources.
	Assessment of faults as potential connectivity pathways	Improve understanding of sub-surface structures and potential fault zones that may act as pathways between target coal seams and shallow aquifers or surface water systems, and by helping to further improve the accuracy of future groundwater models in the Narrabri region.	Using a combination of different geophysical methods and environmental tracers this study will assess the continuity and performance of aquitards separating shallow aquifers and coal seams within and near the proposed gas project development area south-west of Narrabri.
Social and economic	Analysing economic and demographic trajectories in NSW regions experiencing CSG development and operations*	Identify current levels and trajectories of economic, social and demographic variables in CSG regions within NSW and analyse whether or not the CSG industry could change the trajectory of these variables.	Comprehensive baseline assessment of economic, social and demographic characteristics of CSG regions in NSW and the potential impacts of CSG on these characteristics.
	Social baseline assessment of the Narrabri region of NSW in relation to CSG development*	Understand and measure attitudes, perceptions and expectations that exist within the community with respect	Baseline information about the community's wellbeing, perceptions, expectations and resilience in relation to CSG development.

RESEARCH SUBJECT AREA	PROJECT	SCOPE	OUTCOMES
		to CSG development, and current levels of community wellbeing and community resilience.	
	Decommissioning pathways for CSG projects*	Review regulatory frameworks in relation to principles derived from international literature and consider social concerns with regard to decommissioning of wells and well pad infrastructure.	Recommendations for an integrated approach to improving the social, economic and environmental effectiveness of decommissioning of wells and well pads.
	Assessing and projecting on-shore gas effects on regional economic activity	This project will analyse the influence of the NSW on-shore gas industry on regional economic and social indicators, and use economic models to generate descriptions of potential future effects for NSW	An improved understanding of the role of the gas industry in NSW across a comprehensive set of economic and social indicators, enabling insights into potential changes to NSW industry, employment, land use, productivity, and human capital under a range of gas industry development scenarios.
	Monitoring changes in community wellbeing and local attitudes to CSG development in Narrabri, NSW[13]	This project investigates the social impacts of unconventional gas development on local communities over time, and focuses on the Narrabri region of NSW. Research activities will monitor indicators for community wellbeing, resilience, and perceptions of gas development over six to twelve months during the Narrabri gas project construction phase, if approved.	Project results explore social impacts of unconventional gas development and measure any changes in community wellbeing and resilience between baseline pre-approval surveys completed in 2017 and the Narrabri gas project construction phase in 2020-21. These results could also be compared to any subsequent surveys in the operations phase.
Greenhouse gas footprint	Regional Methane Emissions in NSW CSG Basins*	This project will identify and quantify methane emission sources such as CSG infrastructure, feedlots, coal mining, legacy bore holes in the Pilliga region.	This research will result in a detailed inventory and map of methane emissions for the Pilliga region that can be used to compare emissions once large scale gas extraction starts.
Health	Human health effects of coal seam gas*	Review current information to design a study on the health effects of CSG activities based on community stakeholder, governmental, expert consultation group, and industry input.	Comprehensive study design to investigate effects of CSG activity on human health, including development of a conceptual model to inform the study design.

**These projects have been completed and their reports are available at* www.gisera.csiro.au

[13] This research project is contingent on the construction phase of gas development in the Narrabri Shire commencing by 30 March 2020, if approved.

5.1.3 NSW Research Progress and Expenditure

The committed New South Wales research budget, expenditure and milestones completed for each project is provided in table 5.4 (* = completed projects).

Table 5.4 Committed research investment, expenditure and progress in NSW, by project

RESEARCH SUBJECT AREA	PROJECT	ALLOCATED BUDGET	EXPENDITURE UP TO 30 JUNE 2019	PERCENTAGE OF BUDGET SPENT UP TO 30 JUNE 2019[14]	PERCENTAGE OF MILESTONES COMPLETED UP TO 30 JUNE 2019
Surface and groundwater	Impacts of CSG depressurisation on the Great Artesian Basin flux*	$420,910	$415,004	99%	100%
	Data- worth analysis and spatial design of groundwater monitoring networks in the Narrabri Gas Project area*	$216,218	$209,910[15]	97%	100%
	Improving groundwater models to better represent coal seam gas extraction impacts in the Namoi region*	$301,295	$301,834	100%	100%
	Water contamination risk assessment on hydraulic fracturing in unconventional gas extraction*	$290,624[16]	$293,542	101%	100%
	Assessment of faults as potential connectivity pathways	$213,903	$0[17]	0%	0%
Social and economic	Analysing economic and demographic trajectories in NSW regions experiencing CSG development and operations*	$103,694	$103,694	100%	100%
	Social baseline assessment of the Narrabri region of NSW in relation to CSG development*	$272,292	$320,467	118%	100%
	Decommissioning CSG Wells*	$298,876	$299,012	100%	100%

[14] Any expenditure exceeding 100% represents an additional CSIRO contribution.

[15] Additional costs will be charged to this project in 2019/20 for conference attendance and presentation of research results

[16] This is a jointly funded QLD and NSW project. The figures presented in this table are for 'total project' and not split by region.

[17] This is a newly approved project. Expenditure will be incurred in 2019/20.

RESEARCH SUBJECT AREA	PROJECT	ALLOCATED BUDGET	EXPENDITURE UP TO 30 JUNE 2019	PERCENTAGE OF BUDGET SPENT UP TO 30 JUNE 2019[14]	PERCENTAGE OF MILESTONES COMPLETED UP TO 30 JUNE 2019
	Assessing and projecting on-shore gas effects on regional economic activity	$269,903	$0[18]	0%	0%
	Monitoring changes in community wellbeing and local attitudes to CSG development in Narrabri, NSW	$254,869[19]	$0	0%	0%
Greenhouse gas footprint	Regional methane emissions in NSW CSG basins*	$155,363	$155,363	100%	100%
Health	Human Health effects pf Coal Seam Gas Activity Study Design*	$272,524	$317,002	116%	100%
TOTAL ALLOCATED BUDGET		$2,968,780			

**These projects have been completed and their reports are available at* www.gisera.csiro.au

[18] This is a newly approved project. Expenditure will be incurred in 2019/20.

[19] This is a newly approved project proposal whereby $254,869 funds has been committed. This research proposal is contingent on the construction phase of gas development in the Narrabri Shire commencing by 30 March 2020, if approved. If project does not proceed, funds will be returned for future reallocation.

5.2 NSW research ideas being discussed for 2019/20

Approximately $547,732[20] cash remains available for new project proposals to be initiated in FY 2019/20.

The following projects ideas are being discussed, but are yet to be ratified and are subject to review by the relevant Regional Research Advisory Committee. Over coming months further stakeholder consultation will occur aiming to prioritise these research ideas in relation to other community issues.

Table 5.5 Future research ideas in NSW for 2019/20

SUBJECT AREA	IDEA	POTENTIAL REGION	ESTIMATED COST
Greenhouse Gas	Greenhouse gas baselining and assessment to gauge total and local greenhouse gas emissions now and overtime	NSW	$300K
Biodiversity	Optimal biodiversity management strategies for plant population offsetting	NSW	$200K
Socio-economic	The role of gas in NSW – developing a profile of the gas industry in NSW and its role within the regional economy	NSW	$200K
Socio-economic	Third Community Wellbeing Survey to be conducted during operations phase of development, if approved	NSW	$240K
Socio-economic	A scenario based economic study to assess the value of locally produced gas in Narrabri (post announcement)	NSW	$230K
Surface & Groundwater	Risk based study on alternative uses of treated water.	NSW	$220K

[20] This figure is total GISERA funding for NSW, less $2,968,780 already committed to research (tables 4.1 and 4.2) and less anticipated costs for the Director's office/Communications for the life of National GISERA. The remaining research budget does not include future CSIRO in-kind contributions.

6 South Australia R&D Plan & Budget

6.1 South Australia Investment profile

6.1.1 Committed research investment for 2018/19 - 2019/20

The committed budget for projects in South Australia for 2018/19-2019/20 now stands at $1,462,760. A breakdown of the committed research budget across the various subject areas is illustrated in Table 6.1 and Table 6.2 shows the investment committed by contributor.

Table 6.1 Committed research investment in South Australia by topic, 2018/19-2019/20

TOPIC / YEAR	2018-19	2019-20	TOTAL
Water (58%)	$679,346	$164,844	$844,190
Agriculture (12%)	$175,133	$0	$175,133
Social & economic (30%)	$257,592	$185,845	$443,437
Total	$1,112,071	$350,689	$1,462,760

Table 6.2 Committed research investment in South Australia by contributor, 2018/19-2019/20

PARTNER	2018-19	2019-20	TOTAL
CSIRO (25%)	$278,017	$87,673	$365,690
Federal Government (37.5%)	$417,027	$131,508	$548,535
SA Government (37.5%)	$417,027	$131,508	$548,535
Total	$1,112,071	$350,689	$1,462,760

6.1.2 South Australia Current Research Portfolio

A summary of all approved research projects in South Australia is provided in table 6.3.

Table 6.3 Approved South Australia Research Projects

RESEARCH SUBJECT AREA	PROJECT	SCOPE	OUTCOMES
Surface and Groundwater	Onshore gas and water contamination: causes, pathways and risks	Investigate potential groundwater contamination causes, pathways and vulnerability to understand onshore gas water quality impacts for southeast SA.	Achieve a realistic quantification of groundwater contamination risks in gas development areas of southeast SA.
	Groundwater balance in gas development regions of South East South Australia	Improve groundwater balance models in the onshore gas development regions of south east South Australia.	An improved understanding of groundwater flow regimes in selected gas development areas of the Otway Basin will help inform decision making and community understanding of water takes by the gas industry in relation to other water uses and management measures required for optimal water use.
	Microbial degradation of chemical compounds used in onshore gas production in the SE of South Australia	Understand the biodegradation of certain chemical compounds used in onshore gas production in the south-east of South Australia.	Provide information about which chemical compounds are degraded by microbes living in the soils and subsurface aquifers, and the impact on these microbial communities. This data can be used to assess the health of an ecosystem.
Social and Economic	Community wellbeing and attitudes to conventional gas development in the South East of South Australia	Measure levels of perceived risk, benefits, knowledge, and other underlying drivers of trust and social acceptance of conventional gas development in South Australia's south east, and develop baseline data on community values, well-being and future expectations.	Baseline information about community well-being, perceptions, expectations and resilience for conventional gas development, to improve awareness and knowledge.
	Assessing the value of locally produced conventional gas in SA's South East	Develop a profile of the gas industry and its role within the regional economy and develop scenarios for how the local gas industry may evolve.	Knowledge for policy makers and local businesses regarding the socio-economic value of gas activity for local communities, and an improved capacity to forecast outcomes from industry development.
Agricultural land management	Gas impacts and opportunities on primary industries	Analyse possible impacts and opportunities from gas development for rural areas in South Australia's south east.	Information to assist community understanding and inform policy development of potential impacts and opportunities from conventional gas development on primary industries.

**These projects have been completed and their reports are available at* www.gisera.csiro.au

6.1.3 South Australia Research Progress and Expenditure

The committed South Australia research budget, expenditure and milestones completed for each project is provided in table 6.4.

Table 6.4 Committed research investment, expenditure and progress in South Australia, by project

RESEARCH SUBJECT AREA	PROJECT	ALLOCATED BUDGET	EXPENDITURE UP TO 30 JUNE 2019	PERCENTAGE OF BUDGET SPENT UP TO 30 JUNE 2019	PERCENTAGE OF MILESTONES COMPLETED UP TO 30 JUNE 2019
Surface and Groundwater	Onshore gas and water contamination: causes, pathways and risks	$277,550	$114,421	41%	50%
	Groundwater balance in gas development regions of South East South Australia	$326,036	$182,110	56%	60%
	Microbial degradation of chemical compounds used in onshore gas production in the SE of South Australia	$240,604	$235,389	98%	67%
Social and Economic	Community wellbeing and attitudes to conventional gas development in the South East of South Australia	$204,957	$30,150	15%	20%
	Assessing the value of locally produced conventional gas in SA's South East	$238,480	$150,367	63%	67%
Agricultural land management	Gas impacts and opportunities on primary industries	$175,133	$157,808	90%	75%
TOTAL ALLOCATED BUDGET		$1,462,760			

**These projects have been completed and their reports are available at* www.gisera.csiro.au

6.2 South Australia research ideas being discussed for 2019/20

Approximately $681,219[21] cash remains available for new project proposals to be initiated in FY 2019/20.

The following projects ideas are being discussed, but are yet to be ratified and are subject to review by the relevant Regional Research Advisory Committee. Over coming months further stakeholder consultation will occur aiming to prioritise these research ideas in relation to other community issues.

Table 6.5 Future research ideas in South Australia for 2019/20

SUBJECT AREA	IDEA	POTENTIAL REGION	ESTIMATED COST
Socio-economic	Risk and protection of local industry brands (considering setback distances, monitoring requirements and behavioural characteristics/community and consumer concerns)	SA	$200-$300K
Greenhouse Gas	The role of gas and opportunities to accelerate renewable energy and reduce greenhouse emissions	SA	$200-$300K
Greenhouse Gas	Regional greenhouse and air quality	SA	$200-$300K
Greenhouse Gas	Air quality in regions flaring natural gas	SA	$200-$300K
Greenhouse Gas	Well integrity and casings failure	SA	$200-$300K
Surface and Groundwater	Aquifer baselines and future water allocations	SA	$200-$300K

[21] This figure is total GISERA funding for South Australia, less $1,462,760 already committed to research (tables 5.1 and 5.2) and less anticipated costs for the Director's office/Communications for the life of National GISERA. The remaining research budget does not include future CSIRO in-kind contributions.

7 Northern Territory R&D Plan & Budget

7.1 Northern Territory Investment profile

7.1.1 Committed research investment for 2018/19 - 2019/20

The committed budget for projects in Northern Territory for 2018/19-2019/20 now stands at $1,388,083. A breakdown of the committed research budget across the various subject areas is illustrated in Table 7.1 and Table 7.2 shows the investment committed by contributor.

Table 7.1 Committed research investment in Northern Territory by topic, 2018/19-2019/20

TOPIC / YEAR	2018-19	2019-20	TOTAL
Water (78%)	$546,929	$535,857	$1,082,786
Greenhouse Gas Footprint (22%)	$305,297	$0	$305,297
Total	$852,226	$535,857	$1,388,083

Table 7.2 Committed research investment in Northern Territory by contributor, 2018/19-2019/20

PARTNER	2018-19	2019-20	TOTAL
CSIRO (18%)	$136,731	$120,501	$257,232
Origin (8%)	$67,267	$48,200	$115,467
Santos (8%)	$67,267	$48,200	$115,467
Pangaea (4%)	$4,400	$48,200	$52,600
Federal Government (18%)	$135,632	$108,449	$244,081
NT Government (40%)	$440,929	$108,449	$549,378
Charles Darwin University (4%)	$0	$53,858	$53,858
Total	$852,226	$535,857	$1,388,083

7.1.2 Northern Territory Current Research Portfolio

A summary of all approved research projects in Northern Territory is provided in table 7.3 (* = completed projects).

Table 7.3 Approved Northern Territory Research Projects

RESEARCH SUBJECT AREA	PROJECT	SCOPE	OUTCOMES
Surface and Groundwater	Baseline monitoring of groundwater properties in the Beetaloo Sub-basin, NT	Understand the geochemical properties, recharge rates and recharge mechanisms of groundwater.	Sample and analyse groundwater in the Beetaloo Sub-basin, and create a set of baseline data against which any potential impacts caused by the gas industry can be measured. It will provide information about the baseline geochemistry and groundwater flow characteristics in the Cambrian Limestone Aquifer.
	Characterisation of the stygofauna and microbial assemblages of the Beetaloo Sub-basin, NT	To undertake a broad spatial pilot-scale survey of water bores in the Beetaloo Sub-basin, using direct sampling and DNA-based approaches to determine the distribution and abundance of stygofauna and characterise subterranean groundwater-dependent ecosystems.	Provide new knowledge concerning stygofauna and subterranean groundwater dependent ecosystems in the Beetaloo Sub-basin and Roper River system, a critical knowledge gap identified by the Final Report of the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory (2018).
	Environmental monitoring and microbial degradation of onshore shale gas activity chemicals and fluids	Better understand how typical onshore gas chemicals biodegrade in relevant aquifers and soil types in the Northern Territory.	Baseline information about microbial communities in aquifers and soils, and understanding how microbes influence degradation of chemicals typically used in the onshore gas industry in soils and aquifers in the Northern Territory. This information can also be used to gauge the health of groundwater ecosystems.
Greenhouse Gas Footprint	Baseline measurement and monitoring of methane emissions in the Beetaloo Sub-basin *	Understanding of the natural methane levels, over the various seasons, a baseline for accurately quantifying any future onshore gas impacts.	Monitor and measure background methane levels and rate of change in methane levels during the dry, wet, and fire seasons using mobile survey technology.

7.1.3 Northern Territory Research Progress and Expenditure

The committed Northern Territory research budget, expenditure and milestones completed for each project is provided in table 7.4 (* = completed projects).

Table 7.4 Committed research investment, expenditure and progress in Northern Territory, by project

RESEARCH SUBJECT AREA	PROJECT	ALLOCATED BUDGET	EXPENDITURE UP TO 30 JUNE 2019	PERCENTAGE OF BUDGET SPENT UP TO 30 JUNE 2019	PERCENTAGE OF MILESTONES COMPLETED UP TO 30 JUNE 2019
Surface and Groundwater	Baseline monitoring of groundwater properties in the Beetaloo Sub-basin, NT	$502,932	$290,280	47%	60%
	Characterisation of the stygofauna and microbial assemblages of the Beetaloo Sub-basin, NT	$331,890	$1,700	1%	0%
	Environmental monitoring and microbial degradation of onshore shale gas activity chemicals and fluids	$247,964	$31,125	13%	0%
Greenhouse Gas Footprint	Baseline measurement and monitoring of methane emissions in the Beetaloo Sub-basin*	$305,297	$290,280[22]	95%	100%
TOTAL ALLOCATED BUDGET		$1,388,083			

[22] Additional costs will be charged in 2019/20 associated with completion of knowledge transfer session.

7.2 Northern Territory research ideas being discussed for 2019/20

Approximately $1,798,429[23] cash remains available for new project proposals to be initiated in FY 2019/20.

The following projects ideas are being discussed, but are yet to be ratified and are subject to review by the relevant Regional Research Advisory Committee. Over coming months further stakeholder consultation will occur aiming to prioritise these research ideas in relation to other community issues.

Table 7.5 Future research ideas in Northern Territory for 2019/20

SUBJECT AREA	IDEA	POTENTIAL REGION	ESTIMATED COST
Greenhouse Gas Footprint	Mitigating Fugitive Gas Emissions from Well Casings.	NT	$370K
Surface and Groundwater	Improved approaches to long-term monitoring of decommissioned onshore gas wells	NT	$350K
Geology	Mitigating induced seismicity risk in the Beetaloo Basin	NT	$300K

[23] This figure is total GISERA funding for Northern Territory less $1,388,083 already committed to research (tables 6.1 and 6.2) and less anticipated costs for the Director's office/Communications for the life of National GISERA. The remaining research budget does not include future CSIRO in-kind contributions.

8 Proposed management and communication budget for 2019/20

Table 8.1 shows GISERA's actual management and communications expenditure during the 11-12 to 18-19 financial years and the proposed management and communications budget for 19-20.

Table 8.1 Proposed management and communications budget, 2019/20 with actual expenditure for 2011/12-2018/19

ITEM	SUB-ITEM	ACTUAL EXPENDITURE									2019-20	TOTAL
		Initial Alliance Agreement					National Alliance Agreement					
		2011-12	2012-13	2013-14	2014-15	2015-16 (Jul-Dec 15)	2015-16 (Jan-Jun 16)	2016-17	2017-18	2018-19		
Comms	Comms salary & OH	$188,899	$214,378	$259,429	$110,422	$95,405	$86,480	$163,470	$192,714	$172,939	$165,140	$1,649,276
	Travel & accom	$0	$0	$4,116	$3,490	$8,787	$11,039	$20,951	$14,868	$4,949	$15,000	$83,200
	Factsheets, brochures infographics, videos	$11,300[24]	$0	$600	$489	$0	$7,110	$19,537	$21,706	$26,433	$30,000	$117,175
	Public info. sessions	$0	$0	$0	$0	$3,145	$0	$3,312	$21,925[25]	$3,261	$13,000	$44,643
	Vodcasts	$0	$0	$3,000	$0	$0	$0	$0	$0	$0	$0	$3,000
	Printing	$4,520	$0	$296	$555	$2,109	$2,038	$1,324	$3,246	$1,219	$2,500	$17,807
	General Expenses & Annual report	$8,303	$21,937	$511	$3,507	$372	$2,922	$5,277	$4,632	$6,552	$6,000	$60,013
	Media training	$7,530	$689	$7,327	$10,741	$0	$0	$0	$0	$0	$0	$26,287
Comms total		$220,552	$237,004	$275,279	$129,204	$109,817	$109,589	$213,870	$259,091	$215,353	$231,640	$2,001,400

[24] Includes design & artwork for GISERA launch

[25] Includes GISERA's contribution and presence at CSIRO booth at APPEA Conference

ITEM	SUB-ITEM	ACTUAL EXPENDITURE									2019-20	TOTAL
		Initial Alliance Agreement					National Alliance Agreement					
		2011-12	2012-13	2013-14	2014-15	2015-16 (Jul-Dec 15)	2015-16 (Jan-Jun 16)	2016-17	2017-18	2018-19		
Director's office	Director salary & OH	$104,671	$148,924	$101,727	$204,799	$62,688	$61,827	$237,765	$336,191[26]	$314,055[27]	$439,187[28]	$2,011,834
	Admin support	$0	$25,801	$18,416	$167,848	$63,488	$68,411	$252,594	$409,412[29]	$315,639[30]	$260,881	$1,582,490
	Contractor	$0	$0	$0	$0	$0	$61,584	$168,292	$48,754	$0	$0	$278,630
	Travel & accom	$28,384	$13,653	$23,760	$48,129	$15,853	$42,619	$47,221	$48,282	$26,479	$35,000	$329,380
	Conferences	$0	$0	$0	$0	$0	$30,315	$10,524	$10,448	$3,525	$5,000	$59,812
	Annual Workshop	$0	$0	$1,859	$13,410	$10,279	$417	$4,848	$22,759[31]	$1,513	$10,000	$65,085
	Office supplies	$0	$0	$0	$0	$1,089	$7,648	$2,650	$292	$172	$1,500	$13,351
	Auditor	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,000	$3,000
Director's office total		$133,055	$188,378	$145,762	$434,186	$153,399	$272,821	$723,894	$876,138	$661,383	$754,568	$4,343,582
TOTAL (Director's office & Comms)		$353,607	$425,382	$421,041	$563,390	$263,216	$382,411	$937,765	$1,135,229	$876,736	$986,209[32]	$6,344,983

[26] Includes Director and Deputy Director's time to GISERA

[27] Includes Director and Deputy Director's time to GISERA

[28] Includes Director and Deputy Director's time to GISERA

[29] Includes Executive Officer and two Administration Assistants' time to GISERA.

[30] Includes Executive Officer and two Administration Assistants' time to GISERA.

[31] Includes two National Stakeholder Roundtable Group meetings

[32] This figure is the anticipated Director's office and Communications costs up to 30 June 2020 (not over life of National GISERA).

Table 8.2 Partner contributions – Initial Alliance Agreement 2011/12-2015/16

	COMMS & MNGT COSTS CONTRIBUTIONS	2011-12	2012-13	2013-14	2014-15	2015-16 (JUL-DEC 15)	2015-16 (JAN-JUN 16)	2016-17	2017-18	2018-19	2019-20	TOTAL
Initial GISERA	CSIRO	$176,804	$212,691	$210,520	$281,695	$131,608	$0	$0	$0	$0	$0	$1,013,318
	APLNG/QGC	$176,804	$212,691	$210,520	$281,695	$131,608	$0	$0	$0	$0	$0	$1,013,318
TOTAL		$353,607	$425,382	$421,041	$563,390	$263,216	$0	$0	$0	$0	$0	$2,026,636

Table 8.3 Partner contributions – National Alliance Agreement 2015/16-2019/20

	COMMS & MNGT COSTS CONTRIBUTIONS	2011-12	2012-13	2013-14	2014-15	2015-16 (JUL-DEC 15)	2015-16 (JAN-JUN 16)	2016-17	2017-18	2018-19	2019-20	TOTAL
National GISERA	CSIRO	$0	$0	$0	$0	$0	$172,083	$421,994	$540,891	$341,927	$364,897	$1,841,793
	DoIIS	$0	$0	$0	$0	$0	$45,889	$112,532	$267,161	$275,023	$345,173	$1,045,778
	NSW Government	$0	$0	$0	$0	$0	$68,834	$168,798	$151,862	$34,558	$73,966	$498,017
	SA Government	$0	$0	$0	$0	$0	$0	$0	$60,071	$87,673	$73,966	$221,710
	APLNG	$0	$0	$0	$0	$0	$19,121	$46,888	$28,711	$13,704	$14,793	$123,217
	QGC	$0	$0	$0	$0	$0	$19,121	$46,888	$28,711	$13,704	$14,793	$123,217
	Origin	$0	$0	$0	$0	$0	$19,121	$46,888	$28,711	$17,535	$14,793	$127,048
	Santos	$0	$0	$0	$0	$0	$19,121	$46,888	$28,711	$41,113[33]	$24,644[34]	$160,488
	AGL	$0	$0	$0	$0	$0	$19,121	$46,888	$400	$0	$0	$66,409
	NT Government	$0	$0	$0	$0	$0	$0	$0	$0	$43,837	$44,379	$88,216
	Pangaea	$0	$0	$0	$0	$0	$0	$0	$0	$7,661	$14,793	$22,454
TOTAL		$0	$0	$0	$0	$0	$382,411	$937,765	$1,135,229	$876,736	$986,209	$4,318,348

[33] Santos contributing to two regions

[34] Santos contributing to two regions

9 Communication

9.1 Overview

As gas exploration and development increases in regions around Australia, information about the onshore gas industry is being sought by local communities, governments, land-use industries (especially farmers), environmentalists and the wider public. GISERA's accessible, transparent research outcomes are well placed to contribute constructively and objectively to this need.

CSIRO GISERA plays an important role in providing trusted information about the challenges and opportunities associated with the onshore gas industry. Details of GISERA's communication goals are summarised in Section 10.2 Communication goals and KPIs.

Since launching CSIRO's GISERA in July 2011, the GISERA Director and CSIRO research staff have participated in 1130 engagements with a range of stakeholders, such as federal and state Members of Parliament, industry associations, community groups, research organisations, gas developers, journalists and consultants. A breakdown of this activity can be found in Table 10.3 Summary of Engagement over the life of GISERA.

CSIRO GISERA presentations at conferences, community information sessions and seminars continue to be key opportunities to inform stakeholders about research outcomes which address the social and environmental impacts and opportunities arising from onshore gas development. Examples of presentations can be found at Presentations.

Communication of CSIRO GISERA research has occurred through the use of traditional and online media channels, as appropriate, to reach wider community audiences. While the GISERA Director and CSIRO research staff provided 15 media interviews with traditional media channels, including print, television and radio in 2018-19, a key communication focus was development of innovative online communication products accessible directly by public audiences.

Communication highlights during this period include development of a range of communication products to showcase CSIRO GISERA research, including:

- GISERA e-newsletter Issue #11
- A video animation titled Onshore unconventional emissions, explained
- A video titled Unearthing conventional gas
- A video titled Investigating the potential health impacts of coal seam gas
- A video titled Update on air quality assessment in the Surat Basin
- A video titled Investigating the impacts of coal seam gas infrastructure on aminals and pastures
- A factsheet called Local attitudes and perceptions of CSG development: 2014 – 2018, providing the results of the 2018 CSIRO Community Wellbeing and Responding to Change survey in Queensland, Australia
- A factsheet called Community resilience and adapting during CSG development: 2014 – 2018, providing the results of the 2018 CSIRO Community Wellbeing and Responding to Change survey in Queensland, Australia
- A factsheet called Trends in community wellbeing during CSG development: 2014 – 2018, providing the results of the 2018 CSIRO Community Wellbeing and Responding to Change survey in Queensland, Australia

- A factsheet called Research on conventional gas in South East South Australia
- A factsheet called Investigating the environmental, social and economic impacts of conventional gas development in South East South Australia
- A factsheet called Groundwater characteristics in the Beetaloo Sub-basin
- A factsheet called Methane emissions in the Northern Territory's Beetaloo Sub-basin
- A factsheet called Cattle, pastures and coal seam gas – a case study
- A factsheet called Assessing the ambient air quality in the Surat Basin
- A factsheet called Decommissioning coal seam gas wells
- A factsheet called Potential water impacts of coal seam gas in the Pilliga Sandstone
- A factsheet called Groundwater contamination risk assessment
- An updated factsheet called Fugitive emissions from unconventional gas: What that latest scientific research is telling us about fugitive methane emissions from unconventional gas
- An updated factsheet called About us which provides an overview of CSIRO GISERA's aims, partners, communication and governance processes;
- An updated brochure called Summary of research projects which provides a progress summary of research by GISERA.

CSIRO GISERA's reputation as a provider of trusted advice to community has been enhanced by the past year's engagements with landowners, farmers and the local communities at a range of community and industry forums and rural shows, including:

- Presentation on 'Radiello monitoring data summary from Upper Humbug Road site' to community members from Wiembilla Estates on 7 August 2018;
- Community feedback sessions were held in Roma and Chinchilla discussing the findings from CSIRO 3rd survey of community wellbeing and attitudes to CSG development on the 1st to 2nd of November 2018;
- Meeting with local famer in Miles to communicate the final project report to the collaborating case-study farmer for an agricultural land management project on 14 December 2018;
- Research Workshop "Value of Local Gas" for the Assessing the value of locally produced conventional gas in South East South Australia project held in Mount Gambier on 8 March 2019;

Increased understanding of research results occurred through GISERA's knowledge transfer sessions for:

- Biodiversity project 5 Guidelines for offset population sizes, Brisbane July 2018;
- Water project 10 Groundwater contamination risk assessment, Brisbane, August 2018;
- Social project 9 Decommissioning CSG wells, Brisbane, August 2018;
- Water project 7 Impacts of CSG depressurisation on the Great Artesian Basin (GAB) flux , Sydney, August 2018;
- Water project 8 Spatial design of groundwater monitoring network in the Narrabri Gas Project area, Sydney, August 2018;
- Greenhouse project 3 Ambient air quality in the Surat Basin, Brisbane, September 2018;
- Agricultural land management project 6 Inside the herd, Brisbane, September 2018;

- Social project 10 Trends in community wellbeing and attitudes to CSG development – Survey 3, Brisbane, December 2018;
- Greenhouse project 1 Methane seepage in the Surat Basin, Brisbane, June 2019; and
- Greenhouse project 2 Whole of life cycle greenhouse gas assessment, Brisbane, June 2019.

Media interviews with lead CSIRO GISERA scientists discussed topics including:

- GISERA's overall research
- Partnership with the Northern Territory Government
- Methane monitoring in the Northern Territory
- GISERA research in the Northern Territory
- Decommissioning CSG wells
- Ambient air quality in the Surat Basin project

Table 9.1 Scientific presentations, poster presentations and interactions promoting GISERA research during 2018-19

EVENT	NAME OF PRESENTATION	PRESENTER(S)	LOCATION	DATE
International Association of Hydrogeologists (IAH) Congress	Presentation of modelling results from GISERA project 'Impacts of CSG depressurization on the Great Artesian Basin (GAB) flux'	Tao Cui	Korea	Sep-18
IG3IS/TRANSCOM workshop	Estimates of regional CH4 emissions in the Surat Basin, Queensland, Australia from in situ measurements and atmospheric inversion.	Zoe Loh	Sweden	Sep-18
5th Unconventional Gas Symposium	Environmental impact assessment of Coal Seam Gas depressurisation in Australia	Tao Cui	China	Nov-18
Queensland Department of Natural Resources, Mines and Energy's forum on "Social Impacts Research"	Findings from the GISERA 2019 CSIRO Survey of Community Wellbeing and Attitudes to CSG Development	Andrea Walton / Rod McCrea	Toowoomba	Apr-19
Queensland Department of Natural Resources, Mines and Energy's forum on "Social Impacts Research"	Sharing the research findings on the social impacts of resource development with staff who engage with landholders, industry and stakeholders	Andrea Walton	Toowoomba	Apr-19
The 39th International Association of Impact Assessment 2019 Conference	Chaired a panel session on "Applied Research on Social License" where GISERA social research findings were discussed	Tom Measham	Brisbane	Apr-19
APPEA 2019 Conference and Exhibition	A showcase of GISERA research and instrumentation featured. An innovative virtual reality booth which took delegates on a virtual tour of a coal seam gas well, supported by researchers, videos and fact sheets	N/A	Brisbane	May-19
APPEA 2019 Conference and Exhibition	Plenary Session - presented on 'Onshore gas industry coexistence in Queensland' during Plenary session: Perceptions of the modern industry.	Damian Barrett	Brisbane	May-19

EVENT	NAME OF PRESENTATION	PRESENTER(S)	LOCATION	DATE
Energy and Society in Transition Conference	Poster title 'The value of locally produced gas in diversified economies' which presented a summary of the 'Assessing the value of locally produced conventional gas in SA's south east' GISERA project.	Tom Measham	Arizona	May-19
International Symposium on Society and Resources Management	Presented the aims, method and findings from qualitative component of the 'Assessing the value of locally produced conventional gas in SA's south east' GISERA project	Tom Measham	Wisconsin	Jun-19

9.2 Communication outputs

A suite of communication tools have been used to ensure effective and meaningful communication of research outcomes. Table 9.2 shows a range of communication outputs GISERA has achieved over the last 7 years.

Table 9.2 Summary of multi-media communication outputs – Newsletters & Videos

COMMUNICATION TOOL	NAME OF COMMUNICATION PRODUCT	DATE FIRST PUBLISHED	LATEST EDITION	NUMBER OF VIEWS
Newsletter	GISERA e-newsletter (for both external and internal stakeholders)	December 2013 (bi-annual publication)	August 2019	N/A 304 subscribers Audience reach via: subscribers (304), website (84) plus 91 internal CSIRO email contacts.
Videos - CSIRO	Unearthing shale gas	October 2014	-	6,102
	Unearthing coal seam gas	September 2014	-	20,249
Videos - GISERA	What the latest scientific research is telling us about greenhouse gas emissions from onshore unconventional gas	July 2019	-	Total 2,815 LinkedIn: 1,752 Twitter: 955 Website: 108
	Unearthing conventional gas	October 2018		181
	Investigating the potential health impacts of coal seam gas	September 2018		123
	Update on air quality assessment in the Surat Basin	September 2018		84
	Investigating the impacts of coal seam gas infrastructure on animals and pastures	September 2018		75
	Gas Industry Social and Environmental Research Alliance: an overview	January 2018	-	239
	Air, water and soil impacts of hydraulic fracturing of CSG wells	March 2018	-	328
	Looking to the Future: Job forecasts for the Surat Basin, 2014 to 2034	Mach 2017	-	311
	Assessing the air quality in the Surat Basin	August 2016	-	483
	Telling the story	August 2016	-	163
	Methane seeps in the Surat Basin	September 2014	-	658
	Understanding groundwater movement	January 2014	-	662
	Collecting ants in coal seam gas development regions	June 2013	-	238
	Tagging turtles in Gladstone Harbour	May 2013	-	172
	Over view of surface and groundwater projects	March 2013	-	392
	Over view of agricultural land management projects	March 2013	-	504
	Over view of terrestrial biodiversity projects	March 2013	-	347
	Over view of marine environment projects	March 2013	-	205

COMMUNICATION TOOL	NAME OF COMMUNICATION PRODUCT	DATE FIRST PUBLISHED	LATEST EDITION	NUMBER OF VIEWS
	Over view of social and economic projects	March 2013	-	334

Table 9.3 Summary of multi-media communication outputs – Brochures and Factsheets

COMMUNICATION TOOL	NAME OF COMMUNICATION PRODUCT	NATIONAL OR REGIONAL	DATE FIRST PUBLISHED	LATEST EDITION
Brochures / info-graphics	Looking to the Future: Job forecasts for the Surat Basin 2014 to 2034	National	March 2017	-
	Community wellbeing and adapting to coal seam gas: Survey highlights and key messages	QLD	March 2017	-
	Research Progress Infographic	National	August 2013 (updates are ongoing)	June 2019
	Summary of research projects	National	May 2012 (updated as required)	May 2019
	Air quality assessment in the Surat Basin	QLD	May 2018	
Fact sheets	Local attitudes and perceptions of CSG development: 2014 – 2018	QLD	March 2019	-
	Community resilience and adapting during CSG development: 2014 – 2018	QLD	March 2019	-
	Trends in community wellbeing during CSG development: 2014 – 2018	QLD	March 2019	-
	Research on conventional gas in South East Australia	SA	February 2019	
	Investigating the environmental, social and economic impacts of conventional gas development in South East South Australia	SA	October 2018	-
	Groundwater characteristics in the Beetaloo Sub-basin	NT	October 2018	-
	Methane emissions in the Northern Territory's Beetaloo Sub-basin	QLD	September 2018	-
	Cattle, pastures and coal seam gas – a case study	QLD	September 2018	-
	Assessing the ambient air quality in the Surat Basin	QLD	September 2018	-
	Decommissioning coal seam gas wells	NSW	August 2018	-
	Potential water impacts of coal seam gas in the Pilliga Sandstone	NSW	August 2018	-
	Groundwater contamination risk assessment	NSW and QLD	August 2018	-
	Attitudes to CSG development in the Narrabri shire - Factsheet	NSW	April 2018	-
	GISERA and the Otway: Fast facts	National	March 2018	-
	Human health and CSG development: a framework to investigate possible health effects	NSW	February 2018	-
	Potential impacts of coal seam gas development on water flows to the Great Artesian Basin	NSW	October 2017	-

COMMUNICATION TOOL	NAME OF COMMUNICATION PRODUCT	NATIONAL OR REGIONAL	DATE FIRST PUBLISHED	LATEST EDITION
	New South Wales coal seam gas research projects: Update summary	NSW	September 2017	-
	What does science tell us about fugitive methane emissions from unconventional gas?	QLD	May 2017	July 2019
	About Us	National	April 2017	May 2019
	Methane Seeps in the Condamine River	QLD	March 2017	-
	Groundwater flows in the Hutton Sandstone and Precipice Sandstone aquifers	QLD	March 2017	-
	Surat Basin regional air quality, Queensland	QLD	February 2017	-
	Soil Compaction	QLD	May 2016	December 2016
	Understanding the way farmers see their farm.	QLD	May 2016	December 2016
	Access tracks and soil erosion.	QLD	May 2016	December 2016
	Community Wellbeing in the Western Downs: 2014 and 2016	QLD	May 2016	April 2017
	Community attitudes towards CSG development: 2014 and 2016	QLD	May 2016	April 2017
	Ensuring biodiversity offset success: the right kind of seed for a rare daisy (Rutidosis lanata)	QLD	January 2016	May 2016
	Characteristics of methane seeps	National	April 2015	April 2017
	Coal seam gas regions reverse rural decline trend	National	January 2014	-
	Community resilience	National	July 2013	-
	Rural change as a result of CSG developments and the associated economic impacts	National	July 2013	-
	Social licence to operate	National	May 2013	-
	Five fact sheets on coal seam gas extraction and some potential environmental impacts. Now incorporated on the FAQs page	National	April 2012 (updated as required)	April 2017

Table 9.4 Summary of multi-media communication outputs – Media releases, Presentations and Articles

COMMUNICATION TOOL	NAME OF COMMUNICATION PRODUCT	NATIONAL OR REGIONAL	DATE FIRST PUBLISHED	LATEST EDITION
Media Releases / Statements	Pangaea Resources Pty Ltd joins GISERA	National	March 2019	-
	CSIRO research shows good ambient air quality in the Surat Basin coal seam gas region	QLD	September 2018	-
	Coal seam gas is divisive, how can science help?	National	June 2018	-
	South Australian Government partners with CSIRO on South East Gas study	National	February 2018	-
	New NSW study to understand economic impact of gas in regional communities	NSW	November 2017	-

COMMUNICATION TOOL	NAME OF COMMUNICATION PRODUCT	NATIONAL OR REGIONAL	DATE FIRST PUBLISHED	LATEST EDITION
	Community wellbeing and attitudes to CSG around Narrabri, NSW	NSW	November 2017	-
	Australia Institute "discussion paper"	National	October 2016	-
	Live stream air quality data from coal seam gas regions	QLD	August 2016	-
	CSIRO research alliance expands into New South Wales	NSW	March 2016	-
	CSIRO conducting world's best practice methane emissions research	National	May 2015	-
	Landmark report reveals how regional communities really feel about coal seam gas	QLD	September 2014	-
	First ever coal seam gas scientific research alliance established	National	July 2011	-
Presentations	Briefings, seminars, workshop forums and conference presentations on unconventional gas have been given to scientists, students, teachers, the general public, government departments and members of parliament	National	Published as required	-
Articles	117 media articles have been published on GISERA and its research projects in the print media and online media portals. These have included Brisbane's Courier Mail, The Narrabri Courier, the Northern Leader (Tamworth), The Land, Australian Mining, Chinchilla News, Dalby Herald, Stock Journal, Rural Press, ECOS, Conversation, ABC Science, GasFields Commission e-newsletter, Australian Oil and Gas Review, AusIMM Bulletin, Australian Resources Magazine, Investment and Resourceful Magazine and Energy Magazine.	National	Ongoing	Ongoing

9.3 Stakeholder Engagement

GISERA aims to achieve credibility, trust and respect from all stakeholders through the open and transparent conduct and communication of its research and synthesis activities. Table 9.5 outlines the engagements for 2018-19 and Figure 9.1 shows stakeholder interactions over the last 9 years.

Table 9.5 Summary of GISERA engagements for 2018-19

STAKEHOLDER	NUMBER OF ENGAGEMENTS FOR 2018-19
Regional community	15
Gas Industry	33
Federal, State and Local Departments and Agencies	67
Media (includes print, TV and radio)	29
School/Educational institutions/Students	0
Research organisations	19
Industry associations	14
Business groups	9
Total	183[35]

[35] It is important to note here that these numbers of interactions do not take into account the number of individuals engaged in that interaction. For example, regional community group interactions can range from 20-360 participants and a gas industry interaction can be a technical meeting with only 1-10 participants

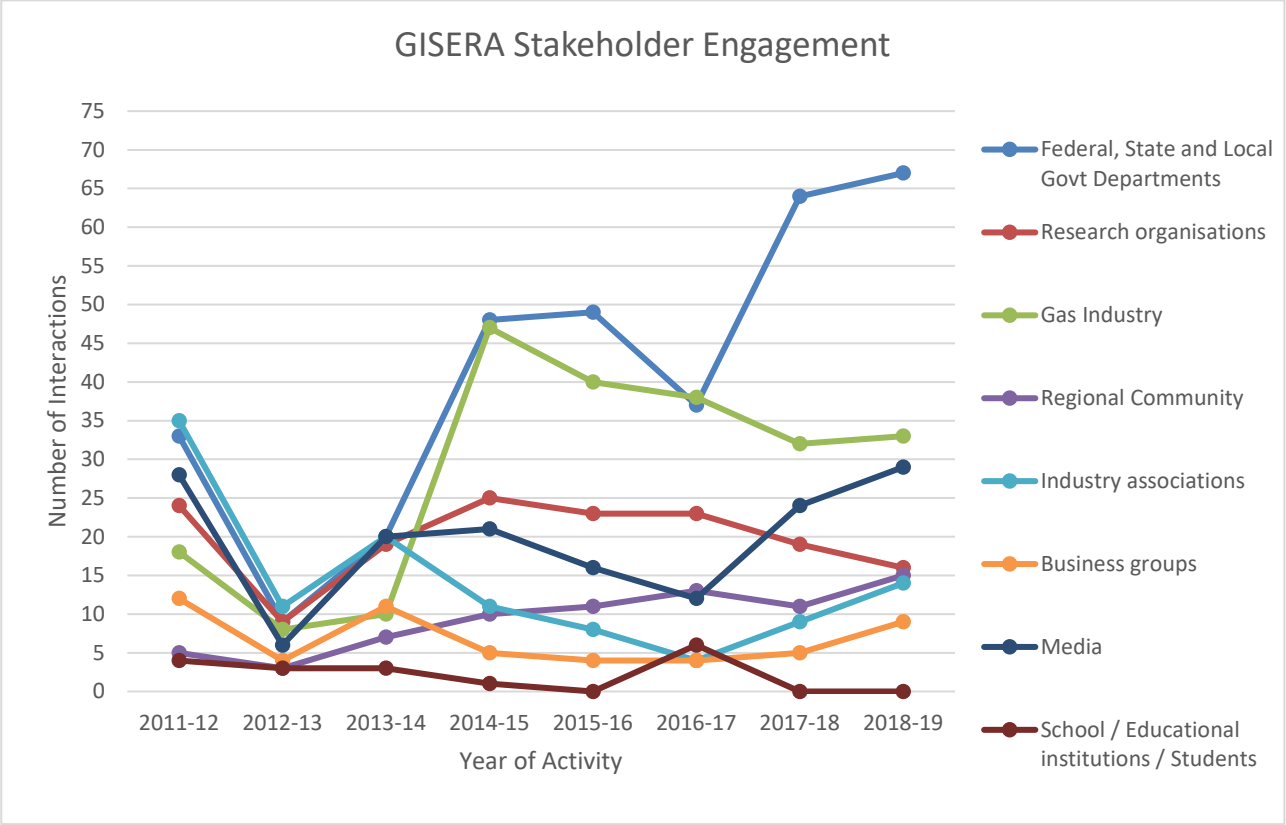


Figure 9.1 Stakeholder interactions from 2011/12 to 2018/19 - These numbers do not take into account the number of individuals engaged in that interaction. Regional community group interactions can range from 20-360 participants and a gas industry interaction only 1-10 participants.

10 Performance against KPIs

10.1 Overall KPIs

GISERA's key performance indicators are:

- Impact
- Capacity building
- Leverage
- Management.

Table 10.1 illustrates GISERA's performance against each KPIs specific assessment criteria from 2011/12-2018/19.

Table 10.1 GISERA's performance against its overall KPIs

KPIS	ASSESSMENT CRITERIA	PERFORMANCE (OVER LIFE OF GISERA)
Impact	Formal government, industry and community request for technical advice	GISERA's communication goals and KPIs tie in with this objective. GISERA has made significant impact in this area as detailed in Section 10.2
	Industry and institutional awards for innovative research	The 2015 Agriculture Director's Awards in CSIRO recognise the achievements of individuals and teams across 11 different categories. The GISERA Agricultural Land Management Team were nominated for and received the Collaboration Award. Team members included staff from CSIRO and USQ/NCEA.
	Publication of papers	Journal – 24 Conference – 36
	Citation of publications	520
	Conference invitations and presentations	250
Capacity building	Total number of research studentships	3
	Number of research studentships for residents of CSG and LNG operational areas	2
	Number of Masters and PhD theses awarded	1
	Number of Publication authorships by industry staff	Nil
Leverage	Participation from industry developers	Australia Pacific LNG, QGC, Origin, AGL, Santos, Pangaea through membership to GISERA and Arrow Energy (through Industry Leader's Group, APPEA)
	Participation from government departments and agencies	QLD Department of Natural Resources and Mines; QLD Department of Science, Information Technology and Innovation; NSW Environment Protection Authority; NSW Health; North West Local Land Services; NSW Department of Industry; NSW Department of Primary Industries; Department of Industry Innovation and Science; SA Department of the Premier and

KPIS	ASSESSMENT CRITERIA	PERFORMANCE (OVER LIFE OF GISERA)
		Cabinet, SA Department for Energy and Mining; NT Department of Chief Minister, NT Department of Primary Industry and Resources, ANU Energy Change Institute; and CSIRO
	Participation from non-government organisations	AgForce, Basin Sustainability Alliance, Australian National University, University of Queensland, University of Southern Queensland, University of New England, Lower Namoi Growers' Association, Country Women's Association of NSW, Livestock SA, South Australian Dairyfarmers' Association, Nature Foundation SA, Limestone Coast Grape and Wine Council Inc., Central Land Council, Northern Land Council, NT Chamber of Commerce, Kathrine Town Council, NT Farmers Association, NT Cattlemen's Association, Charles Darwin University, The Ethics Centre, National Farmers Federation, The Grattan Institute, The Australia Institute
	Number of universities, particularly those local to CSG and LNG activity, participating in research projects	University of Queensland, University of Southern Queensland, Queensland University of Technology, University of Sydney, University of Heidelberg, University of Newcastle, University of New England, University of Tasmania, University of Colorado, Charles Darwin University.
	Financial leverage, or the ability to multiply the research value of contributions	See section 3.1.1
Management	Percentage of research projects achieving target deliverables	72% of projects are complete and have achieved deliverables (38 projects) 20% of projects are currently meeting or exceeding target deliverables (11 projects) 6% of projects have only just commenced with milestones not yet due (3 projects) 2% of projects are not meeting target deliverables due to delays in obtaining required data (1 project). It is anticipated that this will be resolved before December 2019.
	Percentage of research projects meeting schedule	72% of projects are complete (38 projects) 7% of projects are currently meeting schedule (4 projects) 6% of projects have only just commenced with milestones not yet due (3 projects) 13% of projects currently have an amber light against a milestone (7 projects). It is expected that these milestones will be completed before October 2019. 2% of projects are not meeting research schedule due to delays in obtaining required data (1 project). It is anticipated that this will be resolved before December 2019.
	Percentage of research project meeting budget	62% of projects were completed within 5% of budget (based on aggregate average across the 33 projects). 17% of current projects are within budget (9 projects) 9% of projects are over budget (5 projects).

KPIS	ASSESSMENT CRITERIA	PERFORMANCE (OVER LIFE OF GISERA)
		6% of projects are currently overspent due to phasing issues (3 projects). This issue is expected to be rectified by the end of project.[36] 6% of projects are new (3 projects) with expenditure expected to commence in early 2019/20.

10.2Communication goals and KPIs

GISERA works to achieve credibility, trust and respect from all stakeholders through the open and transparent conduct and communication of its research and synthesis activities.

The strategic communication and engagement goals for GISERA are to:

- Engage with and build landholder, community, government and industry understanding of the impacts, risks, challenges and opportunities associated with onshore gas development
- Communicate information in plain English that helps to address knowledge gaps in environmental, social and economic impacts from onshore gas development, whether that is through original research or synthesis of existing independent and peer reviewed knowledge
- Raise awareness of CSIRO's public good research and its outcomes to inform public discourse, government policy development and gas industry best practice through GISERA
- Ensure GISERA's website is a trusted and citable source of information on gas development, social and environmental impacts, and opportunities.

A separate Communications and Stakeholder Engagement Plan guides GISERA communication and engagement outputs. Engagement plans are developed for new states where research is being undertaken, such as South Australia, as required. Effective government engagement also assists in identifying relevant processes and channels for communication, to promote adoption of research outcomes and positive impact from GISERA science.

Table 10.2 provides an overview of the performance to date in achieving GISERA's strategic communication goals.

Table 10.2 Performance against key communication goals

STAKEHOLDER	KPI (TARGET)	PERFORMANCE OVER LIFE OF GISERA
Government	Advice provided to senior bureaucrats / ministers / policy makers	Since July 2011, 258 invitations to provide advice, briefings and presentations were received from senior ministers and policy makers.
	Requests by policy makers for advice	These include Prime Minister and Cabinet Office, Queensland Premiers Office, NSW Department of Premier and Cabinet, and ministerial departments, the Independent Expert Scientific Committee on CSG and Large Coal Mining Development, state expert panels, Qld Agriculture Resources and Environment Committee, and a range of briefings to Queensland, NSW, South Australia, Northern Territory and federal parliamentarians,

[36] CSIRO is responsible for any budget overspend at completion of project.

STAKEHOLDER	KPI (TARGET)	PERFORMANCE OVER LIFE OF GISERA
		departments and agencies. GISERA input has been acknowledged in reports from inquiries, including the specific citing of GISERA publications in the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory Final Report, April 2018 and Interim Report, June 2017, and the Independent review of the national electricity market by Australian Chief Scientist Dr Alan Finkel, June 2017. The Queensland Department of Environment and Science have requested more science information and (potential) research in rehabilitation, financial assurance and residual risk reforms through GISERA's Knowledge Transfer Sessions. GISERA input has previously been sought by a range of governments and policy makers, including: During development of the Commonwealth's Government Domestic Gas Strategy GISERA and University of Queensland provided a briefing to Queensland Parliamentarians on 'The Science of GSG and Onshore Gas'. The Bureau of Resources and Energy Economics' (BREE) 2014 Gas Market report drew strongly on GISERA research, in particular the research on employment effects, household income and demographic change. Three GISERA publication outputs were specifically cited. Briefings on results from GISERA's community wellbeing and responding to change survey were provided to local government in the Surat Basin region, Chambers of Commerce, State members of Parliament and Queensland Resources. Stakeholder workshop involving SA Government bureaucrats and policy makers held in April 2018, instigating ongoing communications and relationship building with key government contacts.
Community	GISERA seen as trusted source of information by community	GISERA has had over 1130 engagements with a wide range of stakeholders over the last seven years (See Figure 9.1 and Table 10.3). As the onshore gas industry increases its exploration activities in Australia, this demand from GISERA is expected to increase. Continued requests from local and national media outlets on the science around potential social, economic and environmental impacts associated with onshore gas development (for example SBS Insight and ABC regional radios). CSIRO researchers through GISERA have engaged with landowners, farmers and the local communities at a range of community and industry forums and rural shows, including: Showcasing GISERA's agricultural research to CSIRO AgCatalyst, CSIRO's premier showcase of the latest innovations and technologies in agriculture and food, Sydney, December 2017 and December 2016; Presentations from GISERA Director Damian Barrett at several Northern Territory presentations, meetings, and community information sessions across NT, including Kalkaringji,

STAKEHOLDER	KPI (TARGET)	PERFORMANCE OVER LIFE OF GISERA
		Maningridge, Darwin, and Alice Springs, from July 2016 to March 2017; Groundwater research presentation on 'Innovative solutions to water challenges in WA', Perth, October 2016; Presentation of research findings from Inside the Herd project to community members from Miles in December 2018; Presentation of research findings from Ambient Air Quality project to community members from Weiambilla Estates in August 2018; Presentation of research findings from 2018 CSIRO Community Wellbeing third survey at community session in Chinchilla and Roma; Presentation of research findings from 2016 CSIRO Community Wellbeing to a range of forums, including the AgForce – UQCCSG Community Forum, to the Western Downs and Maranoa regions including local government, GasFields Commission Qld, special interest groups interested in CSG issues, and other community representatives, throughout 2016-17; GasFields Commission Queensland Community Leaders Breakfast: Dan O'Sullivan, Roma, June 2016; Stakeholder workshops on biological traits and ecological aspects for plant population viability, Health and CSG, Brisbane, May 2017; CSG well decommissioning workshop; and Expert workshop on health impacts of CSG scoping study, Brisbane, May 2017. Previously, CSIRO researchers through GISERA engaged with landowners, farmers and the local communities at the Miles Show (May 2016) and CRT Farmfest (June 2016) in Toowoomba. GISERA is sought as trusted source of advice to community on hydraulic fracturing at the Katherine Food Futures Roadshow (NT Farmers Roadshow), in July 2017. GISERA is sought as trusted source of advice on hydraulic fracturing and shale gas development at the Central Land Council Information Session in April 2016 (CLC represents the indigenous communities of the southern half of the Northern Territory). GISERA sought as a trusted source of advice on the drilling and proposed development of the deep gas project nearby (Warro Gasfield) managed by Latent Petroleum during the Badgingarra Community Forum in September 2015. GISERA sought as a trusted source of advice on impacts of gas development by KRED and Yamatji Marlpa (representatives of 33 Traditional Owner groups in WA) – community workshops for Yamatji were undertaken in July 2014. The Social and economic CSG research forum was held on November 2014 in Chinchilla and attracted stakeholders from state government departments, local government, service providers, local businesses, gas companies and community groups.

STAKEHOLDER	KPI (TARGET)	PERFORMANCE OVER LIFE OF GISERA
		The GHG and Agricultural CSG research forum was held on 22 April 2015 in Chinchilla and attracted 48 stakeholders from government departments, industry, Council, service providers, research organisations, landowners and community groups. The Marine environment CSG research forums were held in Brisbane and Gladstone on 11 and 12 August 2015 with 70 stakeholders from community groups, Council, service providers, research organisations, government and industry.
	Demand for GISERA's engagement is maintained as development progresses	GISERA has had over 1130 engagements with a wide range of stakeholders over the last seven years (See Figure 9.1 and Table 10.3). As the onshore gas industry increases its exploration activities in Australia, this demand from GISERA is expected to increase. Community members willing to participate in GISERA's Regional Research Advisory Committees across Australia. Local community members willing to be involved in GISERA research projects, for example Potential health impacts from CSG. Katherine Food Futures Roadshow (NT Farmers Roadshow), Damian Barrett hosted a long discussion about GISERA and fracking in the Katherine region, Katherine, July 2017; Presentation on GISERA's NSW research preliminary results to key community stakeholders within the Narrabri Community including representatives from EPA, NW Courier, North West Local Land Services, Narrabri Shire Council, Lower Namoi Cotton Growers Association, CFI Namoi Aviation, Member for Barwon, Yes2Gas, NSW Farmers, Narrabri CCC, Narrabri and District Chamber of Commerce, ABC Media, People for the Plains, Narrabri. September 2017; Presentation to Northern Territory Cattlemen's Association on NT fracking inquiry draft recommendations and potential research questions; GISERA continues to be a trusted source of advice on issues related to onshore gas development, including: Supplying management guidelines for biodiversity offset processes through knowledge transfer sessions for a translocation research project providing recommendations for rare daisy *Rutidosis lantana*, Brisbane, September 2016 and guidelines for population offset, July 2018. Advice to the agricultural sector regarding managing changes in rural areas brought on by the introduction of a CSG industry, through "Telling the story' project knowledge transfer session, Toowoomba, December 2016. Socialising outcomes of GISERA research on community functioning and wellbeing 3 to regional community groups in Roma and Chinchilla, November 2018. Socialising outcomes of GISERA research on community functioning and wellbeing 2, various meetings across councils and regional community groups in Toowoomba, Chinchilla, Tara, throughout November 2016, and Brisbane, February 2017.

STAKEHOLDER	KPI (TARGET)	PERFORMANCE OVER LIFE OF GISERA
		Knowledge transfer sessions on economical assessment and forecasting research to community and government groups in Toowoomba, December 2016, and Brisbane, February 2017. Previously, GISERA advice has been sought on issues such as the drilling process, well integrity, water safety and fracking by Badgingarra Community Association - community forum held on 2 September 2015. The Social and economic CSG research forum, held on November 2014 in Chinchilla, attracted stakeholders from state government departments, local government, service providers, local businesses, gas companies and community groups. The Greenhouse Gas and Agricultural CSG research forum was held on 22 April 2015 in Chinchilla and attracted 48 stakeholders from government departments, industry, Council, service providers, research organisations, landowners and community groups. The Marine environment CSG research forums were held in Brisbane and Gladstone on 11 and 12 August 2015 and attracted 70 stakeholders from community groups, Council, service providers, research organisations, government and industry.
Industry	GISERA members adopt practice change	CSIRO through GISERA has provided policy related advice to industry on a range of topics including groundwater reinjection strategies, agricultural engagement, socioeconomic advice and information for stakeholders of Gladstone Harbour. Furthermore, advice to Queensland and Federal governments has been incorporated into development of the regulatory environment towards improved industry best practice. Geochemical response to re-injection project work informed GISERA members and regulators about the required level of injectant pre-treatment to minimise adverse impacts on groundwater quality by reinjection
	Industry adopts methods for improving community engagement	In September 2018, industry representatives at the Knowledge Transfer Session for Inside the herd, discussed how they could change/improve engagement with landholders when discussing gas infrastructure design by using GISERA's water flow model results. In mid-2017, industry members indicated the implementation of new policies relating to management of farm gate closures in gasfield operations, following feedback emanating from research outcomes. In July 2016, researchers from the Community Wellbeing project met with Origin's Manager for Public Policy to discuss indicators of community wellbeing, resilience and social licence to operate. Origin were planning to conduct their own survey to monitor the community 'pulse'. After discussing findings, methods and measures from the CSIRO community wellbeing surveys, Origin planned to use 5 or 6 of the same items in their own survey to allow for comparison with CSIRO's 2014 and 2016 research findings. In this way, the community wellbeing research is feeding into industry benchmarks, standards and policies.

Continued demand for information and advice from GISERA shows that GISERA is meeting the needs of a range of stakeholders (see Table 10.3) and that it is seen as a source of trusted information and advice.

Table 10.3 Summary of engagements over life of GISERA

STAKEHOLDER	NUMBER OF ENGAGEMENTS OVER LIFE OF GISERA
Regional community	75
Gas Industry	228
Federal, State and Local Departments and Agencies	327
Media (includes print, TV and radio)	156
School/Educational institutions/Students	17
Research organisations	161
Industry associations	112
Business groups	54
Total	1130[37]

[37] It is important to note here that these numbers of interactions do not take into account the number of individuals engaged in that interaction. For example, regional community group interactions can range from 20-360 participants and a gas industry interaction can be a technical meeting with only 1-10 participants

GISERA
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