

GISERA | Gas Industry Social and Environmental Research Alliance

Summary of CSIRO's GISERA Research Projects

Queensland

Surface and groundwater Capacitancial response to minimizing, understand and quantify applier reactions occurring due to n=h-jection of CSR water, and their impacts on water quality. Be injection of CSR water understand, quality can manage cologing of hip-iciton wells during re-injection of CSR water permeaters, brites and blends. High performance groundwater moduling, edetermine the testibility of tage-scale n=hip-citon schemes. Isotope and geochemical groundwater moduling, collemants trave and assess the presence of organic compounds in groundwater found in the Sunt and Bown basins using dusitin the decreation in groundwater. Sunt and Bown basins - traview and assess the likelihood organul-water contamination trans the quality in the Sunt Basin - measuring and moduling specific chemicals called environmental travers to gain a botter understanding of the specied and director or Cacuadwater contamination in the Sunt Basin - measuring and moduling specific chemicals called environmental travers to gain a botter understanding of the specied and director or Cacuadwater contamination (R assessment in the Sant Basin - measuring in the Sant Basin in the Sant Basin in Sant Basin R. Queen Historical Latchir in the subality call transition to perturbative a comprehensities or perturbation in the sant Basin in southeast Queensiand on imp seams in the Wellow Coal Measures. Social and economic Monitomic regional Internation below the Wellow Coal Measures - investigate potential impacts of the produced from CSG operations in Queenaland's Sant and Bown basins. Queen seams in the Wellow Coal Measures. Social and economic Monitomic regional Internation Heldwithe Wellow Bas	RESEARCH AREA	PROJECT
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 Elstope and geochemical groundwater baseline study - characterise the baseline geochemical geochemical or dynamic compound in groundwater and tormation water prior to and during initial stages of development - Bydrostarons in groundwater, Stuart and Bowen basins using existing and an adverted from the Stuart Basin - measuring and modelling specific chemicals called environmental tracers to gain a better understanding of the speed and direction or Constructional and call impacts of hydrouils fracturing environmental tracers to gain a better understanding of the speed and direction or Construction and advironmental existing environmental tracers to gain a better understand advironmental fracturing environmental tracers to gain a better understand advironmental environmental tracers to gain a better understand advironmental impacts of hydrouils fracturing environmental tracers to gain a totage environmental tracers to gain a better understand controls and compared environmental tracers to environe engregement with stakeholders in the Coore Coore Creak fload modelling scenarias - development with stakeholders in the Coore - Bydrouils in the Surat Basin in southwast Queensland on impacts of CSG production in the Surat Basin in southwast Queensland on impacts and mobility of environments of transition environments and have local businesses can respond. Monitoring regional transition - synthesise existing project - understand future impacts on regional economics and have local businesses can respond. Understand constitut community explaints and the transition comming as a result of resource developments, and track the social community function and well-being and enderstand prove and enderstand prove advelopment - subtracer and existing project - understand future impacts on regional economics and businesses can respond. Monitoring regional transition - synthesise existing project - understand future impacts on regional economics and businesses can respond. <		High performance groundwater modelling - determine the feasibility of large-scale re-injection schemes.
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- ent to understand groundwater age and origin.
- g open source and company held data.
- of groundwater flow.
- oduction wells in the Surat Basin.
- hydraulic fracturing of gas production wells in the Surat Basin. er GBA region.
- nsland.
- portant water supply aquifers that underlie the target coal
- Bowen basins.
- cial impacts of regional economic change.
- , to understand how different community segments see the
- hancing community responses, and how communities
- ses and compare results with the Survey 1 in 2014. es to CSG development across different phases of industry
- eensland from the construction phase to a fully operational
- nomic impacts that are commonly linked to onshore natural
- ne emissions on a regional scale. in the Surat Basin.
- ating microbes, algae, brine and sediment play in the methane
- emissions, in both summer and winter, using rigorous
- e at various sites (including gas industry, agricultural,

thways, and screen data. micals requiring further in-depth assessment. Undertake a

study area to determine the abundance of RCS. Results will be

RESEARCH AREA	PROJECT
Agriculture	Preserving agricultural productivity - assist in the preservation of agricultural productivity during land use change.
	• 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' f
	<u>Gas farm design</u> - understand how to design farms for a new mixed land use.
	Making tracks, treading carefully - understand the direct and indirect impacts of tracks and traffic on invasive species and erosion in agricultural landscapes.
	Without a trace - identify the nature and likely extent of damage to agricultural soils, and methods for avoiding and improving soils.
	 <u>Telling the story</u> - share understanding of changes on farms and in towns during CSG development in the Surat area.
	<u>CSG and Livestock – Inside the Herd</u> - monitor grazing land with CSG infrastructure to better understand the impacts of CSG infrastructure, traffic and dust on animals and pasture to better understand the impacts of CSG infrastructure.
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.
	• 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 subst
	• 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-v
	• 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 (Rutido
	<u>Guidelines for offset population sizes</u> - improve the understanding of how ecological and biological traits of rare species of plants, commonly encountered in restoration projects
	population sizes by using computer models.
	 <u>Sustaining turtles and their homes</u> - understand how sediments from dredging and discharges affect seagrass and turtles.
	Identifying drought refuges for terrestrial species in the Cooper Basin - apply knowledge from aquatic environments to better manage terrestrial environments during natural gas environments to be the second
Land and	• Review of cements, steels and microbial activity for Qld CSG wells - collate details on materials used in well casings and cements from information contained within Well Compl
Infrastructure	related geological formations from published papers and CSIRO studies.
	• Cement degradation processes in coal seam gas wells in Queensland - investigate the potential for cement degradation and their processes in CSG wells under conditions (press
	encountered in the Surat region.

New South Wales

RESEARCH AREA	PROJECT
Surface and groundwater	 Impacts of CSG depressurization on Great Artesian Basin flux - improve understanding of the GAB groundwater flow in the Pilliga region through integration of existing information for Spatial design of groundwater monitoring network in the Narrabri Gas Project area - analysis and design of groundwater bore networks for optimal groundwater monitoring and ear Improving groundwater models to better represent coal seam gas extraction impacts in the Namoi region - develop more representative models for estimating the groundwater impediate contamination risk assessment - assess the likelihood of groundwater contamination from hydraulic fracturing and wellbore damage.
	 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 by helping to further improve the accuracy of future groundwater models in the Narrabri region. Microbial communities and their ability to degrade prospective chemicals used in coal seam gas activities - help improve understanding of the fate of chemical compounds used in were to come into contact with the environment.
	 <u>Geochemical modelling and geophysical surveys to refine understanding of connectivity between coal seams and aquifers</u> - improve our knowledge of groundwater systems in the the conceptual understanding of potential for hydrogeological connectivity pathways between shallow aquifers. <u>Groundwater modelling and predictive analysis to inform CSG impact assessment, monitoring and management</u> - undertake independent groundwater modelling and predictive a assessment and regulatory monitoring and management in the Narrabri Gas Project area. <u>Review of beneficial reuse or end-use options for brine from the Narrabri Gas Project region</u> - collate existing data on brine and salt management in the region; review existing and benefits of brine reuse and end-use options.
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 analyse whether or not the CSG industry could change the trajectory of these variables. 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 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 Assessing and projecting on-shore gas effects on regional economic activity - analyse the influence of the NSW on-shore gas industry on regional economic and social indicators, potential future effects for NSW. Monitoring community wellbeing and attitudes to CSG in Narrabri (pre-construction phase) - monitor any changes in local community wellbeing and attitudes to coal seam gas (CS Gas Project in NSW.
Greenhouse gases and air quality	• Regional Methane Emissions in NSW CSG Basins - identify and quantify methane emission sources such as CSG infrastructure, feedlots, coal mining, legacy bore holes in the Pilli
Health	 Potential human health effects of coal seam gas (study framework) - review current information to design a study on the health effects of CSG activities based on community stake industry input.
Biodiversity	• Remote sensing and threatened species surveys to better understand risks of forest fragmentation from the Narrabri Gas Project - determine how fragmentation resulting from Nar existing impacts from prior land use fragmentation on biodiversity in the region.

farms.

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tantial ecological impact. west Queensland on their habitat. *losis lantana*) in a new location. s, and different environmental factors determine viable

exploration and development in the Cooper Basin. letion Reports. Review information on microbial activity in

sure, temperature, groundwater chemistry) typically

from models, hydrochemical data and environmental tracers. rly detection of changes.

pacts from coal seam gas well fields.

al seams and shallow aquifers or surface water systems, and

in coal seam gas activities in the region if these compounds

e Gunnedah and Surat Basins in the Narrabri region and refine

analyses to inform coal seam gas groundwater impact

emerging technologies and solutions; analyse the costs and

d demographic variables in CSG regions within NSW and

community with respect to CSG development, and current

to decommissioning of wells and well pad infrastructure. and use economic models to generate descriptions of

SG) during the pre-construction phase of the Santos Narrabri

iga region.

eholder, governmental, expert consultation group, and

rrabri Gas Project land clearing activities will add to the

Northern Territory

RESEARCH AREA	PROJECT
RESEARCH AREA Surface and groundwater	 PROJECT Baseline monitoring of groundwater properties in the Beetaloo Sub-basin, NT - understand the geochemical properties, recharge rates and recharge mechanisms of groundwater. Environmental monitoring and microbial degradation of onshore shale gas activity chemicals and fluids - better understand how typical onshore gas chemicals biodegrade in rele Improved approaches to long-term monitoring of decommissioned onshore gas wells - investigate options for long-term monitoring of well integrity in decommissioned onshore gas wells - investigate options for long-term monitoring of well integrity in decommissioned onshore gas wells - investigate options for long-term monitoring of well integrity in decommissioned onshore gas wells - investigate options for long-term monitoring of well integrity in decommissioned onshore gas wells - investigate options for long-term monitoring techniques and technology, in the context of Northern Territory regulatory requirements Onshore gas water lifecycle management options framework - design an options framework and decision criteria for water and wastewater management for Northern Territory onsore asystems-based approach to understanding chemical water produced after fracturing, and in tanks and ponds in industry facilities in the Northern Territory. Characterisation of the stygofauna and microbial assemblages of the Beetaloo Sub-basin, NT - undertake a broad spatial pilot-scale survey of water bores in the Beetaloo Sub-basin. Examination of stygofauna ecosystems of the Beetaloo Sub-basin - build an understanding of the extent to which stygofauna present in bores reflect their presence more widely or chemical drivers that may determine where stygofauna exist and how communities may be connected. Environmental baseline characterisation of the springs Valley, NT - conduct a field campaign to collect detailed data on the geology, hydrogeology and ecology of the surveys.
Economic Greenhouse gases and air quality	 Prapping returned transport passages and volumes for improved planning and operation - dusing scenarios of both construction and operational phases of gas development, analyse sites and regions in the Beetaloo Sub-basin in the NT. Test a range of interventions that may increase road safety while reducing costs and impacts on the environment and local of Pathways for Indigenous socio-economic development in the Beetaloo region of the Northern Territory - explore how economic opportunities from shale gas and other projects (a values, and priorities of Aboriginal communities. 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 ac Mitigating Fugitive Gas Emissions from Well Casings - review current industry practice and conduct experimental investigations to evaluate techniques and assess new materials of from microfractures and gaps in gas well cement casing.
Agriculture	 Offsets for Life cycle Greenhouse Gas Emissions of Onshore Gas in the NT - seek feasible options to offset life cycle greenhouse gas emissions emitted in Australia associated with of onshore gas extracted from NT Beetaloo Sub-basin. Methane emissions quantification of well drilling to completion processes in Beetaloo sub-basin - use autonomous emissions monitoring stations to quantify fugitive methane emissions unconventional shale petroleum exploration in the Beetaloo sub-basin. Results from this study will compare actual measured results with estimated results to verify the ade Dutting lond menorement longularity and placement of gas in the period.
Agriculture	 Putting tand management knowledge into practice - develop nigh-quality spatial data to netp tandnolders, regulators, and the gas industry evaluate design and placement of gas in reduce erosion, soil damage and dust.
Biodiversity	 Understanding and managing impacts to biodiversity from roads and pipelines in the Beetaloo - investigate how roads, pipelines and other linear transport infrastructure may impact development of an onshore gas industry. UAV-LiDAR and spaceborne remote sensing for site survey and habitat condition monitoring in the Beetaloo - develop a scalable approach for monitoring the structural condition
Land and Infrastructure	 <u>Background Seismicity of Beetaloo Sub-Basin and Seismic Hazard</u> – establish long-term background seismic data to characterise the current natural seismic activity in the Beetal then be used to distinguish any possible increases in seismic activity resulting from future gas development and operations in the region. <u>Beetaloo basin shale long-term competency after decommissioning</u> – quantify the self-sealing competency of shales in the Beetaloo basin that sit between the target natural gas

Western Australia

RESEARCH AREA	PROJECT
Surface and	Groundwater baseline study of the Canning Basin, Western Australia – explore and summarise the current state of knowledge of groundwater systems in the Canning Basin, Western
groundwater	• Baseline groundwater and seismicity, northern Perth Basin – improve understanding of seismic activity and groundwater in the northern Perth Basin in Western Australia.
Social and	<u>Community wellbeing and attitudes to the energy transition in the North Perth Basin</u> - provide an in-depth understanding of how energy infrastructure projects in the North Perth Basin
Economic	local communities.
Biodiversity	Baseline assessment of the biodiversity of the Canning Basin, Western Australia - assess the current state of knowledge about the biodiversity of the Canning Basin in Western Australia
Land and	• Baseline seismic monitoring of the Canning Basin, WA - establish a long-term baseline of seismic monitoring data that will characterise the current natural seismic activity and cu
Infrastructure	Australia.
	Northern Perth Basin subsurface resources conflicts - helping communities, government and industry understand and resolve potential resource conflicts in the northern Perth Basin Subsurface resources conflicts in

want aquifers and soil types in the Northern Territory. as wells in the Northern Territory, including assessment of

shore gas development.

als and their lifecycle during hydraulic fracturing, in flow-back

sin, using direct sampling and DNA-based approaches to

within aquifers. It also aims to understand the physical and

ne Hot Springs Valley to augment data collected in previous

fer and the surface in the eastern extension of the Beetaloo

te disposal requirements, and their potential for

road and rail freight costs, flows and impacts for identified communities.

agriculture, renewables, etc) can support the aspirations,

ccurately quantifying any future onshore gas impacts. designed to minimise fugitive methane emissions leaking

th scenarios of new production and Australian consumption

nissions from well construction and completion activities equacy of existing calculated emission estimates.

infrastructure, protect surface water and vegetation, and

bact biodiversity in the Beetaloo Sub-basin during the

of vegetation in the Beetaloo Sub-basin. Noo Sub-basin in the Northern Territory. This baseline data can

seams and the shallow Cambrian Limestone Aquifer.

ern Australia.

asin region would affect the functioning and well-being of

stralia.

ltural seismic noise within the Canning Basin in Western

asin in Western Australia.

South Australia

RESEARCH AREA	PROJECT
Surface and	Onshore gas and water contamination: causes, pathways and risks - investigate potential groundwater contamination causes, pathways and vulnerability to understand onshore gas and water contamination causes.
groundwater	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
	Microbial degradation of chemical compounds used in onshore gas production in the SE of South Australia - understand biodegradation of certain chemical compounds used in on shore gas production in the SE of South Australia - understand biodegradation of certain chemical compounds used in on shore gas production in the SE of South Australia - understand biodegradation of certain chemical compounds used in one gas production in the SE of South Australia - understand biodegradation of certain chemical compounds used in one gas production in the SE of South Australia - understand biodegradation of certain chemical compounds used in one gas production in the SE of South Australia - understand biodegradation of certain chemical compounds used in one gas production in the SE of South Australia - understand biodegradation of certain chemical compounds used in one gas production in the SE of South Australia - understand biodegradation of certain chemical compounds used in one gas production in the SE of South Australia - understand biodegradation of certain chemical compounds used in one gas production in the SE of South Australia - understand biodegradation of certain chemical compounds used in one gas production in the SE of South Australia - understand biodegradation of certain chemical compounds used in one gas production in the SE of South Australia - understand biodegradation of certain chemical compounds used in one gas production in the SE of South Australia - understand biodegradation of certain chemical compounds used in one gas production in the SE of South Australia - understand biodegradation of certain chemical compounds used in one gas production in the SE of South Australia - understand biodegradation of certain chemical certain chemical certain ce
	Microbial degradation of chemicals and fluids in aquifers of the Limestone Coast, South Australia - demonstrate the potential for microbial degradation of chemicals used by the other sectors and the sectors and the sectors and the sectors and the sectors are sectors as a sector of the sectors are sectors are sectors as a sector of the sectors are sectors are sectors as a sector of the sectors are sectors a
	the Limestone Coast region of south east South Australia.
	• Decision support framework for future groundwater development scenarios in the south east South Australia - develop and test a decision support framework to improve manager
	consider probable future groundwater use scenarios, taking account of climate change and various future water use patterns for irrigation, forestry, onshore gas and other industr
Social and	<u>Community wellbeing and attitudes to conventional gas development in the south east of South Australia</u> - measure levels of perceived risk, benefits, knowledge, and other under
Economic	gas development in South Australia's south east, and develop baseline data on community values, well-being and future expectations.
	• Assessing the value of locally produced conventional gas in South Australia's south east - develop a profile of the gas industry and its role within the regional economy and develop
	• The role of gas in South Australia - clarify the role of natural gas in meeting the state's renewable energy, security, emissions and energy pricing goals.
Agriculture	Gas impacts and opportunities on primary industries - analyse possible impacts and opportunities from gas development for rural areas in South Australia's south east.
	• Perspectives on risk to local markets and industries - explore potential market impacts and associated concerns relating to the value of place of origin labelling and branding arisin

- gas water quality impacts for south east South Australia. uth Australia.
- onshore gas production in the southeast of South Australia.
- onshore gas industry across the Tertiary Limestone Aquifer in
- ement of groundwater resources. Research outcomes will ries in the south east of South Australia.
- rlying drivers of trust and social acceptance of conventional
- op scenarios for how the local gas industry may evolve.

ing from conventional gas development in south east of SA.