



CASE STUDY OF IMPACT
July 2017



Water in the resources sector



We work towards sustainable groundwater resources management by extractive energy and mineral resources sectors. Our research leads to manageable environmental impacts and greater socio-economic benefits.

The challenge

Australia's demand for water continues to rise with our growing population and the expansion of water intensive industries such as mining and agriculture. Better understanding is required by industry, government and society, of risks to groundwater and surface water from extractive industries, specifically coal, unconventional gas and ore-based mineral industries.

The response

Our research helps to develop tools to underpin assessments and respond to water regime alteration and social imperatives, enabling a greater capacity to manage risks to water dependent assets and to protect economic, social and environmental values.

Our research directions include:

Impact pathways characterisation: we develop methods for quantitative assessment of deep and shallow aquifer connectivities through faults, aquitard and legacy bores and examine the effect on surface water systems and water dependent ecosystems.

Impact measure: we develop methods to identify and quantify the successive, incremental and combined impacts on water dependent assets associated with water management by the extractive industry.

Social License to Operate (SLO) and stakeholders participation: we develop methods to incorporate the outcome of quantitative SLO for extractive industries in their effective water management and the platform for effective stakeholders communication and engagement.

Defining values at risk: we develop methods for quantitative valuation of environmental, economic and social water dependent assets, enabling a comparative analysis of values at risk to direct appropriate impact management and off-set strategies.

Effects/impacts attribution: we develop robust methods for cumulative effects measurement due to extractive industries impacts on water regime, across scales and processes, apportioning and attribution to various stressors (climate, industry, agriculture, cities) and beneficial uses.

Risk assessment and adaptive management: we develop methods for integrated risk assessment of multiple physical, economic and social stressors and uncertainties, including analysis of the requirements for, and effectiveness of risk management strategies.

Furthermore, we also develop and implement a framework for cumulative effects assessment and management encompassing multi-scale and multi-disciplinary integrated modelling platform and governance, integrating the platform for engaging with the stakeholders.

The engagement

CSIRO works closely with a range of partners and clients, including government agencies, planning and regulatory bodies, industrial partners, and NGOs to help streamline and create more certain processes for extractive industry development approvals, accounting for cumulative effect assessment and management.

CSIRO develops tools to help assess and manage cumulative effects from multiple operations on water resources and water dependent environments for the Australian resource sector industry as part of development planning and operations life cycle management. We account for multiple risks and uncertainties, and provide triple bottom line information and insights.

The results

Our research will enable the resources sector to adequately assess i) the individual (single operation) and cumulative (multiple operations) effects on water resources and water dependent environments and ii) the responses of water resources and the environment to multi-sector and multifaceted stressors that include resource-related stressors and other stressors (climate variability and change, land use change, water uses by other sectors), iii) the apportioning of cumulative effects to specific stressors; to measure and value community preferences and to establish efficient mitigation and rehabilitation strategies, iv) the connectivity between aquifers and major water bodies in regional, sub-regional and basin scale.

Sustainable water resources management by the extractive energy and mineral resources sectors has been achieved through efficient and socially accepted risk-based decisions and actions, including:

- by incorporating cumulative effects science and governance platforms, we have achieved manageable long-term environmental impacts and greater socio-economic benefits.
- improved assessments of deep and shallow aquifers connectivity and hydrodynamics in the context of coal seam gas and coal mining
- models for a quantitative assessment of deep and shallow aquifers connectivities, including faults, aquitard and legacy bores effects
- novel tools to support feasibility analysis and environmental impact measurements

- methods for comparative and quantitative valuation and evaluation of water dependent assets
- methods for better characterisation of the water resources and their responses to multiple stressors over regional scale and the longer term
- develop and demonstrate a comprehensive uncertainty quantification framework to improve policy decision making and investment confidence
- risk assessment frameworks synthesising qualitative and quantitative inputs to guide operational systems supporting adaptive management.

Our research aims to facilitate achieving a sustainability balance in the extractive sector and better understanding of risks to water assets from extractive industry total life cycle.

The outcome sought is for our partners and customers to have appropriate tools in assessment and response to ecosystem sensitivities to water regime alteration and social imperatives and to enable greater capacity to manage risks to water dependent assessment and to create economic, social and environmental values.



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