TRACKING THE BOOM IN QUEENSLAND'S GASFIELDS

Will Rifkin
Centre for Social Responsibility in Mining
Sustainable Minerals Institute
The University of Queensland

Vikki Uhlmann
Jo-Anne Everingham
Kylie May
Centre for Social Responsibility in Mining
Sustainable Minerals Institute
The University of Queensland

During rapid resource development in a highly contested arena, effective processes for characterising cumulative, social and economic impacts are needed. In this article, we explain a strategy that uses an iterative process involving stakeholders to identify indicators of impacts of onshore natural gas development. The aim of the strategy is to arrive at a small set of indicators that those in the community, government and industry agree are salient and credible.

Four major joint ventures are investing more than A$60 billion to tap Queensland, Australia's onshore natural gas resources. Thousands of wells are reaching into natural gas in seams of coal that lie below aquifers that residents refer to as essential for their heavily agricultural region. The magnitude of these developments has been depicted as threatening the traditional base of political power that has rested with farmers. Nearby coal mining has given some communities the experience of the boomtown cycle, but it is placing unfamiliar strains on municipal resources in other towns. Gas companies provide funds in attempts to mitigate impacts, satisfying requirements of their elaborate social impact management plans (SIMPs).

The research reported in this paper, though only mid-way to completion, suggests that an action-research approach to developing indicators of cumulative impacts on housing, business, employment, liveability and trust in government shows promise for enabling stakeholders to track the multi-faceted effects of a resource boom. We hope that such work helps stakeholders to mitigate the ups and downs of the cycle of boom, bust and recovery that can be driven by resource development.

Tracking cumulative impacts

The southern Queensland Western Downs and Maranoa local government areas are facing the cumulative effects of four megaprojects to extract coal seam gas (CSG) from the traditionally rural farm areas. The region lies a few hundred kilometres from the Australian state capital of Brisbane and 500 kilometres from the Gladstone port facility that will export the liquefied natural gas (LNG) derived from these gasfields. That gas, much of which is exported to Japan and China, promises hundreds of millions of dollars in royalties for the state government. This set of extraction projects has created cumulative social and economic impacts. Ways to understand, measure and respond to them is the focus of this article.[1]

We interpret the impacts of these megaprojects as 'cumulative' in line with Franks et al[2] as the successive, incremental and combined impacts (both positive and negative) of the resource development activity on society, the economy and the environment. To assess these impacts, the framework of five capitals guides us: natural, social, human, manufactured and financial.[3] These capitals can be considered as an expansion

[1] The research for this paper was supported by a grant from the University of Queensland's Centre for Coal Seam Gas (CCSG). This paper represents the views of the authors, not the CCSG nor its member organisations. CCSG is funded by the University of Queensland and by the coal seam gas companies: QGC, Santos, Arrow Energy, and Australia Pacific Liquid Natural Gas. Research ethics clearance has been granted by The University of Queensland.

[2] D Franks et al, 'Cumulative Impacts: A Good Practice Guide for the Australian Coal Mining Industry' (Centre for Social Responsibility in Mining & Centre for Water in the Minerals Industry, Sustainable Minerals Institute, The University of Queensland, 2010).

[3] For an explanation, see N Goodwin, 'Five Kinds of Capital: Useful Concepts for Sustainable Development' (Global Development and Environment Institute, Working Paper No. 03-07, Tufts University, Medford, Massachusetts, 2003) <http://www.ase.tufts.edu/gdae/publications/ working_papers/03-07sustainabledevelopment.pdf>.

of the more traditional triple bottom line of economic, social, and environmental elements of sustainability. Each form of capital is constituted by a 'stock' of resources or assets. In the case of human capital, for example, the stock is the knowledge and abilities of people in the region. That stock is added to, or possibly depleted, during the resource development trajectory in the region. In the case of the construction of a network of pipelines to extract natural gas, manufactured capital in the form of roads, gas compression stations, and water treatment plants is added. If development causes a stock to drop too low, and there is insufficient activity to bolster it, then the region becomes 'unsustainable'. For example, gas development may drive up house prices and encourage older residents to sell their homes and retire to the coast. That can deplete towns of older volunteers, which some social service organisations have traditionally relied upon, and it reduces the stock of grandparents available for family childcare. Alternatively, a region may be seen to flourish when human and social capital 'stocks' are growing, such as when construction activities draw young families to a region.

Our investigation of cumulative impacts in the region takes place in an already intensively studied area. The extent of surveying and committee work has induced 'consultation fatigue' among stakeholders.[4] Nonetheless, we have readily gained input from local residents, representatives of state and local government, individuals from non-government organisations and community groups and staff members from the coal seam industry and contracting organisations. The insights provided here also reflect hundreds of hours of documentary research – including analysis of company reports, state government reports and local economic development plans.

This article starts with a discussion of the geographical and social context of the research, providing an overview of the scale and potential impacts (both real and perceived) of coal seam gas development in southern Queensland. We then outline the role and limitations of state-mandated, social impact management plans in addressing the cumulative impacts of the four major coal seam gas projects in the area. We note how potential benefits and costs of such development would be seen and experienced differently by the different stakeholders - industry, government and the community, and we describe how these different frames of reference pose conceptual and practical challenges for aligning understandings and responses across the different sectors. To handle these challenges, we have undertaken to develop indicators of cumulative socioeconomic impacts. A university-initiated process to develop indicators in such a contested and heavily studied situation, we argue, should pursue the research in a way that facilitates action by stakeholders. We, thus, selected an action-research approach, which has appeal as a process to arrive at indicators that are widely accepted as salient and credible, and that involves cycles of consultation in selecting and refining the indicators. This article provides a snapshot of progress to date in our iterative cycles of indicator development. We summarise insights gained and conclude the article with a discussion of the implications for use of indicators as valuable 'boundary objects', which facilitate dialogue and shared learning among the varied stakeholders.[5] As boundary objects, these indicators of cumulative socioeconomic impact could contribute to a recognition of shared interests and common challenges among stakeholders. The hope is that indicator development helps stakeholders identify how they can collectively enable the region to avoid the decades-long cycle of boom, bust, and recovery typical of rapid resource development.

Scale and effects of coal seam gas development in Queensland

Coal seam gas development has involved significant investment and has affected thousands of people in a large, mainly agricultural region of southern Queensland. Current estimates identify the investment in coal seam gas projects based in Queensland's Western Downs and Maranoa regions as exceeding A$60 billion. These projects are occurring in an area with a population of just 45 000 individuals. That suggests an average investment of A$1.3 million per person, or more than A$40 000 per person per year for the life of the 30-year project. However, each individual is not receiving a cheque for A$40 000 per year. Rather, those funds are expended in areas such as the purchase of material inputs, and in salaries and the provision of accommodation for a fly-in/fly-out or drive-in/drive-out workforce numbering 12 500 workers.[6] Material

[4] C Hayward, L Simpson and L Wood, 'Still Left out in the Cold: Problematising Participatory Research and Development' (2004) 44(1) *Sociologia Ruralis* 95.
[5] G Bowker and S Star, *Sorting Things Out: Classification and its Consequences* (MIT Press, 2000).
[6] Queensland Government Statistician's Office, *Surat Basin Population Report, 2013* (Queensland Treasury and Trade, 2014) <http://www.oesr.qld.gov.au/products/publications/surat-basin-pop-report/surat-basin-pop-report-2013.pdf>.

inputs include thousands of kilometres of steel pipeline fabricated in Korea and other distant facilities, which are being installed to collect and transport the gas to the port for export. In other words, there is a massive investment per capita, but only a portion of that dollar value is remaining locally. The effects of the magnitude and distribution of this investment extends beyond local economic factors, reaching across the state borders and into the international sphere.

The scale of the CSG development can be seen in the size of the region affected. Petroleum leases are in the process of being developed on about 10 per cent of the land surface in a region that measures approximately 500 kilometres by 500 kilometres.[7] Mainly modest-sized cropping farms and large grazing properties cover the area.

A farm property of hundreds of hectares may host ten well pads (some fewer and some more), with associated roads and rights of way for pipelines. Natural gas that emerges from these wells is first separated from the salty water that traps it in coal seams. The gas is then collected in compression stations that send the gas north through a network of pipes to the LNG plant in Gladstone on Queensland's central coast.

The need to extract water from coal seams is a particular concern in this often-parched land. The thousands of CSG wells planned for the area were initially estimated to produce a volume of water equivalent to about 10-percent of annual agricultural water use.[8] The salty water that emerges from the coal seams comes from aquifers that are significantly deeper than those typically used by farmers. Current plans are to process most of this water to reduce salt content sufficiently to enable its use for agricultural and domestic purposes. The reverse osmosis (desalination) plants currently employed convert 90-percent of the incoming water for what is called 'productive reuse' for farmers and the community.

The Queensland government has identified a broad area where their modelling suggests that farmers' bores may drop by five metres or more.[9] By law, those farmers are entitled to 'make good' arrangements, where the gas companies must ensure an ongoing supply of water for them by drilling into deeper aquifers or piping (or otherwise supplying) water to them. Estimates of water volumes extracted by CSG development are a key concern. Questions arise about both gross estimates for the region and impacts on individual landholders, because the underlying geology is sufficiently varied that individual impacts are difficult to forecast. These questions add to the uncertainty about water availability to an area that is currently undergoing an extended drought.

The effects of changes in the local population – both permanent and temporary residents, also confront communities. Longer term local residents note that they see many new faces in town, but they question how long the newcomers will be present or what impacts they will have and what legacy they will leave. Some residents express concern about whether the gas company personnel, with whom they negotiate about drilling crew access to their properties, will still be stationed in the community six months later. In a more general sense, CSG development has meant a significant influx of construction workers, equalling a third of the region's resident population[10] – a surge of activity that is typical of a resource boom.[11] In addition, community relations staff of the CSG companies state that residents raise issues about traffic, changes in lifestyle with the influx of new people and local price inflation.

Handling cumulative impacts of CSG development

Perceived and anticipated cumulative impacts across several projects present significant challenges for all involved in managing the impacts. State regulators, historically, have focused on project-by-project approval based on environmental and social impact assessments by resource companies (called 'proponents'). CSG companies' impacts and reputations are hard to separate. They can become entangled with the impacts and reputations of other players, either competitors or contractors. Cumulative impacts are a particular challenge for residents and businesses. They face a boom, bust and recovery cycle on top of strong pressures brought on by the effects of drought and flood, shifts in international commodity prices (there is export of wheat and cattle from the region), and nearby development of mines that produce coal for export.

---

[7] Queensland Water Commission, *Surat Underground Water Impact Report* (Queensland Government, Department of Natural Resources and Mines (2012) <http://www.dnrm.qld.gov.au/ogia/surat-underground-water-impact-report>.
[8] Ibid.
[9] Ibid.
[10] Queensland Government Statistician's Office, above n 6.
[11] Ibid.

The extensive environmental impact statement that is required for each of the CSG projects includes a social impact management plan (SIMP) – a requirement that was recently reduced. SIMPs can run to hundreds of pages, representing millions of dollars of effort and months, if not years, of work by gas company staff and consultants. Each SIMP has played a central role in the state regulator's determination of the conditions of operation imposed on the project proponent. SIMP's, for example, specify how much repaving of secondary roads is needed to offset the impact of increased traffic by trucks used in construction of the gas pipelines. However, despite an aspirational requirement to include consideration of 'cumulative impacts', it is hard to discern in any one company's SIMP the specific measures to be undertaken to address those cumulative impacts. It is not clear to what extent cumulative impacts are addressed by investments in roads and infrastructure, in social services or facilities or in ongoing community consultation. Conditions of operation that the state has specified to the companies who are starting later require that the companies establish a forum to address cumulative impacts. However, specifics are not articulated in the stated conditions, and the government and its requirements have changed since the conditions were imposed, that is, made more lenient, as already noted.

Due to this tradition for government assessment and regulation to address individual projects, our academic study of cumulative socioeconomic impacts in the region could be seen as 'opening a can of worms'. There may be implications for the allocation of responsibility for cumulative impacts to the CSG companies, or among the companies. Similarly, responsibility might be expected to be shared between the CSG companies and the region's coal mining operations, which are another major non-agricultural presence.

Thus, this study acknowledges that there are: challenges in identifying cumulative impacts; challenges in attributing causes for them; and challenges in ultimately managing, mitigating or enhancing those impacts.

Framing

Our research project represents a search for viable ways to: (1) assess and track cumulative socioeconomic impact in a region that is seeing major development in extraction of coal seam gas; (2) engage stakeholders meaningfully; and, as a result, (3) supplement ongoing governance processes to ensure that this information is factored into the decision-making of key actors, particularly those in government and industry).

Processes for identifying indicators of cumulative socioeconomic impacts of resource extraction – including methods for collaborative development with key stakeholder groups – have been identified by previous studies, such as in relation to the mining of coal.[12] These methods were employed at the community level. We are exploring their applicability to the arena of coal seam gas development at the regional scale. This shift will require modifications to the processes employed previously.

Our aim is to develop indicators that will be used in ongoing decision-making, rather than in one-off generation of scenarios for prescribed reports. The research question here is how to extend attention to 'cumulative impacts' across the various sectors in the region via development and monitoring of a set of indicators. These indicators can, thus, provide a common frame of reference for ongoing decision-making among these stakeholders.

The notion of a frame of reference has been gaining attention in the social sciences since the work of noted sociologist, Erving Goffman.[13] Subsequent attention has been directed at use of various 'frames' in environmental disputes[14] and in discussion of science in government, the media and the community generally.[15] One attraction for researchers is the recognition that the adoption of contrasting frames of reference can result in disputes. In framing issues arising from the cumulative impacts of the coal seam gas industry, stakeholders in the study area are likely to identify certain factors or impacts as important 'in such a way

[12] D Brereton et al, 'Assessing the Cumulative Impacts of Mining on Regional Communities: An Exploratory Study of Coal Mining in the Muswellbrook Area of NSW' (Centre for Social Responsibility in Mining, Centre for Water in the Minerals Industry, and The University of Queensland, 2008) 2.
[13] E Goffman, *Frame Analysis: An Essay on the Organization of Experience* (Harper Colophon Books, 1974).
[14] S Kaufman, R Gardner and G Burgess, 'Just the Facts, Please: Framing and Technical Information' (2003) 5 *Environmental Practice* 223.
[15] M Nisbet, 'Framing Science: A New Paradigm in Public Engagement' in L A Kahlor and P Stout, (eds), *New Agendas in Science Communication* (Taylor and Francis Publishers, 2009).

as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation'.[16]

Indicators – facilitating learning

A set of indicators that different stakeholder groups agree are salient and credible could provide a basis for dialogue and exchange of knowledge. The indicators could thus facilitate learning by functioning as, what have been called, 'boundary objects'.[17] Boundary objects are things like maps, reports or tools that have meaning within one group but also have meaning in another group. For example, a map of farmland showing an array of coal seam gas wells in place and planned for that land has meaning to farmers and to CSG company staff, and is used by both. The map, thus, represents a boundary object. We are aiming for our set of indicators to play this sort of a role: a kind of 'map' that farmers and other residents, non-governmental organisations, local government, state government and industry can all use.

This set of indicators is meant to serve, as a map does, as a frame of reference, to point to an improved way of understanding causes and attributing responsibility. It should also help to identify the required courses of action and opportunities for collaboration among stakeholders to manage cumulative impacts satisfactorily.

Adopting a new frame of reference has been characterised by two UK academics, Meyer and Land,[18] as gaining understanding of a 'threshold concept'. A threshold concept represents a difficult, challenging idea or perspective that is highly significant, because once someone has mastered it, he or she never reverts to their previous, erroneous understanding; the person sees certain problems or situations in a new way. Simple threshold concepts that we have all gained are involved in learning to add or subtract. A more involved threshold concept, inherent in social science, is seeking to understand social impacts from the point of view of the people feeling the impact, rather than merely weighing up net benefits to a town or region from an outside perspective. In our case, a threshold concept could be embodied in enabling people to perceive this resource boom as a necessary part of a rural transformation rather than merely as step in a roller coaster over which they have little control, involving boom, bust and recovery. This particular shift in frame of reference represents recognition of the potential for positive outcomes,[19] rather than merely mitigation of negative outcomes.

Conceptualisation of indicator development as a learning process makes our research project more than just an assessment of cumulative socioeconomic impacts. The indicators, as boundary objects, could be particularly valuable in southern Queensland, where the worlds of the rural community, the coal seam gas industry, and the government's regulatory and development agencies intersect. In such situations, learning can be understood to be both an individual process and a social process. It can involve multiple perspectives and frames of reference as well as multiple stakeholders in dialogue, with this interaction resulting in new understandings and changes in practice.

The indicators can provide four mechanisms of learning: identification, coordination, reflection and transformation.[20] First, in terms of identification, Akkerman and Bakker[21] highlight the potential for legitimating coexistence among different actors by increasing mutual understanding of their diverse practices in relation to one another, rather than maintaining perceptions of separate and incompatible spheres of activity. For example, farmers and industry staff can recognise that they are both running legitimate businesses on the same landscape, and that they can adjust their respective practices to accommodate one another. However, Akkerman and Bakker acknowledge that this step is often politically sensitive, as each side can feel that they are surrendering something. Second, the indicators – and communication about them – may also create cooperative and flexible exchanges between those engaged in different practices so that activities and

[16] Entman 1993, 52, cited in O Renn, A Klinke and M van Asselt, 'Coping with Complexity, Uncertainty and Ambiguity in Risk Governance: A Synthesis' (2011) 40(2) *Ambio* 231.
[17] S F Akkerman and A Bakker, 'Boundary Crossing and Boundary Objects' (2011) 81(2) *Review of Educational Research* 132.
[18] J Meyer and R Land, 'Threshold Concepts and Troublesome Knowledge: Linkages to Ways of Thinking and Practising' in C Rust (ed), *Improved Student Learning - Theory and Practice Ten Years On* (Oxford Centre for Staff and Learning Development, 2003) 412.
[19] K Golden-Biddle and J Dutton (eds), *Using a Positive Lens to Explore Social Change and Organizations: Building a Theoretical and Research Foundation* (Routledge, 2012).
[20] Akkerman and Baker, above n 19.
[21] Ibid.

interactions run smoothly, even routinely, despite the absence of consensus. That suggests a state of mutual tolerance. Third, the indicators can allow people to make explicit their perspectives on the cumulative impacts as well as to understand the perspectives and knowledge of others. Finally, the collaborative co-development and monitoring of the indicators can lead to profound changes in practices, explicit recognition of shared problems, and instigation of measures to defuse confrontation. In these ways, identification of indicators through engagement of varied stakeholders can stimulate processes of reframing and learning.

Salience and credibility, cynicism and trust

As we develop the indicators through an action-research process, we are building on experience in the University of Queensland's Centre for Social Responsibility in Mining to understand the nature of cumulative impacts and develop indicators of impacts of resource development.[22] Indicators are being selected based on insights gathered from international literature and practice, as outlined in our recent article.[23]

We have two aims: (1) identification of salient and credible indicators of impact at the regional scale; and (2) ensuring that this information is used to inform the decision-making of key actors.

'Salient' indicators can be defined as those that suggest relevant and important implications for industry, government, residents of affected communities and others. 'Credible' indicators are those that draw on reliable data and are accepted as legitimate and appropriate by key stakeholders.

In this pursuit, 'consultation fatigue' – mentioned previously – is a concern, as some community members attend multiple consultative committees run by CSG companies, and surveys by industry, government, and university researchers are frequent. Members of one town's chamber of commerce rolled their eyes when staff from our research team were introduced as 'researchers'.

An action-research approach is being employed to cultivate engagement and increase the probability that insights will eventually be used. In part, that is because local, regional or national government did not invite our project; nor was it cultivated by the coal seam gas industry (although industry did provide project funding through the University of Queensland's Centre for Coal Seam Gas). Representatives from industry and government initially assessed the research proposal for relevance; it is monitored by such a reference panel. However, there is no agency or organisation that commissioned our work with the intention of acting on the outcomes.

The learning process is taking place in a context of intense interest, and we are not researching alone. There are more than 70 researchers and 30 social science research projects in Queensland and neighbouring New South Wales investigating various impacts of coal seam gas development. Our effort appears to be distinctive in its emphasis on cultivating working relationships across sectors rather than on just collecting data or recording peoples' experiences and aspirations. In essence, our search for indicators is being used to build trust and stimulate systems thinking, the ability to discern how different factors in this complex arena can affect one another.[24]

Select then refine the indicator set

We have enlisted industry and government – represented on a project reference group – in assisting us to identify a pilot set of indicators. These indicators include factors such as rental prices for housing. We are now in the process of 'populating' these indicators. That process includes obtaining data for the past 10 years on rental prices for three-bedroom homes in a target town, for example. The target town was selected on the advice of a regional community consultative committee (RCCC) run by one of the major CSG companies. The RCCC members noted how the town had experienced a sharp increase in CSG-related economic activity as a result of several of the CSG companies drilling wells and laying pipelines in nearby areas.

The target town is one of three that we will assess in 2014 to establish the spectrum of values for these indicators. That is, we will characterise towns that differ; for example, a town in the region that has seen

[22] See, eg, Franks et al, above n 2, 1; Brereton et al, above n 14, 2.
[23] V Uhlmann et al, 'Prioritising Indicators of Cumulative Socio-Economic Impacts to Characterise Rapid Development of Onshore Gas Resources' (2014) (in press) *Extractive Industries and Society* 1, <doi.org/10.1016/j.exis.2014.06.001>.
[24] See, eg, P Senge, *The Fifth Discipline: The Art and Practice of the Learning Organization* (Doubleday/Currency, 1990).

significant impact, another that residents identify as having seen little impact, and another in between. Placing communities along this spectrum helps to characterise the pattern or distribution of impact to a greater degree than statistics aggregated across the region could.

Data for our indicator set comes from figures tracked by local, state and federal government agencies, by peak bodies (eg, in real estate), by CSG companies (as mandated in their SIMPs), and by other academic researchers (as published or provided in the informed consent of participants).

We have identified a need for indicators of cumulative socioeconomic impacts in the areas outlined below. Each area has a heading, for example, 'housing' or 'employment' or 'training', that reflects government categorisations (ie, headings on websites about regional development). These headings also tend to be shared by chapter headings of CSG Company SIMP reports. So, the headings were selected to reflect characterisations internal to the groups we are studying rather than, for example, imposing the five capitals as headings. The indicators listed are for socioeconomic areas only. For now, we are counting on other researchers to identify physical and biological indicators of cumulative impacts related to water and the environment. Addressing these areas is beyond our expertise and resources.

The specific indicators below can be viewed in some ways as straw figures, foci that may change as we engage in consultation in cycles of refinement. As well, the data required to calculate a value for some indicators is not currently available in a consistent form. In other words, it is our aspiration to use these indicators but that aspiration may not be fulfilled at this time for all designated indicators.

1. Housing – sale and rental prices of housing in different market segments, and number of CSG workers living in camps.
2. Employment and business – household income distribution, number of local workers in target groups (eg, women, indigenous) employed by CSG companies and their contractors; potentially also a leading indicator, such as the number of new vehicle registrations.
3. Education and training – the percentage of residents and target groups (eg, women, indigenous) enrolled in and completing training or apprenticeships.
4. Liveability/community well-being – perceptions of change, captured initially in terms of the number of complaints about CSG workers (which each company tracks) and crime rate statistics as well as data from surveys or interviews on perceptions of CSG company responsiveness.
5. Land and water (as they affect farmers' livelihood) – perceived level of certainty about water quantity and quality, and sharing of land; for example, the number of land-access agreements and 'make-good agreements' (if bore water levels drop) between CSG companies and farmers, and the level of satisfaction with these agreements.
6. Governance – perceptions of trust in government; rates, taxes, and royalties paid past, present, and future; plus perception surveys by other researchers and industry or government.

The nature of these indicators, once they have evolved through our cycles of consultation, will be discussed in future publications.

Mundane local and global and sometimes difficult to capture

Efforts to date suggest that our indicators need to have meaning locally, at the town level, but have implications for regional impacts. The focus on local indicators of regional impacts reflects a need to account for the history of each community in the region, as each one was in a unique state when CSG development arrived and had a different capacity to respond. Thus, meaningful indicators need local granularity. As a result, indicators at a regional scale that are a single number may be inadequate. That is, for example, a regional average for rental price on a three-bedroom house would not be sufficiently meaningful. A regional indicator might best be represented in terms of an historical trajectory (eg, declining population) and a geographic pattern (eg, growth in a few areas but decline in others). Rapidly rising rents in a 'hub' town represent a different socioeconomic impact than moderated rents in a less central town 100 kilometres away.

Consistency can be an issue, as we have found disparities in how certain data is reported. For example, one CSG company has stricter criteria for classifying 'complaints' by local residents than other CSG companies. As a result, merely tallying complaints across the four companies is not necessarily a viable way to reflect community sentiment. That said, collecting such data and highlighting the disparities can stimulate useful dialogue, for example among CSG community engagement staff. That, in turn, can lead to means for com-

paring consistent data, and it can also generate useful discussion about community sentiments and their trends.

Indicators that are mundane can be 'ground-truthed' locally. For example, government figures on home rental prices are not as readily accessed as rental prices seen in the front window of a real estate agency. Our job is to confirm local sources of data that suitably track government's statistics, and vice versa. In other words, it is hoped that a small set of selected indicators will be figures that can be readily counted by local residents, and that the trends identified correspond with aggregated statistics gathered by government or industry. In this way, regional trends can be seen to reflect what people notice locally. That is, local experiences will fall on the spectrum or within the pattern of values captured in the indicators.

Exogenous factors that can significantly affect residents' welfare deserve an indicator. For an agricultural area, an exogenous factor would be annual rainfall (linked to flood and drought) because that has a strong impact on agricultural output. Also important would be currency exchange rates because they affect the region's substantial income from exporting agricultural commodities (eg, wheat and cattle).

Currency exchange rates are one example of an international factor that has a local effect. International forces can be tracked by employing local figures as well. For example, the price of fuel displayed at a petrol station has potential implications for the level of CSG development activity. That is because the price of natural gas – which determines how much CSG development occurs nearby, currently tracks oil prices – though this effect is diminished by the existence of long-term gas contracts. Oil prices affect motor fuel prices, as well, which are a significant input in agricultural production. So, the cost of fuel for farm machinery can be seen as indirectly tied to the likelihood of more CSG wells being drilled in the region in the future. An awareness of such forthcoming development can affect the strategies of drought-stricken farmers, either to sell their landholdings or retain them in the hope of gaining income by providing access to their land for the drilling of CSG wells.

Articulating such connections can assist people in seeing familiar data in new ways, in drawing useful implications from local data that reflects international factors. The ties between local, regional and international factors suggest that the cumulative nature of impacts on the region reflects complex processes. Specific implications of regional impacts might only be seen, in some cases, by consideration of several indicators. For example, local residents have voiced a desire for an increase in young adults and young families staying in the region.[25] However, this population rise can drive up housing prices and strain the capacity for childcare, which is purportedly under-staffed as its pay rates are much lower than those in the resources industry.

Conclusions

Thus, our efforts to date with pilot indicators of cumulative socioeconomic impacts suggest a need for figures or patterns of data that enable local residents to see how they fare relative to the region as a whole (and, some would suggest, in relation to benchmark communities elsewhere). Employees of industry and government need to see the value in such local data and the value in consistency across organisations in recording information for public use. The juxtaposition of data about different domains – for example, housing costs, fuel prices, and training opportunities – have the potential to reveal multiple dimensions of what are felt as individual impacts. For example, rising housing costs do not merely respond to local inflation but can also reflect the desirability of the area to young families. So, tracking the boom brought on by development of coal seam gas in southern Queensland is more than a process of 'data crunching'.

Our search for indicators employs an action-research approach to cultivate agreement on the nature and likelihood of cumulative socioeconomic impacts of CSG development in this resource region. In so doing, we are engaging disparate stakeholders and attempting to overcome the challenges posed by their differing perspectives and interests by finding common ground in the designation of indicators. Through this process, we are trying to turn a daunting task of data collecting and processing into a collective learning opportunity, using indicators as a boundary object26 among these groups. The hope is that the dialogue that results can transcend a conversation about blame – 'CSG stole our water' or 'government regulation stymied our

[25] R Williams and A Walton, *Community Expectations and Coal Seam Gas Development: A Milestone Report to GISERA* (CSIRO, 2014) <http://www.gisera.org.au/publications/tech_reports_papers/socioeco-proj-5-community-expectations.pdf>.
[26] Bowker and Star, above n 6.

best intentions'. What can emerge is more of an emphasis on discussion of what can be done next – and by whom - to enable the region to flourish. This shift from blaming to constructive dialogue is intended to support resilience, connection and collaboration in rural regions affected by intense resource extraction.

Potential shifts in policy and practice that can help to enable long-term benefits to be garnered from the CSG boom are beginning to emerge. The most promising aspect of these shifts is that they appear to be forward thinking. They seem to reflect lessons learned in CSG development that some would say occurred a bit too rapidly for government.

The state government is shifting from highly specified SIMP categories and extensive reporting to operating conditions that emphasise outcomes for communities. For example, instead of the state regulator agreeing to a company's proposal to invest $2 million in building a community centre, the state has deemed that the resource company and local community need to agree on what serves the community best. This change from practice-based to outcomes-based requirements shifts responsibility from the government (in specifying the right boxes to tick) to the resource companies (in generating specific outcomes). However, such a change has dangers. Those experienced in this arena indicate that local politicians can specify the building of infrastructure that will boost their re-election chances. That hazard might be avoided through a consultative form of negotiation about desired outcomes between companies and affected communities.

Communities can gain long-term benefit from CSG development through the building of local capacity. This term – building capacity – has started to gain currency in the CSG industry. This shift corresponds with a change underway from a strong push in construction to a more operational mode. That is, following from completion of each company's 500-kilometre pipeline and the connecting network of pipes from well fields. The change means that companies will have fewer employees and contractors in these communities, and their mandated community investment each year will be significantly less. This declining presence means that CSG company staff are facing high expectations for community investment and a rate of spending with local businesses that will not continue. So, industry staff can be seen to be employing the term 'building capacity' to reflect a company aim for communities themselves to address problems. The companies could be seen to prefer that a lack of affordable housing, for example, is handled by local stakeholders and state government rather than by ongoing investment by the CSG companies.

The state government recently instituted a 'Royalties for Regions' program. This program allocates royalty revenues from resource extraction to building infrastructure in rural areas where that extraction is occurring. The Queensland program follows a similar one instituted in Western Australia. The first year of the program in Queensland saw funding go mainly into building roads and sewage treatment plants in areas affected by coal mining and coal seam gas development. For the second year of the program, the funding strategy was altered to enable funds to go to regions where resource development had not recently surged. This shift holds promise if such investments are oriented to building infrastructure in areas that will soon see a resource boom. Such investment before a boom occurs can be recognised as one form of 'building capacity'.

This notion of being forward thinking and orienting state and company investment to build capacity would be our recommendation for policy and regulation. Such an orientation is evident in current regulation and company SIMPs, but it is not clear the extent to which current practices cultivate the necessary level of community engagement. Therein lies our intended contribution – the engagement of local stakeholders in an iterative, dialogue-based process of selection of salient and credible indicators of cumulative socioeconomic impacts. A town-level approach to characterise a region, with a forward thinking orientation, seems worth exploring.