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Methodological and Ideological Options

Evaluation of social externalities in regional communities affected by coal seam gas projects: A case study from Southeast Queensland

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ABSTRACT

This paper examines the evaluation of social externalities in regional communities affected by four major coal seam gas (CSG) projects in the Surat Basin region of Southeast Queensland, Australia. Using a mixed-methods approach, cross-sectional survey ($n = 428$), and structural equation modelling (SEM) the results of this study reveal community perceptions of rising economic inequality, collective sense of uncertainty about the future, and negative impacts on the standard of living in the affected regions. For example the majority of the respondents are concerned about: the rising cost of living in the area (83.4%), the long-term impacts on groundwater (77.4%), and how their community is being affected (77.3%). We found that perceptions of fairness and inequity weigh heavily, especially on farmers, and correlate to negative psychosocial effects. Our analysis shows that unresolved concerns of community residents about environmental and social issues and the loss of confidence in the local government, contribute to lower life-satisfaction, inhibit the community's ability to plan for the future, and lead to a weaker local economy.

1. Introduction

Globally, an increasing number of agricultural and regional communities are being affected by Coal Seam Gas (CSG) and other large-scale resource extraction projects (Franks et al., 2010; Tonts and Plummer, 2012). In Australia, regional communities, especially the ones that underpin the resource sector, are continually experiencing pressures as the result of rapid economic development associated with major resource projects (Barber et al., 2013; Measham et al., 2013; Tonts et al., 2012). The scale and speed of development of resource megaprojects in Australia over the last decade have introduced numerous new social challenges for regional and local economies such as dramatic inflation of housing and accommodation costs, economic polarization, labor shortages in non-resource-extraction industries, and community cohesion pressures associated with continued expansion of the itinerant workforce (Carrington and Pereira, 2011; Hossain et al., 2013; Petkova-Timmer et al., 2009; Rolfe et al., 2007). As the size and complexity of major resource projects increase, so do their social and environmental externalities.

Studies examining the relationship between the resource sector and regional communities have confirmed that better understanding is required about the socio-cultural dynamics at the community level, and how cumulative impacts of major industrial projects are contributing to variations in community well-being over time (Franks, 2012; Hajkowicz et al., 2011; Tonts et al., 2012). On a broader level, ecological economics and sustainable development literature have long addressed the need for recognition of environmental and social externalities associated with large-scale economic development (Daly and Farley, 2010; Hawken et al., 2010). Externalities are typically not reflected in economic transactions, they do however, have a direct impact on people's welfare and community sustainability, and thus on economic value. Social externalities refer to the positive or negative consequences of an economic activity on social capital and on the quality of life of another (Costanza et al., 2007b).

The fundamental proposition of sustainable development, which focuses on the relationship of what is to be sustained namely ecological and social systems, and what is to be developed namely the economy and society (Brundtland, 1987; Elkington, 1998; Hawken and Niznik, 1992) in principle underpins most corporate social responsibility policies (Anielski, 2002). Furthermore, preserving ecological systems is now a key normative goal in regulatory frameworks and project decision making. This paper argues, however, that preserving social systems and the intangible goods and services they provide is not yet common practice in the resource sector (Thompson, 2008), and is often mixed

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with efforts directed towards earning the social license to operate (Martinez and Franks, 2014).

Increasing scrutiny and a growing demand for greater transparency in the assessment of social impacts are contributing to a shift towards project decision making that meets and maintains the sustainability priorities of the community (Franks, 2012; Haslam Mckenzie, 2013; Prno, 2013; Rolfe et al., 2007). Better understanding of the long term sustainability needs of the community and the multiple interacting drivers that affect quality of life is especially relevant for resource extraction projects with massive footprints, also known as megaprojects (Fischer and Amekudzi, 2011; Flyvbjerg, 2007).

In recent decades, megaprojects have given rise to gigaprojects—capital projects greater than USD$10 billion. This transition is driven by the need to compete in the global marketplace and maximize the economies of scale (Galloway et al., 2012; Merrow, 2011). Subsequently cost overruns, delays in completion schedule, and operability problems have also become more common (Flyvbjerg et al., 2009; Williams and Samset, 2010). The pressure to deliver on budget and schedule and reliance on standard institutional frameworks and regulatory practices have yielded significant shortcomings in managing and addressing social externalities (Cheshire et al., 2014). Significant limitations have also been identified in industry's approach to social impacts and the social dimension of sustainability assessment (Colantonio, 2011; Missimer et al., 2010). Lack of standardized techniques for evaluating social externalities in a megaproject context (Magee et al., 2013) has also contributed to shortcomings in minimizing negative social impacts.

Previous studies have demonstrated that communities affected by megaprojects face socio-economic, socio-environmental, socio-institutional and socio-cultural changes and challenges (Carrington and Pereira, 2011; Downing, 2002; Hilson, 2002; Rolfe et al., 2007; Sharma, 2003). In this paper, we present findings and examine emergent themes for evaluating social externalities of major resource projects from a study of ten regional communities affected by four major coal seam gas (CSG) projects in the Surat Basin region of Southeast Queensland, Australia.

2. Study Context

2.1. Site Study Area

The scope of this research study focused on CSG/LNG megaprojects in the Surat Basin in Southeast Queensland, Australia. Coal seam gas (CSG), also known as unconventional gas, poses spatially extensive impacts on rural communities compared to other forms of resource extraction projects, and tends to overlap other land uses, usually agriculture (Measham & Fleming, 2014). The predominately agricultural region of the Surat Basin has experienced a surge of industrial activity, itinerant workforce and rapid economic development as the result of four major coal seam gas/liquefied natural gas (CSG/LNG), starting in late 2006 and peaking between 2011 and 2014 (Queensland Government and D. S. D. I. P., 2014). The projects associated with the Queensland CSG boom are listed in Table 1.

The Surat Basin is a geological basin that extends across an area of 270,000 km^2. Two thirds of the basin occupies a large part of Southeast Queensland, and the remainder is in northern New South Wales. The communities in this region are situated above the Great Artesian Basin, the largest and deepest artesian basin in the world. The Great Artesian Basin provides the only reliable source of fresh water through much of inland Australia (Habermehl, 2006). The site study area for this research is shown in Fig. 1. The study area included the communities of Dalby, Cecil Plains, Chinchilla, Miles, Tara, Condamine, Wandoan, Taroom, Roma, Injune and the surrounding districts, with an approximate population of 38,000 permanent residents (ABS, 2012).

Table 1
Integrated CSG/LNG projects in the Surat Basin (Department of Natural Resources and Mines, Queensland Government).

PROJECT ACRONYM Estimated Construction Value	PROJECT NAME (Operating Company)	PROJECT SPECIFICS
1 APLNG $30 billion	Australia Pacific LNG (Origin/Conoco Phillips/Sinopec)	Joint venture between Origin Energy—37.5%, Conoco Phillips—37.5% and Sinopec—25% Gasfields: Walloons Gasfields, stretching from Injune to Millmerran Pipeline: from gasfields to Gladstone Processing plant and export terminal: Curtis Island, near Gladstone
2 GLNG $30 billion	Gladstone LNG (Santos/Petronas/ Total/KCXiAS/)	Joint venture between Santos Limited—30%, Petroliam Nasional Berhad (PETRONAS)—27.5%, Total—27.5% and KOGAS—15% Gasfields: around Roma, Emerald, Injune and Taroom, Pipeline: a 435 km gas transmission pipeline from the gas fields to Gladstone Processing plant and export terminal: Curtis Island, near Gladstone
3 QCLNG $30 billion	Queensland Curtis LNG (QGC) BG Group Purchased by Royal Dutch Shell in 2015	Gasfields: around Dalby, Chinchilla, Tara, Condimine, Miles. Roma—largest coal seam gas operations in the Surat Basin. Pipeline: gas and water pipeline network of approximately 800 km from the gas fields to Gladstone Processing plant and export terminal: Curtis Island, near Gladstone
4 AI.NG $20+ billion	Arrow LNG (Arrow CSG (Australia) Pty Ltd. (Arrow Energy)—Royal Dutch Shell & Petrochina Company Limited)	Joint venture between Royal Dutch Shell—50% and Petrochina—50% Gasfields: Parts of Darling Downs and Western Downs Pipeline: between Gladstone City Gas Gate and Curtis Island Processing plant and export terminal: Curtis Island, near Gladstone

2.2. Conceptual Framework for the Evaluation of Social Externalities

The purpose of developing the conceptual framework was to guide the empirical investigation of this study by operationalizing evaluation of social externalities of major resource projects from a social sustainability perspective. Research shows that communities that reflect social sustainability are also: equitable, socially connected, democratic, allow for socio-cultural identity and diversity, have access to natural and built capital, and provide the capacity to improve quality of life (Black, 2005; Colantonio and Lane, 2008; Sachs, 1999). In addition, Colantonio (2007) emphasized that social sustainability occurs when formal and informal processes, systems, structures and relationships actively support the capacity of current and future generations to create healthy and livable communities.

The conceptual framework was designed to help understand the role socio-environmental, socio-economic, socio-institutional and social-cultural factors have on perceptions of quality of life in regional

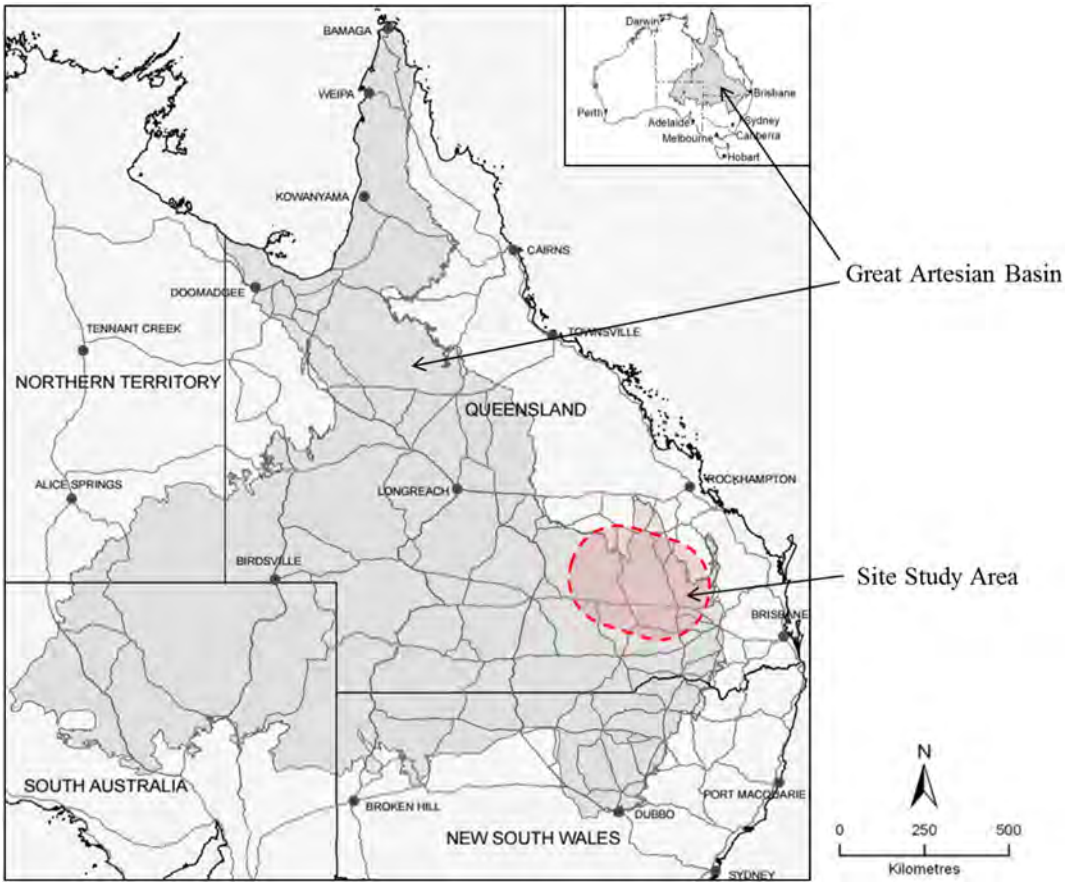

Fig. 1. Map of study area.

communities affected by megaproject development. The theoretical concepts used in the development of the framework stem from the disciplines of ecological economics, psychology, and the multidisciplinary concept of social sustainability and utilized the following: the Four Capitals Model, Quality of life (QOL) as per Costanza et al. (2007a), Max-Neef's model of Human Scale Development (Max-Neef et al., 1991), and Maslow's Five-stage Model of Basic Human Needs (Maslow, 1943), and components of social sustainability derived from literature as shown in Fig. 2.

This conceptual framework is based on the understanding that the capacity to improve sustainable QOL is dependent on the interaction of four basic categories of capital assets: Natural, Built, Human, and Social (Costanza et al., 2008). Each type of capital is of inherent value and investment in one will not fully compensate or substitute for lack of

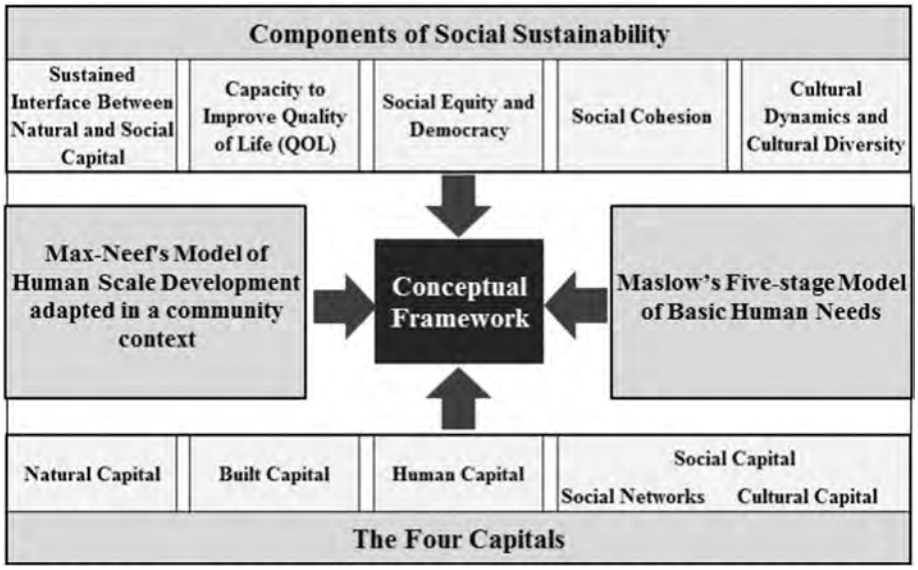

Fig. 2. Theoretical underpinning of the conceptual framework.

investment or loss in another. In this context the definition of QOL as per Costanza et al. (2007a), integrates both objective and subjective assessments of QOL and describes it as '*The interaction of objective human needs, the subjective perception of their fulfilment (subjective well-being), mediated by the opportunities available to meet those needs, over time*'.

The above definition stipulates that: *basic human needs* include: subsistence, reproduction, security, affection, understanding, participation, leisure, spirituality, creativity/emotional expression, identity, and freedom (Glover, 1995). *Subjective well-being* is understood to be self-reported and is assessed by individual's or group's responses to questions about happiness, life satisfaction, utility or welfare. *Opportunities* for humans to meet their basic needs are provided by the four capitals (O'Connor, 2006). And, the relation between the fulfillment of human needs and overall subjective well-being is affected by the *time* varying weights individuals, groups and cultures give to fulfilling each of the human needs relative to the others (Costanza et al., 2007a).

Combining the components of social sustainability with the Four Capitals Model, and adapting the parallel theory of Maslow's Five-stage Model of Basic Human Needs in a community context with Max-Neef's Model of Human Scale Development, resulted in the following themes: (i) access to healthy natural environment, (ii) access to infrastructure and economic opportunities, (iii) equity and governance, (iv) social cohesion, and (v) community actualization. Community actualization referring to the collective capacity of community residents to sustain and improve quality of life and the ability to create the type of community they desire. The conceptual framework presented in Table 2 set the scope for the empirical investigation for this study and provided structure for data collection and analyses.

3. Methods

This study used a concurrent mixed methods approach, with both quantitative and qualitative strands collected at the same time. The two strands were collected to empirically evaluate social externalities of major resource projects and to examine how QOL is being influenced by rapid economic development associated with major CSG projects in regional communities of the Surat Basin.

The quantitative data were collected using a structured questionnaire in a cross sectional survey from 428 participants. The core survey items formed 5-point Likert type scales (1 = Strongly Disagree, 5 = Strongly Agree), plus a standard 4-point type scale (Yes, No, Neutral, Not sure) related to attitudinal, demographic and behavioral information. The survey items and scales were developed based on the analysis of similar studies examining community sustainability, including the community wellbeing survey based on the Genuine Progress Indicator for regional communities, Nova Scotia, Canada, GPI Atlantic (Kulig et al., 2010) and World Values Survey (Inglehart et al., 2005); as well as the exploratory site visit to the study area. The attitudinal survey items were guided by the initial themes of the conceptual framework. The qualitative data collected included: five open-ended questionnaire items completed by the same 428 participants, and twenty four semi-structured interview sessions which were conducted with a total of 41 participants. Qualitative data also included direct observations.

The majority of the data collection was conducted over a period of four months between February and May 2014, with six visits to the region overall including an exploratory visit in November 2013, and a pilot survey in December 2013.

Survey selection criteria included: permanent community residence, 18 years and older, and who have lived in the region for at least two years. The invitation to participate in the survey was also distributed by email to contacts previously made in the region and in person at community group meeting and events; such as country shows, Rotary club meetings, chamber of commerce meetings, and community events. In addition, survey participants were also recruited through notices in community group newsletters, local papers, and public service announcements by the local radio station. The majority of the questionnaire responses were submitted on-line via a secure server connection, with a fifth of the questionnaires submitted via a paper copy. All responses were completely anonymous and confidential.

The seven groups of attitudinal variables (access to healthy environment, access to infrastructure and economic opportunities, equity, governance, social cohesion, community actualization, and social license to operate) were subjected to a multivariate inferential analysis using both SPSS (Version 21) and STATA (Version 13). A multi-step approach was used. It involved: a test of internal consistency (Cronbach's alpha) to show an acceptable level of reliability of scores, exploratory factor analysis (using orthogonal varimax rotation), confirmatory factor analysis to provide evidence of factoral validity for each set of variables, and Structural Equation Modelling (SEM) to establish construct validity of the conceptual framework. The rationale for using structural equation modeling is that SEM is suited for both theory testing and theory development, and is an excellent statistical analysis tool to use when some variables of interest to a researcher are unobservable or latent (Washington et al., 2010).

The SEM specifications were obtained using confirmatory factor analysis with maximum likelihood estimation of the covariances. The model was developed as the result of multiple iteration using STATA analysis program. This software compares the covariance matrices representing the relationships between variables and the estimated covariance matrices of the best fitting model. The final SEM reflects eighteen simultaneous regression equations. SEM provides statistical significance of the latent variables (unobserved constructs) and their measures. It also provides insights into the relationships between these constructs.

The qualitative findings provide a deeper story; enhancing the findings from the quantitative stage. The qualitative data collected from the open-ended survey questions was subjected to thematic analysis using constant comparison process (Glaser et al., 1968). Data coding and analysis were carried out using NVivo (Version 10). The qualitative results from the open-ended questions were aggregated using data transformation into the five themes of the conceptual framework. Content of the interview transcripts were categorized using thematic analysis

Table 2
Conceptual framework for operationalizing evaluation of social externalities.

Conceptual Framework				
1. Access to healthy natural environment	2. Access to infrastructure, services, economic opportunities	3. Equity and governance	4. Social cohesion	5. Community actualization
Socio-environmental factors	**Socio-economic factors**	**Socio-institutional factors**	**Socio-cultural factors**	**Life-satisfaction, quality of life factors**
Access to productive, recreational, and culturally significant natural resources and ecosystem services	Sustained and selfdirected access to economic opportunities, affordable housing, access to: medical facilities, education, transport, appropriate infrastructure and	Social and economic equality, fair and just distribution of resources, ability to come together and make decisions. Ability of local government to meet needs and concerns of the community	Social ties and networks, trust, reciprocity, a sense of community, sense of place, community involvement, ability to express cultural identity, traditions and worldviews	Well-being, sense of belonging, life satisfaction (time for family, leisure, spirituality, creative pursuits), stability, security, ability to plan for the future, freedom

and basic guidelines for coding qualitative data. The categorization reflected similarity and frequency of responses. The field notes and recordings were revisited to verify frequently occurring expressions and any unexpected material that provided atypical evidence. Seventeen categories emerged from careful review of the transcript recordings and field notes. Using the dichotomous variables of zero and one, the frequency of each sub-theme was analyzed.

The last stage of analysis included the integration of inferences and meta-inferences from the quantitative and qualitative findings by comparing the merged-data results. The strength of the merged-data analysis provided both statistical and narrative data and ensured validity and reliability of results. The mixed-methods analysis yielded cross-sectoral findings with strong meta-inferences.

4. Results and Discussion

4.1. Sample Profile

The population sample surveyed consists of 45% men and 55% women from at least six ethnic backgrounds based on self-reported cultural identity. Ages of the participants ranges from 18 to 80+, with varied levels of education. The majority of the sample were long term residents of the region (15+ years), married or in a relationship, employed or self-employed, and are primarily home owners. Work sectors of the respondents vary, with the agricultural sector having the highest number (38.6%). The sample characteristics are consistent with the latest Australia Bureau of Statistics demographic data for the region (ABS, 2011 census), although the census data shows a higher male to female ratio with 51% male and 49% female. This can be attributed to the presence of a predominately male workforce associated with the CSG projects. The distribution of the sample profile is shown in Table 3. Community involvement, interaction with neighbors, volunteering, and community participation were very high among the respondents. The majority (75.8%) of respondents reported a strong sense of community where they live; the majority (75.3%) also reported having a significant connection to the land.

4.2. SEM Model

Many of the issues in quality of life research and sustainability decision making are unobservable, or latent. SEM analysis was used in this study as a statistically defensible means of quantifying these variables through surrogate or measured variables. Quantification of these latent variables provided a better understanding of the complex nature of *social externalities in regional communities affected by major resource projects*, which was the over-arching goal of this study and itself not directly observable.

Table 3
Sample statistics.

	n	%of sample[a]
Total sample	**428**	–
Female	227	53.0%
Male	189	44.2%
Long term residents of the region (+15 years)	302	70.6%
Married/in a relationship	330	77.1%
Employed/self-employed	352	82.3%
Working in the agricultural sector	165	38.6%
Home owners	326	76.2%
Reported having a significant connection to the land	322	75.3%
Actively involved in the community	268	62.6%
Reported a strong sense of community where they live	325	75.8%
Reported being in good health most of the time	377	88.0%
Described their life as stressful	304	71.0%

[a] The distribution does not include respondents who chose to skip the question.

SEMs consist of two main model components; a measurement component and a structural component, results for which are listed in Table 4. The measurement component within SEM incorporates estimates of errors of measurement of exogenous variables (variables that are not caused by other variables in the model) and their intended latent variables. The structural component describes the relationships between latent variables and the potential causal dependencies between endogenous and exogenous variables. The structural component allows for direct, indirect, and associative effects to be explicitly modeled, unlike standard regression models which allow for explicit modeling of direct effects only (Molenaar et al., 2009; Washington et al., 2010).

The five resulting factors revealed through SEM analysis were: (1) *Environmental and Social Concerns*, (2) *Economic Opportunities,* (3) *Governance*, (4) *Impacts on the Standard of Living* and, (5) *Community Actualization*. Correlations using SEM demonstrated relationships between these factors. The first factor, *Environmental and Social Concerns,* includes perceptions (levels of concern) of community residents in regard to environmental health, environmental damage, water and air quality, and how the community dynamics and community values are being affected. The second factor, *Economic Opportunities*, captures the changes in the job market brought by employment opportunities as the result of major projects, as well as opportunities for community residents to benefit financially from the development. The third factor, *Governance*, includes the perceptions of residents about the local council (the ability of the council to address the needs of the community and manage community concerns). The fourth factor, *Impacts on Standard of Living* captured issues related to the standard of living, including living costs and availability of affordable housing. And the fifth factor, *Community Actualization,* relates to life satisfaction and sense of fulfilment in personal, professional and community life. The Goodness of Fit measures and the *p* values confirm that this is theoretically and statistically a defensible model.

The relationships between the five factors are shown in Fig. 3. The direction of influence is shown by the straight arrows and the degree of influence is represented by the standardized correlation coeffiecients as the result of maximum likelihood estimation.

SEM model shows that governance and perceived power (or lack of power) of the local government play an important role in: life-satisfaction, economic polarization (economic participation or exclusion), concerns of residents about environmental and social impacts, and inequity (affordability). The SEM model showed that perceived poor governance (for this case study it is the lack of confidence in local council's ability to address issues associated with the CSG projects) correlates to lower levels of participation by community residents in economic opportunities associated with the projects. The model also showed that concerns of residents about environmental and social impacts (such as impacts on groundwater, lifestyle, and community values) have high negative influences on economic participation and on community actualization (individual sense of fulfilment in personal, professional, and community life). In other words; unresolved concerns of community residents about environmental and social impacts may lead to lower life satisfaction (quality of life) and a weaker local economy. All correlations revealed by the SEM model were statistically significant.

Furthermore, the five resulting factors provided the statistical basis to refine the themes of the conceptual framework. The revised framework reflecting the latent variables and the relationships between them that have emerged as the result of structural equation modeling is presented in Table 5.

The themes of the revised conceptual framework were used to analyze the qualitative results of the open-ended questions and were incorporated into the merged-data analysis. The strength of the merged-data analysis provided both statistical and narrative data, ensuring validity and reliability of results. The summaries for the quantitative and qualitative merged data analysis results are presented in Tables 6a and 6b.

Table 4
Maximum likelihood estimation results and goodness-of-fit measures for SEM.

Measurement component Estimated parameters	Standr. coef.	Standard error	z-Value	P > |z|
Factor 1—Environmental and social impacts				
Changes to the health of env in community <— Factor 1	4.04	0.046	88.60	<0.001
Concern about water quality <— Factor 1	2.650	0.034	78.11	<0.001
Concern about air quality <— Factor 1	4.220	0.052	80.56	<0.001
Concern about environmental damage <— Factor 1	3.600	0.062	58.40	<0.001
Concern how property land is being affected <— Factor 1	4.080	0.050	80.86	<0.001
Concern about change in com values <— Factor 1	3.850	0.060	64.06	<0.001
Concern how community is affected <— Factor 1	4.200	0.044	95.61	<0.001
Factor 2—Economic opportunities				
More financially secure <— Factor 2	2.080	0.025	82.68	<0.001
More employment opportunities <— Factor 2	3.000	0.059	50.62	<0.001
Factor 3—Governance				
Local government performance <— Factor 3	1.990	0.048	40.98	<0.001
Needs concerns being addressed <— Factor 3	2.220	0.050	44.43	<0.001
Values represented <— Factor 3	2.280	0.049	46.96	<0.001
Information provided in a timely manner <— Factor 3	2.590	0.047	54.41	<0.001
Factor 4—Impacts on standard of living				
Cost of living <— Factor 4	4.330	0.040	107.94	<0.001
Availability of affordable housing <— Factor 4	4.230	0.045	93.29	<0.001
Factor 5—Community actualization				
More fulfilled in community life < — Factor 5	2.340	0.047	49.44	<0.001
More fulfilled in professional life < — Factor 5	2.680	0.048	55.70	<0.001
More fulfilled in personal life < — Factor 5	2.420	0.045	54.00	<0.001
Structural component estimated parameters	Standr. coef.	Standard error	z-Value	P > |z|
Environmental and social concerns <— Governance	−0.265	0.046	−5.82	<0.001
Economic opportunities <— Environmental and social concert	−0.716	0.109	−6.57	<0.001
Economic opportunities <— Governance	0.372	0.078	4.74	<0.001
Standard of living <— Environmental and social concerns	0.434	0.078	5.54	<0.001
Standard of living <— Governance	−0.130	0.045	−2.92	<0.001
community actualization <— Environmental and social concern	−0.675	0.077	−8.69	<0.001
Community actualization <— Governance	0.235	0.049	4.74	<0.001
Goodness-of-fit (GOF) measures				
Number of observation = 428				
chi2(123) = 368.07 Prob > chi2 | 0.001				
chi2 divided by model degrees of freedom (123) = **3**				
Root mean square of approximation (RMSEA) = **0.068** (<0.08)				
Comparative fit index (CFI) = **0.94** (close to 0.95)				
Tucker–Lewis index (TLI) = **0.92** (0 < TLI < 1)				

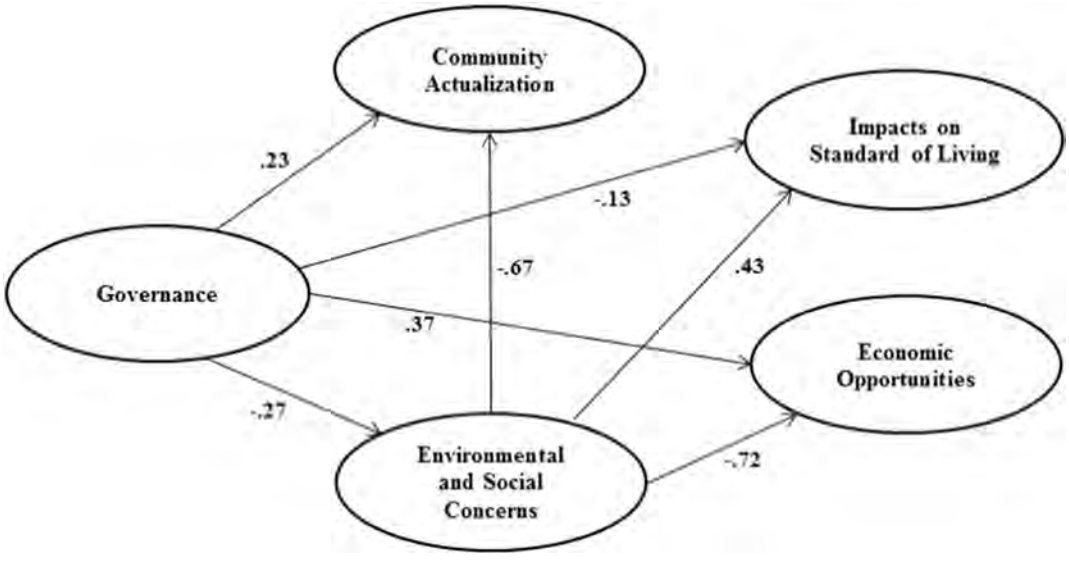

Fig. 3. SEM model with correlations among factors shown.

Table 5
Revised conceptual framework after SEM analysis.

Conceptual framework after SEM				
1. Environmental and social concerns	**2. Economic opportunities**	**3. Governance**	**4. Standard of living**	**5. Community actualization**
To what extent did the development associated with C'SG projects influence:				
Environmental health in the region, water and air quality, ecosystem services, access to productive recreational and culturally significant resources, community life	Equitable opportunities for community residents to benefit financially from the development, employment opportunities for local residents	Ability of local government to: meet the needs and concerns of the community, support community values, provide information in a timely manner, deliver infrastructure and services	Cost of living, availability of affordable housing, equitable distribution of benefits, leisure time, affordability, amenities and facilities	Life satisfaction (fulfillment in community, professional and personal life), ability to plan for the future, sense of belonging, perceived benefits for future generations

4.3. Key Findings

The concurrent mixed methods approach used was significant as it extended the understanding beyond attitudes and perceptions of the development to the longer-term societal implications. The study findings revealed that residents in communities affected by CSG projects in the Surat Basin are experiencing unfavorable impacts to: quality of life, social capital and standard of living, as well as rising economic inequality and a sense of uncertainty about the future. The emergent themes combined with merged-data analysis resulted in cross-sectoral finding and strong meta-inferences discussed in the following subsections.

4.3.1. Impacts to Quality of Life and Life-Satisfaction

The majority of the respondents (63%) rated the overall quality of life in their community as worse *'now compared to what it was five years ago*'. With respect to life-satisfaction; the majority of the respondents disagreed with being *more fulfilled* in their *community, professional*, and *personal* lives since the projects began in the region. Of the three aspects of quality of life, the majority of the respondents were the least fulfilled in their *community life*.

SEM analysis demonstrates a direct correlation between life-satisfaction (captured by the theme of *Community Actualization*) and perceived ability of the local government to represent and address the needs of the community. This relationship is also captured by the qualitative data from open-ended questions, and from semi-structured interviews; reflected in the overarching sub-themes of *disempowerment* and *loss of autonomy*. The contributing factors to a *sense of powerlessness* include: perceived lack of local representation post the amalgamation process of the local councils; sense of not being respected or valued by the local and state governments; sense of being powerless and small compared to the CSG industry; the division in the community as the result of the CSG projects and in some cases the inability of the community to come together to make decisions.

The issue of noise associated with gas well installations, flares, industrial activity and heavy road traffic is a significant area of concern for some community residents; specifically landholders whose residences are in close proximity to gas field operations. Some property owners reported feeling vibrations inside their homes from the pumps and CSG installations on their property. According to Kahneman (Kahneman, 2011) constant exposure to noise, along with chronic pain and severe depression, are three conditions that humans are not designed to biologically adapt to. As there is no adaptation to the condition of living with constant noise, it can therefore be inferred that involuntary exposure to chronic noise has a detrimental effect on quality of life and human wellbeing.

The thematic analysis of the semi-structured interviews, through the count occurrences of the subthemes provided evidence of what could constitute as increasing apathy in the community. In addition to a sense of powerlessness and loss of autonomy some respondents reported being '*exhausted*' and '*numb*' to the issues and challenges associated with the development of the CSG industry. Apathy is reflected by indifference and is considered to be a natural response to prolonged disappointment; it can also be a dangerous barrier to communication and meaningful participation. Similarly to depression and a sense that '*nothing matters*', apathy may lead to mental health issues (Csikszentmihalyi and Wong, 2014).

4.3.2. Impacts on the standard of living, economic inequality

The broader concept of the standard of living is understood to be closely related to quality of life. It takes into account not only the material factors, but also more intangible aspects that make up human life such as: family time, sense of security and stability, cultural resources and social life (UN Human Development Report, 2013). Responses to the open-ended questions confirm not only concerns about the rising cost of living in the region, but also higher stress and less free time to spend with friends and family as the result of economic pressures brought by the development. The majority of the respondents (59.6%) to the structured survey questions felt that in the last five years the standard of living in their community has become worse. A large majority (83.4%) also reported having concerns about the rising cost of living. The majority of the respondents (62.4%) also disagreed that they were more financially secure as the result of the development in the region.

Responses to open-ended questions reveal high levels of economic inequality in the region and the presence of a '*two-tier*' or *'two-wage'* economy. Positive economic benefits and opportunities seem to be concentrated among a small number of local residents. These include: some landholders, those employed in the CSG sector, and selected local businesses, for example: pubs, restaurants, motels, real-estate and property developers. Less than one quarter of the respondents (17.8%) agreed that '*they are now more financially secure as the result of the CSG projects in the region*'.

Qualitative data from interviews provided further evidence of economic inequality. Some respondents felt that although the local communities were bearing most of the costs and long-term consequences of the rapid economic development associated with the CSG projects, the benefits were flowing predominately to the major urban centres. Previous research in this field has shown that economic inequality can lead to collective feelings of: superiority and inferiority, being valued and not valued, respected and not respected, as well as higher consumerism, social status insecurity, more social evaluation anxiety and fear of negative judgments (Kraus et al., 2012; Wilkinson and Pickett, 2009). This is significant because as previous studies have shown (Abbott, 2007; Wilkinson and Pickett, 2006, 2009) the resulting psychosocial effects can influence mental health and community wellbeing, and can also contribute to negative externalities of weakened community resilience and a weakened local economy.

Stresses associated with economic inequality, and the threat of loss to homes and productive resources have been shown to have severe effects on mental health and community wellbeing. Studies, such as the one by Hales (2007) on the social impacts associated with the proposed development of the Traveston dam on the Mary River in Queensland, and parallel work in social psychology measuring stress hormone related to threats to self-esteem as the result of income inequality (Calvert and Fahey, 2013), have confirmed that those kinds of stresses have a particular effect on negative wellbeing.

Table 6a
Merged data analysis quantitative results summary.

QUAN results

n = 428

		Structured Survey Questions [a]			
			Not concerned	Neutral	Concerned
I.	*Environ. and Social Concerns*	**Environmental health in the area**	9.3%	14.3%	**75.9%**
		Water quality	9.6%	11.4%	**77.4%**
		Air quality	20.0%	23.1%	**55.1%**
		Environmental damage	9.3%	17.5%	**71.8%**
		Personal land/property being affected	15.9%	19.2%	**63.1%**
		Changes in community values	6.5%	19.2%	**72.9%**
		How community as a whole is being affected	4.9%	15.9%	**77.3%**
			Agree	**Neutral**	**Disagree**
II.	*Economic Opport.*	**More employment opportunities**	**40.6%**	23.8%	34.1%
		Better financial security since the projects began	17.8%	19.4%	**62.4%**
			Content	**Neutral**	**Not content**
III.	*Governance*	**Local government - overall performance**	9.1%	18.0%	**72.0%**
		Local council's ability to:			
		Address the needs of community	14.8%	16.1%	**68.0%**
		Represent the values of the community	14.0%	21.0%	**63.8%**
		Provide information in a timely manner	18.4%	33.9%	**46.5%**
		Infrastructure and Services	10.1%	17.8%	**69.7%**
			Not concerned	**Neutral**	**Concerned**
IV.	*Standard of Living*	**Cost of living**	3.1%	12.1%	**83.4%**
		Availability of affordable housing	5.1%	14.3%	**78.7%**
			Agree	**Neutral**	**Disagree**
V.	*Community Actualization*	*Changes to QOL since the projects began*			
		More fulfilled in your community life	11.5%	29.4%	**58.2%**
		More fulfilled in your professional life	18.9%	38.6%	**40.2%**
		More fulfilled in your personal life	9.8%	38.1%	**51.4%**
		Will this development benefit future generations in your community	14.5%	15.4%	**56.8%**

Notes:
[a]Selected evaluation measures based on results of exploratory factor analysis using principal factors algorithm.

Table 6b
Merged data analysis qualitative results summary.

QUAL results

		n = 428	n = 41	
		Open-Ended Survey Questions[b]	**Semi-structured Interviews**[c]	**Direct Observations**[d]
I.	***Environ. and Social Concerns***	Environmental Concerns (**50** references) Concerns about Agricultural Viability (**45**) Loss of community spirit, less community involvement (**288**) Need for better environ. protection (**104**) Division in the community, signs of greed (**46**) Presence of itinerant workers - FIFO (**169**) Presence of CSG industry (**175**)	**Environmental Concerns**: Noise, dust, traffic, living in industrial zone, groundwater impact, health impacts **Social Concerns**: negative impacts on the social fabric, division in the community, less involvement by some community members, privacy loss on some properties	– Heavy traffic and road works in some areas – Road noise; oversized vehicles – Industrial operations on some properties – Visible flares in some areas – Minimal social interaction between itinerant workers and locals – Some neighbours are no longer on speaking terms
II.	***Economic Opport.***	Economic loss as the result of development (**68**) Economic gain as the result of development (**32**) New employment opportunities (**15**) Limited employment opportunities for locals (**66**) Rapid industrial development in the region (**10**)	**Opportunities**: business opportunities seem to be centred around the hospitality and real estate sector; other report minimal work opportunities for locals **Falling property values** for those close to CSG operations	– Large number of real estate brokers – Some local business closed, many empty shop fronts – Former dress shops selling high-vis gear – No vacancies in many motels, pubs and hotels busy (itinerant workers)
III.	***Governance***	Insufficient gov. support, lack of respect (**123**) Community needs not being addressed, issues since amalgamation (**58**) Roads safety, road damage, road traffic (**227**) Overburdened services, higher rates (**84**) Overburdened infrastructure (**121**)	**Governance:** Perceived lack of representation, loss of rights, loss of autonomy due to amalgamation; lack of respect, sense of not being valued **Services**: need for better hospitals, education facilities to meet population growth; overburdened infrastructure roads and services	– Internet unavailable in some areas after 5:00 pm due to FIFO workers coming off shift – Heavy traffic and road works on parts of Warrego Highway
IV.	***Standard of Living***	Increase in the cost of living (**229**) Concerns about high rent and housing costs (**159**) Two-tier, two-wage economy, inequity (**185**) New amenities in town (**26**) Less family/leisure time (**25**)	**Impacts on the Standard of Living**: higher cost of living, lack of affordable housing, less and less free time (working more), time consuming negotiations with CSG companies, boom and bust dynamics, two-wage economy, new amenities/cafes in town	–New franchises, cafes, restaurants –High prices for petrol, food, coffee –Accommodations expensive/unavailable –Bran new housing developments, many are empty
V.	***Community Actualization***	Sense of uncertainty about the future (**172**) 'We need to protect our lifestyle' (**83**) Goal: 'To survive' (**63**) 'Need to stick togethere' (**36**) Provide for the best interest of family and children (**23**) Improve/preserve liveability (**17**)	**Apathy**: exhausted by the uncertainty, sense of powerlessness, loss of autonomy, no choice, 'nothing we can do' **Psychosocial Effects**: stress, anxiety, sense of not being valued or respected, sense of not belonging	–Some residents are reluctant/uncomfortable to discuss CSG issue in public –Amplified distrust of 'strangers' –Consultation and survey fatigue in some areas –Noticeable industry presence, sponsorships

Notes:
[b] Frequency of references shown in parentheses.
[c] Emerged themes and sub-themes of thematic analysis.
[d] From field notes.

Positive externalities associated with the CSG development were captured by the thematic analysis of open-ended questions and interview data. These included new amenities, facilities, cafes and restaurants in the region, as well as, corporate sponsorships for local clubs and events. Some respondents also referred to an increase in multiculturalism in the region.

4.3.3. Impacts on Social Capital

Findings from this study indicate that social capital is being affected and in some cases eroded in communities directly affected by the CSG projects. One of the major contributing factors is the division/polarization of the community. The majority of the respondents (58.6%) felt that the sense of community has decreased in the last five years. When asked '*how does your community feel about the rapid economic development occurring in the area*' the majority (68.7%) said that their community was '*divided*' on the issue. The majority of the respondents (77.3%) also reported being concerned about how their community was being affected. Similarly, the majority of the respondents (72.9%) were concerned about the change in community values since the projects began.

Responses from the open-ended questions support the results from the quantitative data; thematic analysis identified social cohesion concerns in regard to the declining community spirit and community involvement. Negative impacts on the social fabric of the community, including; community polarization, less participation, cases of homelessness due to cost of living, and cases of anti-social behavior, such as prostitution, drugs and alcohol as the result of large itinerant work force were also captured by the sub-themes from the semi-structured interviews. Direct observations also made evident that some residents are uncomfortable to discuss CSG issues within earshot of anyone in their community. Interview data demonstrate that some residents are reluctant to voice their opinion for fear of being judged by other community members as '*being against progress*'.

Other key factors affecting social and cultural capital in the region include: loss of some of the foundational members due to voluntary displacement associated with the projects, impacts on lifestyle, and a sense of trust within the community. For example, loss of trust among neighbours has been particularly amplified in some communities by confidentiality agreements imposed by project proponents. Many respondents reported being deeply connected to the land (physically, financially, culturally and emotionally). This was a common theme, and links directly to a sense of place and cultural identity. Other contributing factors to the erosion of social capital included: perceived loss of privacy; transient nature of the itinerant population in the region; perceptions of increasing '*greed*' among community members; and unequal distribution of benefits.

4.3.4. Sense of Uncertainty about the Future

The findings from qualitative data revealed a heightened sense of uncertainty about the future. Specifically, sense of uncertainty was particularly related to worries and concerns about impacts on groundwater, especially by those residents in the agricultural sector, and long term health impacts, especially by those residents living in close proximity to gas wells and gas field operations. Other concerns expressed by the respondents included the threat of the CSG industry on viable agricultural production and land-use effects, including access to productive resources and impacts on lifestyle and livelihoods. Several respondents also expressed concerns about the threat to property values, and the inability to sell their property due to the proximity to industrial CSG operations.

Other issues contributing to the sense of uncertainty included: concerns about how the community and the community values are being affected, long-term employment opportunities for locals, and perceived lack of stability, '*loss of control*' and inability to plan for the future. Dissatisfaction with local governance was also a contributing factor to a sense of uncertainty. The majority of the respondents (72.6%) were not content with the local governance in the region, and 68.8% disagreed with the statement that '*local council has done a good job addressing the needs and concerns raised by members of your community*'.

The SEM model showed that dwindling confidence in local governments' ability to address environmental and social concerns is related to lower levels of economic participation. The SEM model also showed that unresolved environmental and social concerns (such as impacts on groundwater, impacts on lifestyle and community values) negatively influence life-satisfaction and community's ability to plan for the future.

4.4. Policy Implications

4.4.1. Incorporating Evaluation of Social Externalities into SIA

This study suggests that there is scope to improve impact assessment of resource projects through a careful analysis and evaluation of social externalities. According to Franks (2012) Social Impact Assessment (SIA) is a process for understanding and responding to the social issues associated with development. At its core, SIA is designed to: assist in identifying key issues from the perspective of those potentially impacted by the project; predict and anticipate change; to mitigate the negative impacts and enhance the positive ones.

Under the Australian federal system, approval and assessment of resource development projects are done under state based legislation. Social Impact Assessment is required as part of regulatory approval processes and is almost exclusively defined under state based schemes. The SIAs are usually focused on predicting impacts related to a specific project and are integrated within environmental impact statements as part of project level approval in each state. Project proponents are expected to assess and mitigate the impacts that are directly related to their project. After the initial approvals had been gained, there is minimal formal requirement for follow-up assessments of the impacts.

The Australian based Centre for Social Impact defines social impacts as the net effects of an activity on a community and the well-being of individuals and families. Social impacts are experienced or felt (real or perceived) by an individual, social group or a community. This paper argues that social externalities, which are understood to be positive or negative consequences of an economic activity on social capital and people's welfare, are an integral component of understanding, identifying and assessing social impacts. It is recommended that social externalities of major projects are evaluated, as part of the predictive assessment phase of the SIA process.

Based on the principles of adaptive management practice, the predictive assessment phase is used to identify likely impacts, and to evaluate their scale and significance using technical and participatory methods. Incorporating the concept of social externalities into the impact assessment process can help improve efforts towards minimizing long-term societal costs as the result of negative social impacts of resource development projects.

4.4.2. Community Sustainability Trust

Negative externalities may result in long-term costs to society. To help mitigate negative social externalities and impacts on social capital, and to support social sustainability in resource communities, a key recommendation of this study is for project proponents to establish a Community Sustainability Trust in partnership with the community and the local government during the implementation phase of the project. The trust should be designed to allocate funds to mitigate social impacts and internalize negative social externalities as part of the project, ideally responding to impacts in an adaptive way over the life cycle of the project. Compensatory mitigation is often used to protect natural resources. The Community Sustainability Trust can reflect existing initiatives aimed at mitigating environmental externalities and at protecting ecosystem services.

4.4.3. Social Impact Management Plan Strategies in Queensland

In September 2008, the Sustainable Resource Communities policy was introduced in Queensland. It addition to other things it was designed to mitigate and improve internal proponent practices for managing impacts on communities. The policy introduced Social Impact Management Plans (SIMPs) to outline the forecasted changes to communities, the agreed strategies for addressing impacts, and the responsibility of various parties in relation to the management of social issues. In July 2013, however, in response to industry's request for the SIA process to be less complex and costly, the Queensland Government removed the requirements for SIMPs, integrating the SIAs into the EIS fast-tracking process. The new framework aimed to provide greater certainty for proponents and reduce the costs and time burdens on industry. Under the new framework, only direct project impacts need to be identified. Based on the empirical evidence collected during the course of this study, it is recommended that SIMPs or similar strategies for improving the outcomes for resource communities in Queensland are reinstated as part of the SIA process.

4.4.4. Minimizing Uncertainty

The findings from this study show that many residents, landholders, and community groups in the Surat Basin are still worried about the rapid and '*seemingly unrestrained*' development of the coal seam gas industry and its associated risks. Due to uncertainty of what industry related developments will occur on their properties in the future, many landholders have indicated a lack of confidence to develop and expand their operations. There is also concern that uncertainty surrounding CSG activity is affecting property values. The sense of uncertainty is further heightened by the perceived lack of third party monitoring and auditing process of CSG activities. Potential externalities related to uncertainty may include mental health issues in the community and impacts to food and fibre production in the region. It is recommended that the results of the monitoring and auditing be made transparent and public where appropriate. Governments (local, state, and federal) can also play a greater role in minimizing uncertainty for communities through the provision of strategic assessments, and ensuring full disclosure of all planned activities by the resource authority holders.

4.4.5. Reducing the Imbalance of Power

The evidence collected in this study also shows that many landholders feel that they have been greatly disempowered in the negotiation process for land access and compensation. Many landholders who were initially approached by the operating companies to enter into compensation agreements were not aware of the critical importance of these agreements, for example, many landholders were unaware that deals made with CSG companies lie with the land and bind all future owners. The confidentiality agreements, complexity of terms, time pressures and legal costs associated with the negotiation process have imposed a great deal of stress for many landholders and have created a collective sense of disadvantage. This study has also shown that perceptions of fairness and inequity weight heavily on land owners throughout the entire process and disrupt meaningful participation leading ultimately to apathy.

In addition to financial and environmental impacts, it is recommended that compensation agreements also address health, social, and lifestyle impacts. To ensure that landholders are treated fairly and with respect, and land access negotiations occur on a fair and equitable basis, it is recommended that compensation agreements are made public, similarly to real estate transactions; and that instances of unconscionable conduct in land negotiations are investigated.

This study recommends that similar rigor used to protect consumers by the Australian Competition and Consumer Commission (ACCC) is applied to protect landholders. For example, the ACCC considers "unconscionable conduct" to exist if one or more of these factors are present: whether any conditions were imposed on the weaker party that were not reasonably necessary to protect the legitimate interests of the stronger party; whether the weaker party could not understand the documentation used; the use of undue influence, pressure or unfair tactics by the stronger party; the lack of requirements of applicable industry codes; the lack of willingness of the stronger party to negotiate; the extent to which the parties did not act in good faith.

5. Conclusions

The scope of this research study focused on the regional communities affected by CSG/LNG megaprojects in the Surat Basin in Southeast Queensland, Australia. Coal seam gas, also known as unconventional gas, poses spatially extensive impacts on affected communities and tends to overlap other land uses, usually agriculture. The findings drawn from this research provide insights into the social externalities of rapid economic development associated with four major CSG projects in the Surat Basin region.

This paper highlights that the evaluation of social externalities is an important step towards understanding and responding to the changes induced by major resource projects and enhancing the outcomes for communities and society. The study findings revealed that the communities affected by CSG projects in the Surat Basin are experiencing rising economic inequality, sense of uncertainty about the future, and erosion of social capital. The concurrent mixed methods approach used was significant as it extended the understanding beyond attitudes and perceptions of the development to the longer-term societal implications.

The relationships revealed by structural equation modeling were instrumental in helping to undertand the extent to which the development associated with CSG projects has influenced quality of life in the affected communities. Findings show that concerns of residents about environmental and social impacts (such as impacts on groundwater, lifestyle, and community values) have high negative influences on economic participation and on community actualization. In other words; unresolved concerns of community residents about environmental and social impacts may lead to lower life satisfaction, inhibit the community to plan for the future and lead to a weaker local economy. The analysis outcomes further emphasize that identifying and responding to internal and external factors that determine whether benefits and costs of economic development are equitably distributed is central to supporting the sustainability needs of the community. We have discussed a number of policy implications, such as the Community Sustainability Trust and pathways to reducing uncertainty, for mitigating the above.

We would like to add that future research would be enhanced by a comparison study of social externalities from the four CSG/LNG megaprojects in the Surat Basin. It would be of interest to investigate whether the approaches used by different operating companies result in different outcomes for communities and their effects on social externalities.

Finally, it is worth remarking that this case study focused on the evaluation of social externalities of CSG/LNG projects, which are more spatially expansive and tend to overlap agriculture land uses more than other resource extraction projects. Extending this analysis and applying the conceptual framework to other major resource projects outside of the CSG sector would provide further knowledge of evaluation methods. The evidence presented indicates that evaluating, and in due course quantifying and internalizing social externalities as part of project decision making are a matter of significance for all major stakeholders including: landholders, communities, local governments, project proponents and society as a whole.

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References

Abbott, S., 2007. The psychosocial effects on health of socioeconomic inequalities. Crit. Public Health 17 (2), 151–158.
ABS, 2011. Australian Bureau of Statistics Census Data.
ABS, 2012. Australian Bureau of Statistics Census Data.
Anielski, M., 2002. A Sustainability Accounting System for Canada: Research paper prepared for the National Round Table on the Environment and the Economy.
Barber, J., Shael, T., Cowling, S., Bialowas, A., Hough, O., 2013. Resources and Energy Major Projects April 2013. BREE, Canberra (May).
Black, A., 2005. Rural Communities & Sustainabilty.
Brundtland, G.H., 1987. World Commission on Environment and Development. Our Common Future. pp. 8–9.
Calvert, E., Fahey, T., 2013. Income Inequality and the Family (Retrieved from).
Carrington, K., Pereira, M., 2011. Assessing the social impacts of the resources boom on rural communities. Rural. Soc. 21 (1), 2–20.
Cheshire, L., Everingham, J.-A., Lawrence, G., 2014. Governing the impacts of mining and the impacts of mining governance: challenges for rural and regional local governments in Australia. J. Rural. Stud.
Colantonio, A., 2007. Social sustainability: an exploratory analysis of its definition, assessment methods metrics and tools.
Colantonio, A., 2011. Social Sustainability: Exploring the Linkages Between Research, Policy and Practice.
Colantonio, A., Lane, G., 2008. Measuring Social Sustainability: Best Practice from Urban Renewal in the EU 2008/02: EIBURS Working Paper Series November 2008.
Costanza, R., Fisher, B., Ali, S., Beer, C., Bond, L., Boumans, R., ... Snapp, R., 2007a. Quality of life: an approach integrating opportunities, human needs, and subjective well-being. Ecol. Econ. 61 (2–3), 267–276. http://dx.doi.org/10.1016/j.ecolecon.2006.02.023.
Costanza, R., Graumlich, L., Steffen, W., Crumley, C., Dearing, J., Hibbard, K., ... Schimel, D., 2007b. Sustainability or collapse: what can we learn from integrating the history of humans and the rest of nature? AMBIO: J. Human Environ. 36 (7), 522–527.
Costanza, R., Fisher, B., Ali, S., Beer, C., Bond, L., Boumans, R., Snapp, R., 2008. An integrative approach to quality of life measurement, research, and policy. SAPI EN. S. Surveys and Perspectives Integrating Environment and Society (1.1).
Csikszentmihalyi, M., Wong, M.M.-H., 2014. The Situational and Personal Correlates of Happiness: A Cross-national Comparison *Flow and the Foundations of Positive Psychology*. Springer, pp. 69–88.
Daly, H.E., Farley, J., 2010. Ecological Economics: Principles and Applications: Island Pr.
Downing, T.E., 2002. Avoiding New Poverty: Mining-induced Displacement and Resettlement. vol. 52. International Institute for Environment and Development.
Elkington, J., 1998. Partnerships from cannibals with forks: the triple bottom line of 21st-century business. Environ. Qual. Manag. 8 (1), 37–51.
Fischer, J.M., Amekudzi, A., 2011. Quality of life, sustainable civil infrastructure, and sustainable development: strategically expanding choice. J. Urban Plann. Dev. 137 (1), 39–48.
Flyvbjerg, B., 2007. Megaproject Policy and Planning: Problems Causes, Cures.
Flyvbjerg, B., Garbuio, M., Lovallo, D., 2009. Delusion and deception in large infrastructure projects: two models for explaining and preventing executive disaster. Calif. Manag. Rev. 51 (2), 170–193.
Franks, D., 2012. Social Impact Assessment of Resource Projects. International Mining for Development Centre.
Franks, D.M., Brereton, D., Moran, C.J., 2010. Managing the cumulative impacts of coal mining on regional communities and environments in Australia. Impact Assess. Project Appraisal 28 (4), 299–312.
Galloway, P.D., Nielsen, K.R., Dignum, J.L., 2012. Managing Gigaprojects: Advice from Those Who've Been There, Done That. ASCE Publications.
Glaser, B.G., Strauss, A.L., Strutzel, E., 1968. The discovery of grounded theory; strategies for qualitative research. Nurs. Res. 17 (4), 364.
Glover, J., 1995. Women, Culture, and Development: A Study of Human Capabilities. Oxford University Press, USA.
Habermehl, M., 2006. The great artesian basin, Australia. Into the Well from which You Drink Do Not Throw Stones, p. 82.
Hajkowicz, S.A., Heyenga, S., Moffat, K., 2011. The relationship between mining and socio-economic well being in Australia's regions. Resour. Policy 36 (1), 30–38.
Hales, R., 2007. A Discussion Paper on the QLD Government's Assessment and Management of the Social Impacts of the Proposed Dam on the Mary River.
Haslam Mckenzie, F., 2013. Delivering enduring benefits from a gas development: governance and planning challenges in remote Western Australia. Aust. Geogr. 44 (3), 341–358.
Hawken, P., Niznik, L., 1992. The ecology of commerce. Exec. Excell. 9, 3.
Hawken, P., Lovins, A.B., Lovins, L.H., 2010. Natural Capitalism. Earthscan Publications.
Hilson, G., 2002. An overview of land use conflicts in mining communities. Land Use Policy 19 (1), 65–73.
Hossain, D., Gorman, D., Chapelle, B., Mann, W., Saal, R., Penton, G., 2013. Impact of the mining industry on the mental health of landholders and rural communities in southwest Queensland. Australas. Psychiatry 21 (1), 32–37.
Inglehart, R., Puranen, B., Pettersson, T., Nicolas, J.D., Esmer, Y., 2005. The World Values Survey.
Kahneman, D., 2011. Thinking, Fast and Slow. Macmillan.
Kraus, M.W., Piff, P.K., Mendoza-Denton, R., Rheinschmidt, M.L., Keltner, D., 2012. Social class, solipsism, and contextualism: how the rich are different from the poor. Psychol. Rev. 119 (3), 546.
Kulig, A., Kolfoort, H., Hoekstra, R., 2010. The case for the hybrid capital approach for the measurement of the welfare and sustainability. Ecol. Indic. 10 (2), 118–128.
Magee, L., Scerri, A., James, P., Thom, J.A., Padgham, L., Hickmott, S., ... Cahill, F., 2013. Reframing social sustainability reporting: towards an engaged approach. Environ. Dev. Sustain. 15 (1), 225–243.
Malik, K., Human Development Report, 2013. The Rise of the South: Human Progress in a Diverse World (March 15, 2013). UNDP-HDRO Human Development Reports 2013.
Martinez, C., Franks, D.M., 2014. Does mining company-sponsored community development influence social licence to operate? Evidence from private and state-owned companies in Chile. Impact Assess. and Project Appraisal 32 (4), 294–303.
Maslow, A.H., 1943. A theory of human motivation. Psychol. Rev. 50 (4), 370.
Max-Neef, M.A., Elizalde, A., Hopenhayn, M., 1991. Human Scale Development: Conception, Application and Further Reflections. vol. 1. Apex Press New York.
Measham, T.G., Haslam Mckenzie, F., Moffat, K., Franks, D.M., 2013. An expanded role for the mining sector in Australian society? Rural. Soc. 22 (2), 184–194.
Measham, T.G., Fleming, D.A., 2014. Impacts of unconventional gas development on rural community decline. J. Rural Stud. 36, 376–385.
Merrow, E.W., 2011. Industrial Megaprojects: Concepts, Strategies, and Practices for Success. Wiley. com.
Missimer, M., Robèrt, K.H., Broman, G., Sverdrup, H., 2010. Exploring the possibility of a systematic and generic approach to social sustainability. J. Clean. Prod. 18 (10), 1107–1112.
Molenaar, K.R., Park, J.-I., Washington, S., 2009. Framework for measuring corporate safety culture and its impact on construction safety performance. J. Constr. Eng. Manag. 135 (6), 488–496.
O'Connor, M., 2006. The "Four Spheres" framework for sustainability. Ecol. Complex. 3 (4), 285–292.
Petkova-Timmer, V., Lockie, S., Rolfe, J., Ivanova, G., 2009. Mining developments and social impacts on communities: Bowen Basin case studies. Rural. Soc. 19 (3), 211–228.
Prno, J., 2013. An analysis of factors leading to the establishment of a social licence to operate in the mining industry. Resour. Policy 38 (4), 577–590.
Queensland Government, D. S. D. I. P., 2014. Managing the Impacts of Major Projects in Resource Communities.
Rolfe, J., Miles, B., Lockie, S., Ivanova, G., 2007. Lessons from the social and economic impacts of the mining boom in the Bowen Basin 2004–2006. Australas. J. Reg. Stud. 13 (2), 134–153.
Sachs, I., 1999. Social sustainability and whole development: exploring the dimensions of sustainable development. Sustainability and Social Sciences. Zed Books, London, pp. 25–36.
Sharma, R., 2003. Involuntary displacement: a few encounters. Econ. Polit. Wkly. 907–912.
Thompson Jr., B., 2008. Ecosystem services & (and) natural capital: reconceiving environmental management. N.Y.U. Envtl. L.J. 17, 460.
Tonts, M., Plummer, P., 2012. Natural resource exploitation and regional development: a view from the west. Dialogue 31, 19–25.
Tonts, M., Plummer, P., Lawrie, M., 2012. Socio-economic wellbeing in Australian mining towns: a comparative analysis. J. Rural. Stud. 28 (3), 288–301.
Washington, S.P., Karlaftis, M.G., Mannering, F.L., 2010. Statistical and Econometric Methods for Transportation Data Analysis. CRC press.
Wilkinson, R.G., Pickett, K.E., 2006. Income inequality and population health: a review and explanation of the evidence. Soc. Sci. Med. 62 (7), 1768–1784.
Wilkinson, R.G., Pickett, K.E., 2009. Income inequality and social dysfunction. Annu. Rev. Sociol. 35, 493–511.
Williams, T., Samset, K., 2010. Issues in front-end decision making on projects. Proj. Manag. J. 41 (2), 38–49.