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Livelihood discourses at the water-energy-food-nexus in Victoria's Coal Seam Gas (CSG) debate

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ABSTRACT

Onshore Coal Seam Gas (CSG) extraction is a controversial practice that has attracted scrutiny from stakeholders surrounding its risk to livelihoods and the environment at the water-energy-food nexus. Victoria's 2016 public Inquiry into Unconventional Gas provided an opportunity to evaluate how stakeholders conceptualise the role of livelihoods at the water-energy-food nexus and how discourses were deployed to interpret the risks and benefits of CSG development. This paper argues that the relationship between CSG, livelihood assets and resource security is discursively constructed as a form of power and plays a significant role in both nexus modelling and CSG decision-making. This is supported by the application of Critical Discourse Analysis (CDA), which determined that stakeholders regularly considered livelihood assets to be crucial to both sustaining livelihoods and resource security in Victoria. Based on these findings, a *revised water-energy-food nexus model* is presented where livelihood assets are positioned at the centre of the nexus framework. This paper concludes by considering how competing environmental discourses are likely to shape the future of Australia's water, energy and food security in ongoing CSG debates more generally.

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CSG; power; discourse; water-energy-food nexus; resource security; livelihoods

Introduction

Onshore Coal Seam Gas (CSG) drilling remains a contested practice in Australia (Hannigan 2014). Victoria's Inquiry into Unconventional Gas (Parliament of Victoria) provided a platform for stakeholders to argue either for or against the renewal of onshore gas exploration. Specifically, it allowed actors to frame the perceived risks and benefits that CSG poses to livelihoods and resource security. Stakeholders have historically conceptualised the impact of CSG on resource management and their way of life (Hannigan 2014; Lacey and Lamont 2014), however different stakeholders with competing interests describe the relationship between livelihoods and water, energy and food security interconnectivity (water-energy-food nexus) in different ways. The discourses that actors involved in this public debate use to frame CSG development, livelihoods and the water-energy-food nexus are significant because (a) they demonstrate public understandings of livelihoods in relation to the nexus concept, and (b) provide an opportunity to reveal power relations as a consequence of the language used by stakeholders. Consequently, how livelihoods and resource security are framed in Victoria's CSG debate are of central importance to this paper.

The controversies surrounding onshore CSG development stem from the extraction process. Underground wells and the application of pressurised water are used to syphon out gases, mostly methane, from underground coal seams (Paragreen and Woodley 2013; Hannigan 2014). The result is a generative source for electricity and heating. However, this method can potentially lead to water contamination and air pollution which negatively impacts residential and commercial land holders (Paragreen and Woodley 2013).

Traditionally, mainstream industries view these developments as a 'greener' energy alternative to traditional fossil fuels such as coal to curb green-house gas emissions (Everingham et al. 2014). Energy security and employment have been positioned as accompanying benefits alongside development (Huth et al. 2018; Lacey and Lamont 2014). In contrast, other stakeholders have often argued CSG operations present a significant risk to livelihoods, arable land and resource security, and contribute to climate change (Hannigan 2014; Huth et al. 2018).

In the presence of climate change, a growing population, deforestation and loss of bio-diversity, understanding these interlinkages from a social and environmental perspective is critical to supporting sustainable livelihoods and Australia's future water, energy and food security (Brears 2018). Despite the importance of these matters, there has been very little research into how stakeholders have discursively constructed the risks and benefits of CSG development to livelihoods at the water-energy-food nexus. Therefore, this study applies Critical Discourse Analysis (CDA) to

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assess stakeholder submissions to the Inquiry to ask: How have stakeholders described the relationship between water, energy and food resources and livelihoods in Victoria's 2016 CSG debate?

The application of CDA to stakeholders' Inquiry submissions to determine how actors framed livelihoods and their relationship to the water-energy-food nexus generated two key findings. Firstly, stakeholders opposing development described the nexus and livelihoods link in the form of natural capital. Predominantly these assets were aquifers, arable land and clean air. Secondly, CSG proponents regularly used language aligned with financial capital inclusive of monetary compensation, industry employment and wider manufacturing. Importantly, as a practice of discursive power, it was the language that these stakeholders did not adopt that suggests the delegitimisation of some community livelihoods over others. These findings demonstrate a strong link between discursive power, CSG development, livelihoods and resource security. This study concludes by assessing the implications of these findings for theorising opportunities for further research and policy direction within the scope of CSG in Australia.

CSG contestation in Australia

How stakeholders frame the relationship between CSG, livelihoods, and water, energy and food security in public debates can be contextualised against the industry's operational origins in Australia. The CSG sector began actively competing against strong social resistance dating back to the 1990s at the commencement of drilling operations (Lacey and Lamont 2014) and has received significant attention from media organisations and news outlets. Since 2013, the Australian Broadcasting Corporation (ABC) has covered the negative consequences of CSG on livelihoods in Australia (ABC). Elsewhere, other outlets have regularly provided running commentary on CSG developments as a contribution to the public discourse. Industry have also contributed extensively through sets of public media announcements (Mercer, de Rijke, and Dressler 2014).

Some residents and communities have since mobilised through the process of collective action by citing risks to agricultural production, water quality and livelihoods more broadly (Lacey and Lamont 2014; Trigger et al. 2014). Australia's CSG sector is expected to intensify exploration and operations with an additional 20,000 wells planned for development with an equally increasing level of resistance from communities (Paragreen and Woodley 2013). These public clashes and anticipated escalations between civil society and pro-CSG actors suggest widely varying stakeholder understandings of the relationship between CSG, livelihoods and water, energy and food security. Further, it reveals how public discourse is often used to influence public opinion and resource management policy outcomes. This strong connection between discourse, livelihoods and resource management in Victoria's CSG debate can be analysed through the lens of the water-energy-food nexus.

Currently there has been little application of the water-energy-food nexus model for considering mining contestations in Australia, and no studies relating to CSG specifically in Victoria. Key authors have adopted the standard definition of the word nexus as 'a connection or series of connections linking two or more things' (Endo and Tomohiro 2018, 4). This translates into acknowledging the interconnected nature, and subsequent management, of the water, energy and food sectors within sustainable development (Swatuk and Cash 2018; Pandey and Shrestha 2017). CSG is situated as the 'energy component' in the nexus model, underscoring CSG's relationship to food and water security. How stakeholders discursively frame these issues is important because it reveals how power is reproduced through broader discourses (Fairclough 1992) and the relationship society has with resource security, livelihoods and CSG.

The water-energy-food nexus

Within the literature, it is generally agreed that a nexus model is required to manage local and global water, energy and food resources holistically and effectively (Abdul et al. 2017). This is because water, energy and food are productively linked (see Figure 1). Currently, the agricultural sector is the largest consumer of fresh water globally (FAO 2020). It also requires an intensive energy supply to provide irrigation, machinery and transport throughout the food system (FAO 2020; Bazilian et al. 2011). This intersectionality is likewise exemplified in the water sector, in which dam networks are often used for both generating hydroelectricity and to support agriculture (Al-Saidi and Elagib 2017). Inversely, pollutants from poorly treated agricultural or industrial energy waste directly compromises the integrity of water reserves used to supply those industries and local populations (Hannigan 2014). The convergence of these risks and opportunities is problematic from an environmental/resource use perspective, but also from a governance perspective. Stakeholder interests in these sectors diverge across local, state and global scales. For instance, the construction of dams on rivers that traverse sovereign borders create competing ideas about who has the right to regular water access: do local towns relying on irrigation have priority, or foreign energy corporations producing hydroelectricity? By considering energy, water and food together, the nexus framework seeks to address these complex interactions through comprehensive management and governance (Endo and Tomohiro 2018; Hoff 2011; Abdul et al. 2017; Al-Saidi and Elagib 2017).

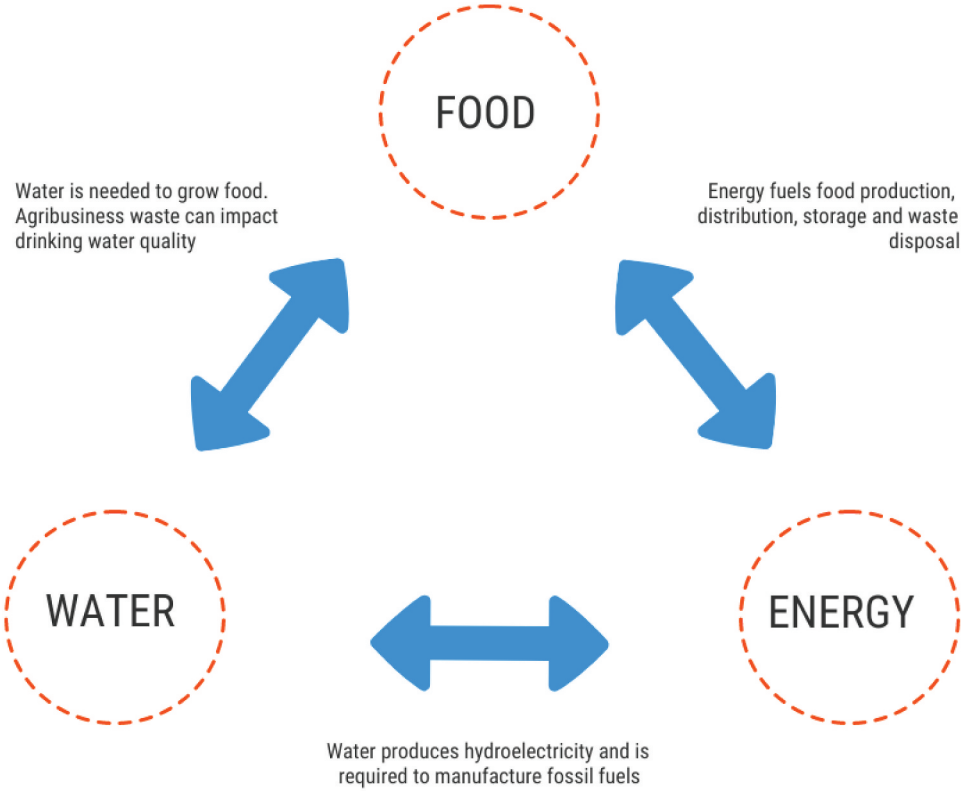

Figure 1. The dominant 'nexus' model of water, energy and food sectoral interconnectivity.

The core strengths of the water-energy-food nexus framework can be demonstrated with the example of climate change, waste management and best practice, where it is being promoted as a guiding paradigm to combat and prepare for the adverse side effects of global warming (Abdul et al. 2017; Smajgl, Ward, and Pluschke 2016). The dissemination of transport related pollutants, electricity industry emissions and toxic waterway discharge embedded in resource security measures are all contributing to environmental degradation. The integrated management of industries that foster harmful practices will be beneficial to reducing unwanted waste and ecological damage (Abdul et al. 2017). Failing to acknowledge the relationships between these sectors could potentially expedite damaging and unforeseen water, energy and food sector practices. For example, establishing new food security measures without ensuring surrounding water resources are not adversely impacted could exacerbate food insecurity rather than alleviate it (Swatuk and Cash 2018). Much in the same way, failing to consider water holistically would adversely impact the quality and distribution of local food production. The value of a nexus approach to addressing environmental change and balanced resource management have been demonstrated by some scholars within the water, energy and food nexus field of literature (Brears 2018; Endo and Tomohiro 2018). Despite these benefits, the natural science model detailed thus far has also been accused of being incomplete.

In contrast, several social science authors have provided substantive critiques of the nexus model and its implementation. Wiegleb and Bruns (2018) argue, first, that the water, energy and food nexus is dominated by efficiency targets, neoliberal economic policies and macro-level institutions. This often presents resource scarcity as an objective truth that can be resolved through technological advancements that deliver efficient practices and 'greener' intensification. This is problematic because it fails to acknowledge the role of inequality in shaping resource scarcity, accessibility and affordability, and therefore impairs the interests of society as a whole (Biggs et al. 2015). Second, the nexus approach has been criticised for its lack of engagement with people-centred initiatives and for suggesting a universal application of resource management strategies (Wiegleb and Bruns 2018). According to Swatuk and Cash (2018), nexus approaches tend towards 'resource reductionism' and employ a top-down simplified governance of water, energy and food security. This has been viewed as a lost opportunity for empowering local communities through the process of participating in policy development (Swatuk and Cash 2018) and potentially jeopardises the inclusion of those most vulnerable (Biggs et al. 2015). As Wiegleb and Bruns (2018, 1) concluded:

> We need to engage more closely with alternative nexus discourses, embrace epistemic pluralism and encourage multi-perspective debates about the socio-nature relations we actually intend to promote.

An alternative nexus model has emerged that places human livelihoods at the centre of the system. This livelihoods centred approach connects socio-economic and environmental issues within a policy framework to compensate for weaknesses in other models that did not acknowledge social change (Biggs et al. 2015). For the purpose of this study, livelihoods and what support them will take the form of an asset-based approach to include the impact CSG may have on livelihoods that rely on nexus related resources. These livelihood assets are as follows: human capital references skills and health; social capital encompasses relationship and cooperation resulting in economic output; natural capital includes nexus assets such as water, fisheries and fertile land; physical capital is inclusive of livestock and water infrastructure, and lastly; financial capital comprises of any form of income from savings or employment (Chambers and Conway 1992).

Although this approach based on livelihood capitals resides in the periphery of mainstream nexus discussion, it places human experiences at the centre of the model to encourage equitable social outcomes (Bazilian et al. 2011; Biggs et al. 2015; Swatuk and Cash 2018). The security of these resources is not simply determined by market scarcity and accessibility; rather, it is influenced by power relations between public actors, structures and institutions (Swatuk and Cash 2018). The integration of lived experiences into the water-energy-food nexus facilitates an avenue for unpacking critical sociological questions. Who decides what food production is efficient? Who decides whose water should be allocated for energy production? What regulatory measures are in place to provide clean water that has not been contaminated from industrial waste? Sustainable development with a livelihoods approach seeks to address these questions by positioning people's basic human rights, the facilitation of public awareness and the active inclusion of communities in the discussion, planning and implementation of policy at the centre of the development cycle (Abdul et al. 2017). Placing individuals at the centre of the nexus prioritises the lived experiences and livelihoods of those who are likely to be impacted by water, energy and food development (Biggs et al. 2015). This is important because it potentially influences livelihood outcomes.

Key authors have elucidated the benefits of this alternative model (Biggs et al. 2015). For example, Valli and Girard (2018) investigated how water flow between Australian users impacts both agriculture and mining. They found the nexus is more complicated because social dimensions significantly impact resource management (Valli and Girard 2018). Other studies have evaluated the role of livelihoods in CSG development contestations in Australia (de Rijke 2013; Mercer, de Rijke, and Dressler 2014), although the water-energy-food nexus model has not been explicitly applied as an analytical lens.

A livelihood-centred approach to the nexus is useful for assessing stakeholder engagement in Victoria's CSG debate because it acknowledges the central role of people's lives in water, energy and food security, building on previous research into CSG in Australia. Bec, Moyle, and McLennan (2016) determined CSG to be a potential risk to livelihoods by employing qualitative methodologies to unpack stakeholder concerns surrounding CSG development in Roma, Queensland. They identified a loss of rural lifestyle as the most important factor for residents, while highlighting deficiencies in housing affordability. Further, Grubert and Skinner (2017) revealed community anxieties and uncertainty concerning CSG development in Gloucester, New South Wales, highlighting a poor stakeholder engagement process that left residents feeling as though they did not have an adequate platform to voice their concerns. Lastly, de Rijke (2013) assessed the social consequences of CSG development in Dalby and the adjacent region. This report recommended a deepening of anthropological studies to ensure that the quality of people's livelihoods are not overlooked as a consequence of streamlined government approval processes (de Rijke 2013).

Although this scholarship incorporates components of CSG social impacts and nexus theory independently, it does not synthesise these concepts. This highlights a significant gap in social science research into stakeholders' understandings of the interconnections between water, energy and food in Victoria's CSG debate. This paper addresses this theme by asking how stakeholders have described the relationship between livelihoods and water, food and energy resources more generally as a form of power.

Methodology

Critical discourse analysis

How actors 'talk about' the issue of CSG development and its relationship to livelihoods at the water-energy-food nexus can be analysed through the application of Critical Discourse Analysis. CDA refers to a group of critical approaches within multi-disciplinary scholarship that investigates the deployment of power through language or visuals (Blommaert and Bulcaen 2000a; Fairclough and Wodak 1997). Fairclough's (1992) assessment of CDA positions discourse as a vessel by which power, inequality and ideologies are conducted and communicated (Wodak and Meyer 2009; Wodak and Chilton 2005; Machin and Mayr 2012; Giddens and Sutton 2013; Blommaert and Bulcaen 2000a). Therefore, it is argued that we can examine how power is applied through language in text by applying CDA (Machin and Mayr 2012).

News articles, public submissions, speeches and advertisements are all subjects for discourse analysis because they are mediums whereby meaning is conveyed (Machin and Mayr 2012; Cheek 2008). In the context of this study, CSG Inquiry submissions form the medium to assess how stakeholders use power to describe the relationship between livelihoods and water, energy and food resources.

Fairclough's (1992) three-dimensional model of CDA identifies four segments that categorise a text for analysis: vocabulary; grammar; cohesion, and text structure. This three-dimensional model is best understood as ascending in scale from the level of text and upward to social practice. Here, 'vocabulary' is a single word, 'grammar' indicates the structure of single words in sentences, cohesion refers to how more than one sentence is constructed, while text structure is attached to macro textual organisation (Fairclough 1992). The second dimension of 'discursive practice' encompasses the dissemination, organisation and consumption of texts. It is the 'infrastructure' by which text is circulated, which can vary depending on institutional arrangements or social norms. For example, distribution types may vary from casual conversation, to political speeches or industry solicited submissions and reports (Fairclough 1992). Lastly, discourse as social practice draws directly upon critical theory by transcending the micro-analysis of words and sentences into the macro-level of power and ideology as social practice. Ideology and power are defined here as having a tangible existence through institutional practices that dominate and further integrate the hegemonic discourse (Fairclough 1992). Importantly, hegemony is not only the act of traditional domination, it can also be the act of persuading and influencing covertly, particularly by what is *not* being said (Fairclough 1992; Fairclough and Wodak 1997).

The research design for this study applies the CDA model proposed by Fairclough (1992) to consider (a) the micro-textual analysis of written data submissions on CSG in Victoria; (b) the transmission of the data through the government inquiry; and (c) how that discourse translates into social practice. How stakeholders frame the relationship between livelihoods and water, energy and food security, and the risks and benefits of CSG development to resource security in Victoria, are central questions underpinning the research design and method. CDA thus provides an opportunity to expose power relations between local residents, community groups, NGOs, industry and smaller government administrations such as councils. These stakeholders formed the basis for the data set and sampling strategy.

Purposeful non-probability sampling has been employed in this study to evaluate submissions from varying stakeholders to the Inquiry into Unconventional Gas in Victoria. This sampling method allows the extraction of specific submissions from the target population within each stakeholder group (Neuman 2006). To do this, the full data set of 1084 submissions were downloaded from the Victorian Government website and individually organised into the following stakeholder fields and respective submission counts: Farmers (21); General public who are Anti-CSG (739); General public who are Pro-CSG (3); Community groups and NGOs (56); The CSG industry (26); Federal, state and local municipal governments (28); Water sector (2), Energy sector (2) and Food sector (1). The length of submissions varied significantly. They ranged from two pages (ANTI-CSG) to 142 pages (CSG industry). Some submissions were excluded from the full data set for the following reasons: 11 hand written letters were excluded because handwriting made it difficult to extract the contents digitally; 167 submissions were discarded due to a lack of direct relevance to water, energy and food security interconnectivity; and seven documents were not available due to database system errors or document removal.

Next, one submission from each of the above stakeholders was selected for inclusion in this study based on isolating wider stakeholder representation (e.g. public, private/industry, civil society groups and individuals, for and against) and water, energy and food security content of the submission. Details of each submission and why they were chosen can be found in Table 1. This allowed for a thorough analysis of nine submissions from: Public ANTI-CSG individual; Public PRO-CSG individual; Lock The Gate (LTG); Municipal Association of Victoria (MAV); Minerals Council of Australia (MCA); Australian Water Association (AWA); Energy Users Association of Australia (EUAA); Australian Food and Grocery Council (AFGC), and; Victorian Farmers Federation (VFF).

Analysis and limitations

Analysis was conducted by applying three-stage coding analysis: open coding; axial coding, and selective coding (Gorra and Kornilaki 2010). Fairclough's (1992) textual analysis techniques were applied to identify livelihood and resource security-specific vocabulary and terms such as aquifers, agriculture, irrigation, gas wells, farmland, jobs, employment and livestock. Although metaphors are also key to CDA, metaphors were not widely present in the selected data submissions and so were not included as part of analysis in this study.

Lastly, methodological limitations were identified during the analysis process. First, researcher bias from a position of knowledge and assumptions has been identified as a limitation when applying CDA. Second, nine documents were chosen from a total of 1084 submissions. There is the possibility some stakeholders outside the dataset may have explored CSG, power and discourse at the nexus somewhat differently. However, the strength of CDA is to unpack text in

substantial detail to reveal hidden power dynamics that influence decisions. Although every submission was briefly reviewed as part of the sampling process, it was not possible within the time limits of this study to conduct a quality textual examination of every submission. It is also important to recognise that providing feedback to the Victorian fracking inquiry required knowledge of the submission process and access to relevant technology to carry out a submission. It also required a fluent grasp of English to understand these processes and also convey corresponding concerns. This may have been difficult for those with disabilities or members of the community who do not have English as a first language, including indigenous Australians.

Findings

Power, discourse and livelihoods were central concepts when analysing how stakeholders conceptualised the nexus through language. In general, stakeholders regularly described a firm relationship between livelihoods and water, energy and food resources in the context of livelihood assets. The language adopted by stakeholders at the textual level was broadcasted through the Inquiry as 'discursive practice' which was the vehicle for the dissemination of the content. This then provided a platform for world views to be translated into social practice as described by Fairclough (1992).

The remainder of this paper will explore two key findings revealed by the application of CDA. First, anti-CSG stakeholders framed the relationship between the management of water, energy and food resources and livelihoods through the lens of natural capital. This included arable land, air and aquifers. Second, CSG advocates framed livelihood assets at the nexus primarily through financial capital in the gas and manufacturing sectors. These contradictions and contentions between diverging world views in Victoria's CSG debate will be unpacked below.

Natural capital: Sustainable livelihoods, agriculture and anti-CSG

Four stakeholders described a strong understanding of the relationship between livelihoods and how water, energy and food resources were managed. This is consistent with the literature that adopts a livelihood-centric approach to the nexus (Bazilian et al. 2011; Biggs et al. 2015; Swatuk and Cash 2018). These stakeholders were: ANTI-CSG Resident, Lock The Gate (LTG), Municipal Association of Victoria (MAV) and the Victoria's Farmers Federation (VFF). The stakeholders who displayed this conceptualisation of the nexus were opposed to CSG development in Victoria and viewed CSG development as negatively impacting natural capital assets. Specifically, they:

- Elucidated an understanding of natural capital at the nexus (particularly water and arable land) as a crucial component of livelihood sustainability while framing CSG as a risk to farming livelihoods;
- Framed CSG as a contributor to climate change, which therefore poses a risk to natural capital assets that support food production livelihoods;
- Differed from pro-CSG stakeholders, who did not acknowledge livelihoods at this node of the nexus.

Groundwater is critical for sustaining safe drinking water for all members of the community in both urban and regional Victoria. It plays a particularly important role in supplying irrigation for crops and water for maintaining dairy production (Victorian Government, 2019). Many stakeholders highlighted water as a finite resource. And while all stakeholders aligned with the concept of water being central to sustaining agriculture, anti-CSG stakeholders also framed CSG and agriculture as being incompatible. Here, stakeholders framed the nexus as fragile, and livelihoods were seen as being at risk as a consequence of CSG development in regional Victoria. In one example, LTG connected both water and land assets as essential to sustaining their livelihoods through irrigation for crops and drinking water for livestock. Farmers felt that the power from the CSG industry placed an unfair burden on their livelihoods because of compromised natural capital in aquifers:

> Coal Seam Gas, Shale and Tight Gas require huge amounts of water during the fracking process. This water would likely be sourced from town water and underground water supplies … Without clean, uncompromised water farmers cannot farm. Are producers expected to take on this risk here in Victoria? Once an aquifer is compromised there is no going back. (LTG)

The connection between groundwater and farming livelihoods was further described as 'vital' by ANTI-CSG Resident, who adopted the language of 'conflict' and 'limited water' to describe the finite resources that CSG and farming are competing over:

> Groundwater plays a vital role in sustaining agriculture in Victoria, and hence our economy and lifestyle. Mining coal and gas (and especially UCG) is a very water intensive process. With the prospect of an expanding mining sector, fossil fuels and agriculture can be expected to be in the increasing conflict over limited water supplies in the coming years. (ANTI-CSG resident)

The CSG negotiation process was widely framed as unequal, with many stakeholders describing farmers' livelihoods as being 'left out of the negotiation process', despite widespread regional environmental, water and landscape impacts' (VFF). These impacts were elaborated by MAV, who connected three types of natural capital (water, land and clean air) to farmer's livelihoods:

> The inadequate independent assessment of the potential adverse environmental impacts of unconventional gas exploration and extraction, including: the local and cumulative impacts of gas extraction on water supply and quality; the risk of contamination of groundwater and the potential contamination of underground aquifers; the management of waste water; loss of access to groundwater for other users (including farmers); the risk of land contamination; [and] the risk of air contamination. (MAV)

Other stakeholders concluded CSG was a significant contributor to greenhouse gas emissions. They viewed climate change as a threat to productivity, food production, natural capital assets and agricultural livelihoods at the nexus in Victoria:

> In the case of UCG, which requires access land to land in a way that is adversely impact[ing] on local farming activity and the environment, there is an additional consideration when it comes to climate change. … Potential changes in climate may reduce productivity and output of Victoria's agricultural industries in the medium and long term. It is essential that we do not put one of the country's main food producing areas at risk from UCG drilling without fully understanding the possible long-term impacts on ground water and agricultural land. (ANTI-CSG resident)

In summary, anti-CSG Stakeholders have described a strong relationship between livelihoods and water, energy and food security by focusing on natural capital. Natural capital was viewed as critical to maintaining farming livelihoods, while CSG development was framed as a threat to livelihoods and livelihoods assets as consequence of its contribution to climate change. Further, some stakeholders argued that their livelihoods were neglected and ostracised from the decision-making process. Stakeholders who believed that their livelihood dependence on natural capital had been compromised also believed that their experience has translated into an unequal power relationship between themselves and CSG advocates. Importantly, this was further demonstrated by CSG proponents making no reference to natural capital as a source of livelihood support at the nexus. Pro-CSG stakeholders did not convey an understanding of the role of natural capital and its connective relationship with livelihoods and food security in Victoria. This is consistent with CDA literature whereby dominant actors discursively exclude less powerful actors (Dryzek 2013; Fairclough and Wodak 1997). Instead, they predominantly framed the connection between livelihoods and water, energy and food security in relation to financial capital, as described next.

Financial capital: Tensions at the nexus

In accordance with the literature, both CSG proponents and those opposed to CSG development framed financial capital as important to sustaining livelihoods, albeit in very different ways. A total of six stakeholders represented this group: four pro-CSG actors (MCA; EUAA; AFGC; AWA) and two anti-CSG actors (LTG; ANTI-CSG Resident). For CSG proponents, rather than using language that represented the interconnectedness of water, energy, food resources and livelihoods in their entirety, the connection was focused on energy and livelihoods in the form of financial capital. Financial capital language included vocabulary that represented manufacturing, compensation, employment and any subsequent income in the context of CSG development. Anti-CSG actors were more concerned with financial capital generated through natural capital. These findings can be organised into three subthemes:

- CSG was framed by proponents of the sector as delivering ongoing financial capital to the community in the form of employment. They also used financial capital to elevate CSG sector work in importance over other livelihood activities.
- Monetary compensation was described as a form of financial capital for land-owners willing to sell their property to CSG corporations.
- Stakeholders who were opposed to CSG development viewed it as a threat to more sustainable forms of financial capital such as employment in the dairy sector.

Because the MCA submission was substantially larger by page number, they also unsurprisingly provided the most examples of language associated with financial capital. Their core argument was that unconventional gas is highly profitable and thus, beneficial to local manufacturing, production and jobs:

> The development of an onshore gas industry has the potential to bring a great deal of wealth to the state and the people of Victoria. It also has the potential to support regional economies and provide high-paying jobs for people who wish to live in the regions. (MCA)

Meanwhile, other pro-CSG stakeholders framed a ban on CSG development as a threat to their operations because they believed natural gas was a solution to controlling energy costs. Like the use of UN documents detailed earlier, the EUAA has used manufacturing industry reports to substantiate its claims that energy costs will impact employment outcomes:

> [Australian paper] … states that without "access to affordable, reliable gas supply, it is likely that the Mill's operations would be significantly curtailed, leaving little or no scope to undertake future or even continued investment in the Maryvale Mill's operations." They go on to say that with "900 regional jobs tied directly to the Maryvale Mill's operations, a potential closure of the Maryvale Mill would have significant direct and flow on impacts within the Latrobe Valley. (EUAA)

The AFGC supported claims made by EUAA that an ongoing CSG ban could lead to loss of employment for members of the community working in manufacturing as a consequence of higher energy prices and weaker investment opportunities:

> It is vital that the Victorian Government commit to a new gas market, which will deliver flow on benefits to the Victorian economy … In the absence of reform, Victoria risks a decline in industry competition including loss of investment by new business, and loss of manufacturing jobs. (AFGC)

One AWA sub-author further framed CSG development as a significant contributor to 'green' rural community development through employment in the gas sector as financial capital. In doing so they have discursively positioned CSG as a clean energy solution:

> CSG developments provide employment across a diverse range of disciplines, with significant multiplier benefits to regional towns. … [The CSG sector] augments the range of employment opportunities in work that many may find stimulating, by providing a positive and meaningful outcome for the environment. (AWA)

While it is not the purpose of this study to evaluate the accuracy of claims about jobs in the energy sector as 'high paying' or 'green', it is a consideration of power which subsequently relegates other forms of livelihoods, or other forms of financial capital, as less significant. Compensation is one such example. As Drawer (2012) notes, compensation is a form of financial capital for land owners, however he places a provision that such arrangements must be adequate and fairly delivered. The MCA refers to what they view as unfair protections for land owners in the compensation process, and is indicative of power relations:

> Under state-based arrangements, a coal company may enter into an access agreement where the landholder is satisfied with the both the conditions and the level of compensation. In some circumstances, this compensation may provide much needed income to the landholder (e.g. to support agricultural activities during times of drought). Giving multiple parties absolute veto and therefore ultimate influence over whether a project will or will not proceed, effectively undermines the right of the primary landholder to enter into a compensation agreement with a coal company … This would be the case even where the landholder is the only party directly affected by a proposed development. (MCA)

Interestingly, pro-CSG stakeholders who predominantly adopted a natural capital approach to livelihoods (see previous section) also used language aligned with financial capital at times. However, they did so by framing CSG development as a hazard to livelihoods that relied on financial capital in other sectors such as farming. ANTI-CSG Resident and others demonstrated this finding:

> Furthermore, increased pressure on infrastructure by the flux of mining activity will drive up council rates, service based businesses such as farms, farm supply, auto-mechanics, hospitality, tourism etc., will find it increasingly difficult to be able to employ staff at affordable wages leading to high general living costs for residents and visitors, essentially driving away vital workforce needed by the agricultural and service sectors, residents and tourism. (ANTI-CSG Resident)

In summary, CSG advocates regularly framed livelihoods as reliant on financial capital from the CSG sector, along with other industries who favoured cheaper energy sources. This suggests a contestation between what jobs are valued and which have been devalued at the water-energy-food nexus in Victoria's CSG debate. CSG proponents who have adopted a financial capital approach to livelihoods have therefore excluded the lived experiences of stakeholders and land owners who may not benefit from employment or compensation from the CSG sector. The exclusion of these perspectives exposes a clear position of power occupied by pro-CSG advocates because land owners are given little opportunity to reject development (Paragreen and Woodley 2013). The language of capitals has been differentially adopted by stakeholders to describe the relationship between livelihoods and water, energy and food security.

Discussion

These findings demonstrate that stakeholders place livelihoods at the centre of the water-energy-food nexus in Victoria's CSG debate. Elaborating further on this discursive connection, these findings highlight the specific importance of natural capital and financial capital as livelihood assets. The emergent interlinkages are presented below (Figure 2) in the form of a revised nexus model. The nature of power at this intersection – and how it shapes nexus modelling – raises a pertinent question: what does the future of livelihoods and water, energy and food security look like under these competing discourses in CSG debates in Australia?

Discursive constructions of livelihoods, water-energy-food nexus and CSG

The language adopted by stakeholders to frame the nexus affirms the views of other authors that place livelihoods at the centre of the nexus (Bazilian et al.

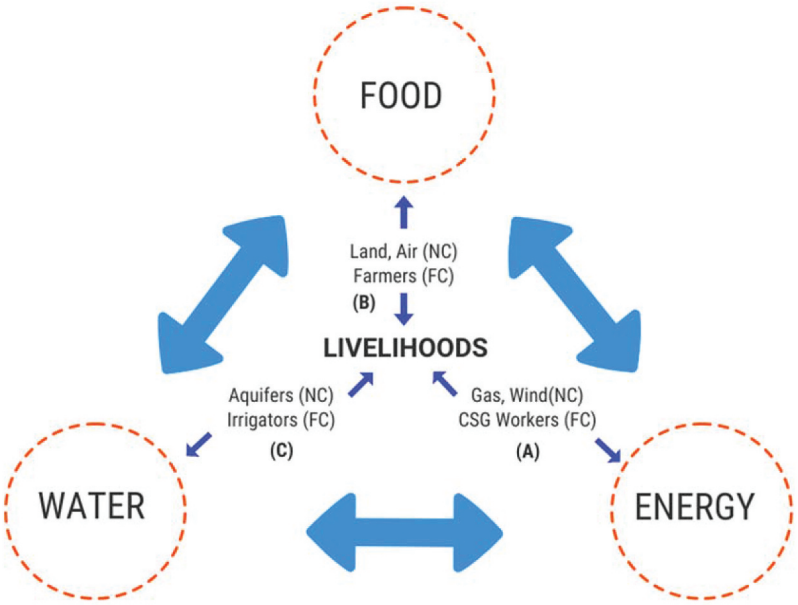

Figure 2. A livelihood and livelihood assets approach to the water-energy-food nexus.

2011; Swatuk and Cash 2018; Wiegleb and Bruns 2018). While this study supports the incorporation of livelihoods, it further suggests the integration of livelihood assets (capitals) within the nexus framework because they show how stakeholders understand these interlinkages. Below I propose an alternative nexus model that reflects how stakeholders have communicated these interconnections. In Figure 2 (below), three sub-nexus' or nodes emerge at the intersection of livelihoods-energy (A), livelihoods-food (B) and livelihoods-water (C). Exploring discourses around natural capital (NC) and financial capital (FC) at these three individual nodes helps us to further unpack power-knowledge relations within the CSG debate. This is the focus of the remainder of the paper.

The pro-CSG point of view dominated the discussion surrounding the connection between energy, livelihoods and capital assets at the sub-nexus shown as (A) in Figure 2. CSG is framed as more or less an endless source of employment and growth for Victorian residents without irreversible or serious ecological damage. In contrast, anti-CSG stakeholders described the relationship between financial capital, livelihoods and energy security in the form of employment opportunities in solar and wind sectors whilst acknowledging at least in part, climate change. The differences in these two perspectives of livelihoods at the energy node of the nexus is one aspect of understanding the contentious nature of CSG in Victoria. Who decides the 'green credentials' of CSG, and subsequently which energy-based livelihoods at the nexus are worth more than others? Dominant actors determine how livelihoods are stratified at the nexus through discursive power. Stakeholders deploying discourse to frame CSG in Australia can be corroborated with other research (Mercer, de Rijke, and Dressler 2014). This demonstrates that livelihoods at the energy node of the nexus are discursively constructed entities in CSG decision-making. This can also be evidenced at the food node of the nexus.

From an anti-CSG approach to the food node (B) of the nexus, the relationship between livelihoods, capital assets and food security was constructed through language aligned with farming livelihoods and the protection of natural capital assets. Agriculture was framed by anti-CSG proponents as the greener alternative to an incompatible gas sector. Meanwhile, although pro-CSG stakeholders did not discuss the food node of the nexus in their submissions, it does not mean they neglected to discursively engage with it. By not acknowledging the livelihoods that rely so heavily on the protection of natural capital assets, pro-CSG stakeholders have delegitimised the livelihoods of farmers and instead focused on the potential for CSG employment in their Inquiry submissions. What dominant actors do not say through discourse is a form of power that seeks to undermine and neglect alternative storylines that challenge the business as usual approach (Van and Teun 2008; Fairclough 1992; Blommaert and Bulcaen 2000a; Wodak and Meyer 2009; Dryzek 2013). This is another dimension to the contentiousness of CSG development.

Lastly, although the water node (C) featured prominently as natural capital in the form of river systems and groundwater, it was seen as a minor contributor to direct employment. Interestingly all stakeholders framed water as a commodity. Here, its value is only worth as much as its economic output within a world of globalised growth (Strang 2004; Dryzek 2013). The value of water to supporting livelihoods for all stakeholders was described through its ability to produce financial capital. Although water might be seen as

a baseline natural capital asset in its own right, this debate illustrated how it can be further broken down into aquifers and river systems where CSG drilling could compromise the integrity of their quality. These are the same natural capital assets that are crucial to supporting the livelihoods of irrigators. Although irrigators were not a major contributor to this public Inquiry, these findings support the claim that discourse has been used to construct the role of natural capital assets and livelihoods at the nexus.

Power, discourse and the future of CSG

Identifying power through discourse at the nexus highlights CSG decision making and subsequent public policy development for energy, water and food security in Victoria and Australia more broadly. The complexity of discourses identified in this study's findings forge contrasting trajectories in how public stakeholders pursue the management of CSG, livelihoods, capital assets, water, energy and food security, and sustainable development more generally into the future. Importantly, the exploration of these nodes illustrates the tension between competing stakeholders' livelihoods as a consequence of actors' world views. How the nexus is constructed through competing discourses matter, because these contestations play a role in the future direction of CSG debates elsewhere.

As a fluid resource management concept, the water-energy-food nexus can be manipulated through language to present the risks and benefits of CSG development from varied positions of power. How stakeholders negotiate public discourse prompts us to consider what the future of CSG, livelihood, and resource security outcomes look like in a sustainable Australia. If these results remain consistent into the future, a financial capital approach to livelihoods at the nexus will have an enduring influence on CSG decision-making by continuing to favour livelihoods that are already reliant on financial capital of fossil fuel sector workers rather than natural capital to sustain a way of life. However, stakeholders opposed to CSG are far more likely to show an interest in furthering investment in 'greener' sectors. This was evidenced through their language that elevates the importance of sustainable agriculture, climate change and environmental protections over gas extraction. These contestations will continue to influence the Australian CSG decision-making landscape – and therefore, livelihood outcomes at the water-energy-food nexus into the future.

Conclusion

The process of onshore CSG development in Victoria continues to be a matter of divisions between industry stakeholders, and local municipals, NGOs and the community. These debates reveal how language is used to construct wider discourse and their impact on livelihoods and resource security. This paper has applied CDA to submissions made to the Victorian Inquiry into Unconventional Gas to demonstrate how stakeholders described the water-energy-food-nexus and its relationship with livelihoods. This is important because it provides insight into the role of power and discourse at the nexus for future decision making. Two key findings emerged. CSG proponents promoted financial capital-based employment whilst legitimising livelihoods that rely on natural assets – particularly citizens in the agricultural sector. Inversely, anti-CSG actors described arable land and uncontaminated water as central to maintaining their way of life within the nexus system. These competing views positioned livelihood assets (natural and financial capital) differently within the water-energy-food nexus, demonstrating how discourse is constructed in ways that prioritise some community livelihoods whilst devaluing others. The conceptual relationship between livelihoods, assets/capitals and water, energy and food has resulted in a revised nexus model (Figure 2) that can be useful for decision-making.

Three recommendations have been identified for consideration in future CSG exchanges between stakeholders. First, power considerations need to be further embedded in the decision-making process to ensure equitable stakeholder engagement processes. Government actors across varying scales should continue to acknowledge their influence through discourse in stakeholder deliberation to determine how and why stakeholders are adopting the language they do. This would potentially lead to better outcomes for the livelihoods of vulnerable or less powerful members of the community. Second, because this research demonstrates the importance of nexus modelling with livelihoods and the role of livelihood assets, publicly placing these models at the centre of CSG debates will provide deeper transparency to the water, energy and food security policy process. Third, integrating nexus modelling into social license approaches in stakeholder engagement could assist in better understanding these discursive complexities. Although this would bring its own sets of complications surrounding definitions, CSG proponents and anti-CSG actors already approach sustainability from an incongruent set of principles. These recommendations should be considered for development and execution particularly by state governments. There is also a significant amount to take away from other stakeholders in future debates including civil society and industry.

The research limitations in this study centre around the choice of datasets, as CSG development continues to be challenged by the public throughout Australia. Although Victoria's submissions were adequate in assessing this study's research questions, Inquiry

submissions from other states could reveal other dimensions to public discourse, power, resource security and livelihoods that may not have been captured in Victoria alone. Expanding this research to other states provides an opportunity for future research. Evaluating interstate inquiry submissions (Western Australia or the Northern Territory) or an analysis of social media data in a cross-sectional geographic study is recommended. Further, while financial and natural capital were overwhelmingly the dominant capitals conveyed by participants in their understanding of CSG impacts in Victoria, there is an opportunity to explore the role of other capitals in other CSG debates around Australia which resided outside the scope of this article. These include human capital, social capital and physical capital. This could provide insight into education, sense of place and commercialised assets that innately produce a source of livelihood such as livestock. Lastly, it needs to be acknowledged that although the moratorium on onshore gas extraction was not lifted despite the discursive efforts of those arguing for its removal, how stakeholders framed livelihoods at the nexus was nevertheless an exercise of power to influence the onshore gas debate. While this article has not focused on policies as a consequence of these submissions, it does present a worthy opportunity to apply a policy lens to the historical debate where the emphasis of the research could assess outcomes outside the scope of CDA. This could further be extended to other onshore gas debates or contested extractive activity throughout Australia. For example, a longitudinal analysis of Victoria's, or Australian CSG policies would provide valuable insight into the history of CSG decision making and its effect on both food and water resource management.

The nexus' ongoing refinement as a development model through the assessment of public discourse will be crucial in the presence of uncertain environmental and social change in Australia. How will public stakeholders frame resource management into the future in a changing social landscape, and who will be the new winners and losers in the pursuit of ongoing investment in 'cleaner' food, water and energy sectors? The future of these sociological questions and CSG decision-making in Australia will be dependent on how power and discourse continue to be exercised by hegemonic and competing actors. How these tensions transpire will be central to which destination we arrive at in the ongoing journey for a just and sustainable future.

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Elliot Clarke is a PhD Candidate and Research Assistant attached to the School of Chemical Engineering (UQ) and the Future Fuels Cooperative Research Centre (FFCRC). The centre aims to advance the decarbonisation of Australia's energy systems in response to climate change while ensuring the green energy transition proceeds as fairly and as safely as possible for all members of the community. Recently, he has worked across the School of Social Science and the School of Political Science and International Studies. The purpose of his thesis is to explore the role of deliberative processes in public perception and attitude formation towards hydrogen energy and other future fuels. How members of the public deliberate about the future of Australia's clean energy security and how effective these processes are at delivering their aims and objectives towards sustainability are central themes to his research. More broadly, he is interested in all matters surrounding the environment, climate change, resource management, public policy, governance, sustainable livelihoods, community engagement and the sociology of technology.

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