'Adaptive Assessment' of Cumulative Socioeconomic Impacts

by

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Adaptive assessment employing boundary objects

This paper argues for a form of 'adaptive assessment' of cumulative socioeconomic impacts of resource development. We employ concepts related to complexity, wicked problems, boundary objects, and adaptive management. The complexity of such an assessment task is illustrated here with examples from a case that our research team has studied for the past three years – four megaprojects totalling $60 billion to produce onshore natural gas in an agricultural area of Queensland, Australia with 40,000 residents.

We argue not for a single method of 'adaptive assessment' but for the collection of a set of useful 'heuristics', or provisional rules of thumb. These heuristics must be examined in an ongoing way, preferably via participatory processes. These participatory processes can be enabled by use of what are known as 'boundary objects'. Boundary objects are items – such as statistics on population - that are meaningful to analyst, industry staff person, government official, local resident, and business owner. Each one would view population figures in their own way, but they are likely to share a common understanding of an upward trend, a downward trend, or stable numbers.

Such indicators hold the promise of being able to represent the complex systemic interactions characteristic of cumulative social and economic effects of multiple resource projects in relatively simple, tractable terms. One can select to profile changes in population, housing costs, income levels, and the like to provide an overview of the social and economic impacts of the projects on a town or region. Selecting a compact set of indicators, with the participation and agreements of key stakeholders, limits the number of parameters that they needs to keep track of to recognise trends and trade offs in their region. Agree indicators can thus facilitate easier, broader understanding, and – one hopes – a clearer view of appropriate responses to specific challenges, such as soaring housing costs, as well as clarifying overall planning options.

This paper provides an overview of this line of argument, and it is meant for those seeking to understand conceptual underpinnings. Our argument is fleshed out in a forthcoming book chapter. A case study region is discussed below in general terms, with specific data from a 3-year study offered in forthcoming reports and journal articles, which will be available from the authors.

Indicators and complexity

Agreed indicators – ones arrived at by stakeholders rather than selected separately by experts – can be seen to represent 'boundary objects' in that they are "adaptable to

different viewpoints and robust enough to maintain identity across them" (Star and Griesemer, 1989: 387). Some scholars (*e.g.*, Sebastian, Bauler, and Lehtonen, 2014; Bauler, 2007) have characterised indicators as boundary objects among disciplines or professions, for example, between policymakers and scientists. The role of indicators as boundary objects can be extended to their function among regional stakeholders.

For example, an indicator tracking a town's population can mean one thing to a state statistician who needs to report a figure for treasury calculations on funding for social services. It can mean something else to a resident who has viewed the community as a sleepy little country town with a slowly declining number of residents. Yet, despite these differences in the implications that each party would draw from the population figure, the figure is sufficiently meaningful to both parties that they can have a useful conversation about the trends in population over the past decade and foreseeable future trends.

The notion of using population as an agreed indicator introduces levels of complexity nonetheless. Is it better to measure the population of residents in a town or also in the surrounding district, and should one include in this figure non-resident workers who are generally confined to their camps during their two-week rotations in the area? An answer depends on what impacts you are trying to assess; that is, is the data or figure that you are looking at salient in the eyes of key stakeholders? Do they want total figures or just the shape of the curve that represents changes in population over time? Additionally, what you measure can also depend on whether local residents are willing to classify non-resident workers as 'members' of their town's population for reasons other than a population count; that is, do they want non-resident workers playing in the local sports club or speaking out in a town meeting? Such questions address whether the chosen population figure can be accepted as credible and legitimate by such key stakeholders.

The qualities of salience, credibility, and legitimacy (Kenchington, Stocker, and Wood, 2012) can be seen as 'heuristics' or rough guidelines. Use of the term 'heuristic' is meant to imply suggested rules to employ, rather than fixed guidelines or procedures. Heuristics are described by social psychologist Tversky and economist Kahneman (1974) to explain how humans simplify everyday problems where a thorough examination of decision options seems impractical.

It is important to note that such qualities are not inherent in the data that one gathers. Rather, salience, credibility, and legitimacy are negotiated with stakeholders. This negotiation about what to measure reflects different frames of reference, different values, and different levels of understanding in specialised areas, such as business, economics, or social services. These complicating factors – as well as the complexity involved in creation of the socioeconomic impacts themselves - call for assessment of cumulative effects to be adaptive in the same way that management of complex, 'wicked' problems (Rittel and Weber, 1973; Uhlmann, Rifkin, Everingham, Head, and May, 2014) needs to be adaptive.

Complexity in the production of cumulative socioeconomic impacts is illustrated by the example below of the effects of multiple projects developing natural gas resources in the agricultural region that we studied (Rifkin, Uhlmann, Everingham, and May, 2014). This

complexity is compounded in the assessment process by socio-political complexity of relationships among stakeholders, which can either enable or constrain access to the data desired, such as the number of gas industry contractors working in the area.

An example of a complex interplay of factors

Natural gas development in southern Queensland, Australia, has involved a significant influx of fly-in/fly-out and drive-in/drive-out workers. Their migration has created implications for the demand on housing, the level of traffic on local roads, and use of internet bandwidth in the region, among a range of other factors. For example, the weekly rent for 3-bedroom houses in a town of 1,200 residents went from $300 to $550, well above the state average, in a 2-year period. It then settled back to around $400 per week, closer to where the historical trend would suggest it should be.

The availability and cost of housing has been influenced by the rate of approval by local government of development applications (initially constrained by a lack of staff) and the rate of construction (constrained by high demand) of homes, motels, and worker camps. The call for new housing has been mitigated by local residents 'cashing in' on the high prices available for their homes, with older farmers reported to be selling up, retiring, and moving to a coastal area that is hundreds of kilometres away. This departure by older residents is behind reports of a decline in community volunteers and decreased availability of childcare provided by grandparents. Lags in the growth of childcare capacity are not supporting the wishes of local residents, whom studies indicate want their town to be attractive to young families.

The housing market has been dynamic, nonetheless. There has been significant construction of new houses and motels, many funded by non-resident investors from distant metropolitan areas who are said to be spurred on by real estate speculators. That has led to local residents expressing concern that new houses will be left vacant, accompanied by comments that such neighbourhoods could degrade into 'ghost towns' or attracting squatters.

Traffic on primary and secondary roads has increased, becoming the most frequent complaint to the community engagement staff of the project proponents. Local police have directed more attention to traffic, with reported infractions climbing from 40 per thousand residents in 2010 to 130 per thousand residents in 2013.

The higher traffic volumes reflect an increased number of people living and working locally. This rise has been counteracted by adaptive strategies, such as company policies about how non-resident workers are permitted to reach the area. One company brings its employees to the area by bus from a metropolis 200-300 kilometres away, while another moves staff via a 45-minute flight in a turboprop flying into the small, local airport.

Not all industry employees have been covered by such company transport policies, though, as many work for subcontractors. Subcontractors are likely to have had contracts written at a time when measures to address road congestion were not considered to be a major issue to address within their contracts. Thus, there has been no stipulation about the means employed by many of the subcontractors to travel from their homes or offices to their worksite in the region.

The surge in the number of non-resident workers has also caused an impact when they go 'off shift'. They have been reported to have been using up internet bandwidth. Some shifts end when children are about to begin doing their school homework, and children are said to have been unable to connect to the internet during these periods.

In sum, housing costs, traffic, demographics, and childcare can be seen to be linked in a complex way. These links can be characterised with the help of community input as well as input from other stakeholders in industry and government. Obtaining such input, in our case, proved challenging as key community stakeholders were suffering from 'consultation fatigue', government staffing was being reduced, and industry personnel were changing.

Such a complex system presents 'wicked' problems

A varying array of stakeholders and their different bases of economic and political power can be seen as part of the 'system' that needs to characterised for effective cumulative impacts assessment. The interplay among these factors causes us to view the society and economy of this region analytically as a complex adaptive system. Complex adaptive systems have been defined in the field of complexity studies (Holland, 1999) as being constituted of networks of actors and interactions that cannot be described as simple aggregations of individual entities. They are not individual in that they are having effects on one other in a variety of ways, and their influenced by historical relationships. They are said to be 'adaptive' in the sense that the behaviour of individuals, organisations, and the system responds to unfolding events.

Such systems in a socio-political domain present one with wicked problems (Head, 2008). Wicked problems (1) defy a simple formulation and (2) each can be seen as a symptom of another problem. Wicked problems have no definitive solution, no clear set of possible solutions, and no test of which solution is 'best'. Some solutions appear better to some stakeholders and other solutions seem better to other stakeholders. Any approach to a solution cannot be readily undone, which limits the benefits of a trial and error approach.

Within a complex adaptive system, strategies for management - and measurement in particular - usefully involve heuristics, or provisionally valid rules of thumb. Articulating the down side of using heuristics in human decision-making has been at the heart of Tversky and Kahneman's work (1974). They and others have identified biases in heuristically based decision-making, such as a preference for the status quo (Eidelman and Crandall, 2012; Kahneman, Knetsch, and Thaler, 1991; Samuelson and Zeckhauser, 1988) or an aversion to loss (Kahneman, 2011). The danger of such biases indicates a need for questioning assumptions behind heuristically based decisions so that the decision-maker learns to improve. Thus, heuristics require an ongoing checking and rechecking of assumptions as well as checking for agreement among stakeholders on ways forward.

The nature of wicked problems that they are meant to address makes any implementation of heuristic guidelines spatially local and valid for only a limited period of time. That is, they will work in one setting one day but not the next. For example, community-based monitoring of impacts of resource development may 'fall over' after a

few years as funding or good will expires (Haggerty and McBride, 2014). These characteristics have made our development of agreed indicators to track the cumulative socioeconomic impacts of multiple gas megaprojects a highly iterative process.

Conclusion

The central heuristic employed in our cumulative impacts assessment is the use of indicators agreed to among stakeholders. These indicators are conceived to serve as boundary objects – a representation of common ground. The agreed indicators are arrived at by a participatory process for two reasons. First, such participation is accepted as a tenet of social impact assessment (Esteves, Franks, and Vanclay, 2012). Participation reflects generally agreed values for human rights, and it fosters 'buy-in' for solutions. Second, such participation provides mechanisms for ongoing scrutiny of the heuristics employed in tailoring individual indicators, such as population figures. In other words, representation of multiple viewpoints can be seen as a valuable way of coping with complexity and wicked problems.

Cumulative effects assessment is best seen as an iterative process, one to be repeated, revisited, questioned, adapted, and refined over time. In this respect, it aligns well with notions of 'integrated impact assessment', particularly where integrated assessment refers to a process of assessing impacts throughout the life of a resource development project (Lee, 2006; Orenstein, Fossgard-Moser, Hindmarch, Dowse, Kuschminder, McCloskey, and Mugo, 2010).

Guidelines for and practices of 'adaptive assessment' need interrogation and refinement. Case studies can usefully augment this analysis, particularly when methods are described along with the underlying principles that drove the choice of those methods and the principles and practicalities that define their limits. In this way, a lack of consensus on how to conduct cumulative effects assessment can be reconsidered and seen as an acceptance that there is no one best way. However, there is an emerging set of guiding principles for effective practices. Use of agreed indicators as boundary objects represents one of those heuristics.

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