Understanding adaptive capacity

A tool for economic transition planning

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LOCAL COMMUNITIES WILL ADAPT AS THE GLOBAL ECONOMY CHANGES

As countries around the world decarbonise their economies and increase investment in renewable energy resources, Australia faces declining demand for key exports including coal and LNG products.[1] The economic transition away from fossil fuels will disproportionately affect some Australian communities with currently large industry concentrations in the fossil fuel sector.[2]

Overall, the picture at a national level is positive: new opportunities are emerging and, if nurtured, they should more than offset the decline in demand for Australia's fossil-fuel intensive industries. But at a local level, this aggregate picture becomes less clear. Policymakers, community leaders, and investors need to maximise the likelihood that each community has a just and successful transition.

Current discussions about transition planning often revolve around identifying a new anchor industry (for example, a hydrogen hub) to be the engine of a regional economy. This approach is certainly useful, not least because it can motivate and attract large amounts of capital. However, it is not a robust strategy by itself: if the new anchor industry does not take off or succeed, communities are back at square one. For this reason, it is important to also more generally build a community's economic resilience and adaptive capacity.

What matters for successful outcomes for these communities is their underlying levels of adaptive capacity, which will determine how resilient they will be to external economic forces. There is therefore value in identifying the specific factors that contribute to the adaptive capacity of Australia's fossil-fuel-exposed communities. Broadly speaking, "adaptive capacity" refers to the factors that shape whether a community is resilient, and the strength of these factors in communities.

It is closely related to the concept of "economic resilience", which is the ability of a region to adapt and prosper through economic change.[3]

Responding proactively to economic change will require focus and precision. Each community will have different opportunities and different needs, which is why tailored transition planning is essential. Analysis of adaptive capacity can identify specific strengths in a community – a base to build upon – as well as the weaknesses where targeted investment can build economic resilience.

ADAPTIVE CAPACITY – A MULTIDIMENSIONAL FRAMEWORK FOR RESILIENCE

To develop a framework, the Centre for Policy Development consulted stakeholders from grassroots organisations working in Australian fossil-fuel-exposed communities. These discussions were complemented with literature on the underlying factors that determine the ability of regions to withstand economic shocks and long-term changes to their economic structures.

The framework includes seven dimensions of adaptive capacity (for which we initially suggest ten quantitative indicators) that demonstrate different factors of the underlying adaptive capacity of regions exposed to declining fossil fuel demand. By adopting an indicator-focused approach rather than developing a composite index, it is possible to gain insights into priorities for policy and investment on a region-by-region basis.

Economic diversity

The level of economic diversity in a region is typically understood to have important positive implications for adaptive capacity and economic performance.[4] As industries have different demand elasticities, export orientations, labour and capital intensities, and exposures to competition, greater economic diversification reduces vulnerability to shocks and also enables a faster recovery.[5] With a more diversified economic structure, a region is able to be more flexible when re-orientating its industrial base to adapt to changing economic conditions.[6] Industries that are less affected by the shock can absorb the labour and other resources from affected industries, thus reducing negative impacts on employment and economic activity. On the contrary, regions that are less economically diversified may be more susceptible to sector-specific shocks, have fewer opportunities to re-orientate their industrial base, and have fewer opportunities to recover from shocks.

Two ways of measuring economic diversity are the number of people employed outside the fossil fuel industry in each region as a proportion of total employees (an immediately intuitive indicator), and the Hachman index (a more abstract indicator). The Hachman index compares each LGA's employment distribution to that in the reference region, in this case non-major-city Australian LGAs.[7] The Australian Bureau of Statistics provides data by region for employment by industry based on the Australian and New Zealand Standards Industrial Classification (ANZSIC).

Innovation

Innovation is the development and implementation of a new or much improved product, process, or marketing or organisational method.[8] A region's capacity for innovation influences its ability to transform its industrial base and recover from economic shocks through the development of new ideas.[9] Innovative

capacity also increases the abilities of regions to overcome various types of lock-in, including functional, cognitive and political, that hinder regional renewal.[10] Improving regional innovation capacity is thus a key policy priority for the transformation of regional economies.[11]

There are various ways to conceptualise and measure innovation. The Australian Bureau of Statistics provides data on the number of new businesses by region,[12] which can be used to measure the proportion of new businesses as a fraction of all businesses. Although somewhat outdated, the former Commonwealth Government Department of Industry, Innovation and Science also published a dataset that captures business expenditure on R&D, and the number of trademarks and patents over 2009—2016 by SA3 regions.[13]

Geographic connectedness

New industries and businesses will only thrive if they are able to connect to nearby markets and sources of demand. Beyond having access to markets, geographic interconnectedness can also give residents better access to services and may help increase a region's liveability.[14] Geographic connectedness and spatial proximity further enhance regional resilience by facilitating knowledge flows amongst individuals and increasing efficiency within regional labour markets.[15]

One simple way of measuring geographic connectedness is by using the straight-line distance from a fossil-fuel-exposed region to the nearest capital city such as Greater Sydney. Capital cities are the most economically diverse regions in Australia and offer employment for various skill sets. As discussed below, under 'Extending the analytical framework', this is one factor that could benefit from more sophisticated analysis.

Financial capital

Higher levels of household financial capital, including income and wealth, provides household-level financial resilience as well as available capital for local investment. Household financial capital is also an important source of demand for local businesses, and the more households are able to continue to consume goods and services (particularly non-tradable services, like hospitality) the more resilient a local economy will be. At a household-level, households with more financial resources are also better able to absorb decreases in spending power, for example due to unemployment as industries close, and are also better able to support other areas of the community through a transition, for example through monetary donations.

The economic capital of households can be measured using the Index of Economic Resources (IER), which is part of the suite of Socio-Economic Indexes for Areas (SEIFA) published by the ABS.[16] The IER summarises census variables related to financial advantage, such as household income, housing costs, and assets.

Workforce skills

Human capital includes the skills, knowledge, experience and educational attainment of the people living in a region and is essential for the economic resilience of regions to structural changes because it allows for other types of capital, such as financial capital, to be deployed productively.[17] A more highly educated workforce is linked to higher creativity levels, the generation of new knowledge and the absorption of knowledge generated elsewhere, thus enabling communities to adapt quickly to both short- and longer-term economic changes.[18] High-skilled and well-qualified workers may be more productive with more transferable skills, thus helping to increase regional economic resilience.[19] The five-yearly Australian Census collects data on each respondent's level of highest educational

attainment, which can be used to identify the percentage of the population with post-school education by region.[20] Further analysis can be conducted on the split between post-school education offered by universities and vocational education and training offered by TAFE. Including analysis of both university and vocational training is important as these develop complementary skill sets with different levels of transferability.

Social capital

Social capital can enhance a region's ability to respond to economic shocks by strengthening the ability of its members to work collaboratively on common, self-identified goals, increasing sense of community and belonging, and building networks between organisations and individuals.[21] A strong social fabric is advantageous as communities go through significant economic transition, as it provides alternative non-work-based avenues of support, connection, and meaning. Social capital can include civic networks, norms of reciprocity, and trust in institutions, acquaintances, and strangers.

One existing way to measure social capital is through volunteering participation rates: the ABS collects data on this through the Australian Census. Volunteering is likely to contribute to social capital as it offers a way for community members to create bonds of trust and reciprocity. However as we discuss below, this is an imperfect proxy for overall social capital, and more analysis and data at the LGA level could better clarify the picture.

Access to public services

Access to public services such as healthcare, education, childcare facilities, aged care, and housing is a critical contributor to peoples' quality of life. For example, access to healthcare has been identified as one of the most important features impacting the liveability of a region — defined as willingness to continue living in one's neighbourhood.[22] Being able to access quality healthcare plays a crucial role in determining

whether regions can maintain economic stability by preventing, treating and managing diseases. Families with children are also likely to choose a place to live based on access to quality education. With access to higher levels of education, individuals benefit by being more likely to find employment, remain employed, learn new skills while working, and earn more over their working life.[23]

Given the wide range of public services available and difficulties inherent in defining "quality", several indicators could be used to capture access to services. We suggest two initial metrics: the ratio of teachers to children in an area can be derived from ABS Census data, while the Commonwealth Department of Health and Aged Care provides information on the number of healthcare workers by region.[24]

APPLYING THE "ADAPTIVE CAPACITY" FRAMEWORK TO TRANSITION PLANNING

The Centre for Policy Development is working on applying this analytical framework in key areas to demonstrate how the approach can identify levels of adaptive capacity in at-risk communities. This work aims to reveal insights into how to invest in adaptive capacity and how underlying strengths can be capitalised upon to ensure successful transitions for fossil-fuel-exposed LGAs.

In the meantime, we are publishing this technical paper because we believe the framework itself is a useful tool as policymakers and leaders begin to consider how to plan for economic transitions.

Using "adaptive capacity" to tailor decisions

Regions around the world are developing plans to guide the transformations of local communities reliant on fossil fuel industries as a major employer. Such plans map out the transformational paths that communities aspire to follow in diversifying their economies and ensuring liveability of their regions in a decarbonised world. In the European Union, The Just Transition Mechanism raises and directs funds to fossil-fuel-exposed regions and provides coordinated support including through a helpdesk and regular seminars.[25] In Scotland, the Just Transition Commission assists communities, businesses, unions, and workers to produce just transition plans, targeting a diverse range of factors including energy poverty.[26] In the 2022 federal election, the now federal government pledged funding to improve energy efficiency in existing industries, create new clean economy industries including in green metals and clean energy component manufacturing, and develop new industries to diversify regional economies.[27]

A national commitment to transition planning is a good first step, but the transition plans themselves must be tailored to each local community. A region with a strong base of innovative enterprises may benefit from a capital injection to kick-start a new wave of entrepreneurs. In another region, such funding may fall flat, when what they really need is support for new skills development and worker retraining.

We propose two ways that decision-makers and community leaders might use this analysis to prioritise decisions. The first approach is to identify the region's strengths upon which to build. For instance, a community with high levels of transferable skills and geographic connectedness might provide capital investments to firms that can connect into nearby supply chains. The second approach is to identify the region's weaknesses that can be buttressed with targeted investments. For instance, a community *without* good geographic connectedness may need to prioritise investment in new infrastructure to link to nearby domestic markets.

Case study: assessing Mid-Western Regional's adaptive capacity

Mid-Western Regional LGA is located in the Central Tablelands in NSW, around three hours north-west of Sydney. As expected, Figure 1 shows that Mid-Western LGA has a high proportion of fossil-fuel workers. These workers are mainly employed in coal mining, particularly around the Ulan Seam. It also has lower-than-average levels of volunteering as well as economic diversity based on the Hachman index.

In addition to its accessibility, Mid-Western Regional also has higher-than-average levels of adaptive capacity based on all other indicators. Going forward, the LGA has opportunities to broaden its industrial base in particular by growing its existing agricultural sector as the area is known as the food bowl of NSW. For example, co-location with low-cost renewable energy resources could be used to diversify into value-added food processing and to develop an agrivoltaics industry (putting agriculture and solar panels on the same land).

The LGA's relatively close location to Sydney is useful both for the export of local goods and because of the potential to further develop a strong identity as an attractive tourist hub, particularly focusing on wine-making and cellar doors. Its relatively high levels of post-school education, coupled with a strong presence of engineering skills linked to the fossil fuel industry, would be useful in developing a thriving manufacturing industry. Relatively high household-level economic capital is a positive for supporting future industries and businesses, as well as new community infrastructure. Currently, Mid-Western Regional has quite high innovation rates, including a considerably higher-than-average level of business expenditure on R&D. If policies are implemented that support the liveability of the area, such as increasing public services and strengthening social capital, there is a potential for the community to not just survive an economic transition, but to truly thrive.

Figure 1: Value of indicators for Mid-Western Regional: number of standard deviations away from mean
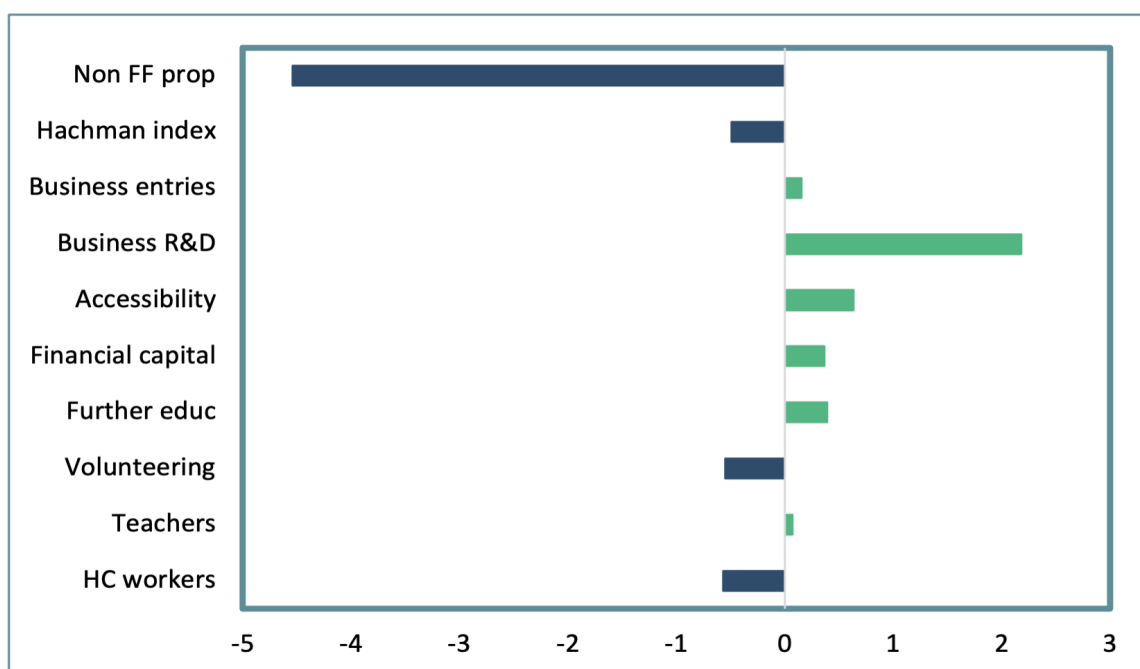
Note: The x-axis is the number of standard deviations away from the regional average for that indicator. The regional average is the average of the indicator for all non-major-city LGAs, as defined by the ABS. See Appendix A for a definition of each indicator.

Extending the analytical framework

Some areas of the framework described above could be improved through further collection and publication of data by Australian governments and other authorities, as well as through more sophisticated analytical techniques from well-resourced data teams. For example, studies have identified that institutional capacity is a key factor for whether regions are resilient to the decline of fossil fuel industries.[28] However, such a measure does not yet exist at a subnational level in Australia. Other potentially important indicators include real-time measurement of access to R&D support for example through integration of universities and local industries, the environmental health and resources of regions, as well as access to facilities that could support renewable and low carbon manufacturing.

Additionally, there are few publicly-available measures of innovation at the regional level. The sections above describe the use of data on R&D, patents and trademarks at the SA3 level. However, the data are from 2016, and would by now be outdated. More recent measures of innovation published by the ABS are only available by state and territory, and so do not identify variation across fossil-fuel-exposed communities at the sub-state level.[29] The innovation data at the SA3 level cannot be disaggregated by industry, and so we cannot tell how many new businesses are part of the fossil fuel sectors versus those outside the fossil fuel sector. And so it is difficult to determine whether high innovation is a strength (an innovative local economy to build in) or a weakness (a local economy where all the dynamism depends on fossil fuel sectors remaining in the region).

Social capital is also particularly difficult to assess at the LGA level. We have proposed using volunteering rates above, but this is an imperfect proxy. Existing data on other measures of social capital — such as survey responses on whether people believe they are able to get support in times of crisis and whether they trust their neighbours — are too under-powered when conducting analysis at an LGA level and can only

offer insights at a state level, which is not useful for local transition planning.[30]

Other areas of the framework would benefit from further detailed analysis. For example, an open question remains around how best to measure the integration of communities into inter-regional economies. In the framework above, we have focussed exclusively on geographic distance to a major market: the closest capital city. We suggest this metric because the data are readily available. However, this indicator does not reveal whether communities are integrated into other employment centres that are located closer, including potentially renewable energy zones. Nor does it consider the *strength* of the connections between geographically proximate markets, for example, through infrastructure, or supply chain partnerships.

A final open question is how best to define the characteristics of regions in which people want to live. We focus on access to services by exploring two metrics related to healthcare and education. However, conceptualisations of the liveability of communities are typically broader in scope, capturing not only these metrics but also access to other services as well as to meaningful employment, nature, and affordable housing among other factors. Our metrics also do not capture the *quality* of the education and healthcare services available in a region.

These are all areas ripe for more sophisticated analysis, and we hope that by presenting this framework, it provides a scaffold for future work.

APPENDIX A:
DEFINITIONS OF INDICATORS
FOR APPLICATION OF
FRAMEWORK

Non FF prop: number of people not employed in the fossil fuel industry in an LGA as a proportion of total employees

Hachman index: the Hachman index compares each LGA's employment distribution to that in the reference region, in this case non-major-city Australian LGAs.

Business entries: the proportion of new businesses in an LGA (new businesses/total businesses as of 30 June)

Business R&D: business expenditure on R&D per 10,000 population by SA3

Accessibility: straight-line distance from a fossil-fuel-exposed region to the nearest capital city such as Greater Sydney

Financial capital: Index of Economic Resources (IER), which is part of the suite of Socio-Economic Indexes for Areas (SEIFA) published by the ABS for each LGA

Further educ: percentage of the population with post-school education in an LGA

Volunteering: percentage of the population that volunteers in an LGA

Teachers: number of teachers per 1,000 children in an LGA

HC workers: number of healthcare workers per 1,000 people in a SA3

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