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Considerations for the establishment of the Net Zero Authority

A rapid research report by ANU

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Authors: Rebecca Colvin, Llewelyn Hughes and Frank Jotzo

Crawford School of Public Policy

Institute for Climate, Energy and Disaster Solutions

The Australian National University

Canberra ACT 2600 Australia

www.anu.edu.au

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1. Executive summary

This rapid research paper aims to serve as a **wayfinding device for Australia's Net Zero Economy Agency** as it works toward establishing the Net Zero Authority. It outlines opportunities and priority actions for consideration in establishment of the Authority. It is targeted to specific questions that emerged through consultation between the Australian National University and the Department of Prime Minister and Cabinet, in the domains of economics, and of social changes and regional communities.

The paper is based on an initial selective desktop assessment drawing on the authors' expertise, available research on transition globally and in Australia, and international experience with transition institutions. It identifies broad insights as well as specific elements relevant for the NZA. It does not provide examination of Australian government architectures or specific recommendations on institutional design, thorough examination of specific regional examples, comprehensive review of international experiences, nor assessment of performance of specific policy instruments. **Key themes** that can be identified are the following.

A broad remit and taking a comprehensive approach benefits institutions guiding the net zero transitions. The NZA could usefully focus both on fostering new economic and industrial growth opportunities and on proactive management of regional transitions. Successful guidance will usually require a broad portfolio of instruments comprising governance, regulatory, and fiscal instruments. **Coordination within and across governments** is a key function for a central agency of this nature. The NZA could play a co-ordinating role across federal government departments and agencies/authorities, and engage with State/Territory and local governments.

Strategy setting as well as monitoring and analysis are important aspects for success. The NZA could establish systems of monitoring, reporting and evaluation of progress with the net-zero transition and impacts of policy interventions. It could also set strategy in areas such as linking net zero sector plans with green industry policy, investment facilitation and regional and social transition objectives. **Inclusivity and enabling partnerships outside government** are important functions. The NZA could facilitate or lead bottom-up strategy-setting by engaging a wide range of stakeholders, including regional communities as well as business and civil society. It could also help lead Australia's engagement on net-zero transition, with a focus on the Indo-Pacific. **Key findings and considerations** for the Agency and the Authority are the following.

Managing and monitoring energy transition

In the contested space of energy transition, international experience shows that institutions and processes such as multi-stakeholder coal transition commissions can help identify shared views and can succeed in creating broad agreement on goals and actions. The NZA could **establish consensus-forging processes** on contested issues in energy transition, at the national or regional level. Multi-stakeholder processes in Canada, Germany and other countries yield applicable lessons.

Ongoing monitoring and evaluation of the net-zero transition is a prerequisite for well calibrated interventions and can help establish common understanding and trust. The NZA could **establish a system for monitoring and evaluating national net-zero**

transition. It would define criteria, track indicators and assess progress on energy and industrial transition, economic and social developments including in priority regions of interest, and impacts over time of industrial closures and of new investments. Government led monitoring could be paired with independent assessment by an expert commission.

Identifying industrial opportunities

Place-based industrial strategies increasingly focus on bottom-up approaches, with an emphasis on the collaborative development, updating, and evaluation. This reflects the view that solving market failures using industrial strategies represents a form of experimentalism. Support should be focused in areas where Australia can grow out of existing capabilities, with consideration of services in addition to manufacturing. Capabilities can be identified through complementary top-down and bottom-up approaches.

International experience shows implementation of place-based strategies differs across countries, with common elements embeddedness, discipline, and accountability. The NZA could lead in **building capacity for identifying capabilities using a top-down assessment process**, combined with **designing multi-stakeholder processes in support of industry capabilities development** focusing on problem solving within identified industries. A challenge for Australia is the lack of economic complexity, making investment in research and development (R&D) an important consideration. Australia's measured level of public spending in energy R&D is low relative to peers. The NZA could **review the performance of the national innovation system** in support of the low carbon energy transition.

Social and regional dimensions

Industrial and economic change in regional communities is experienced by community members through **cumulative impacts** of the activities underway. Impacts can be proactively acknowledged, communicated and managed. Doing so requires taking a regional community-based approach to recognising the localised experience of the net zero transition. The NZA could **facilitate a regional community-based approach to identifying, reporting on, and - to the extent possible – managing cumulative impacts**. Through extensive community engagement, this process builds legitimacy for the transition and assists with maximising opportunities and minimising negative impacts on communities. The social licence for the net zero transition is affected by many actors engaging in industrial and economic change. The NZA has the opportunity to **engage as an actor seeking to pursue the social licence** and **coordinating others** (such as industry) to adopt good practices for community engagement and benefit sharing that will advance collective benefit.

To embed meaningful community engagement in the NZA, an opportunity is to consider adoption of **a governance structure that includes regional community boards** to advise on a range of matters relevant to the transition, the NZA, and the communities themselves. Such an approach would also engender legitimacy in the transition, as the community boards would demonstrate to people in the regions that 'people like them' are guiding the management of the transition.

2. Managing and monitoring energy transitions

2.1 Managing coal transition

Many countries have experienced or are experiencing energy transition. Large scale shifts from coal to other energy, and decline or phase-out of coal mining, are typically the most profound type of energy transition. Australia is experiencing the former and will experience the latter (Treasury 2023).

Energy transitions come with major technological, economic and social changes. Interests and pressure fields usually involve stakeholders such as companies invested in declining industries, employees and local communities, replacement investments and energy affordability.

The political dynamics and policy responses are idiosyncratic to national context. Policy reacts to, shapes or drives aspects of energy transitions to varying extents and in different ways. Nevertheless, some elements of relevance to Australia can be identified from international experience.

Coal transitions can be understood in terms of the type of transition, specifically whether they are driven primarily by supply-side (e.g., coal mining) or by demand-side (e.g., coal combustion) factors; a variety of aspects of their political economy; and their outcomes, e.g., in terms of economic, social and environmental ramifications Diluiso et al., 2021).

Transition away from other energy sources, chiefly gas and oil, has not yet been observed at scale. Similar broad lines may apply but the specifics are likely to differ.

### Synthesis of international experience

Notable cases of coal transitions include those of the United Kingdom, the United States, and Germany. Case studies are also available for many other countries (Caldecott, 2017, Coal Transitions Project, n.d.).

The main instances of coal transitions so far involved substantial declines in both coal production and consumption as they took place in countries that both produce and use coal. However, these changes are not necessarily synchronous; for example, Germany first phased down domestic black coal production - a process that was completed some time ago - before starting to reduce domestic use of black and brown coal, which is an ongoing process.

Drivers and barriers

Market forces often initiate, drive or accelerate transition (refer Figure 1). Typical market drivers on the supply side are high costs of domestic mining relative to import prices, and on the demand side lower costs of alternative energy sources e.g., gas and renewable energy, depending on relative costs in specific locations.

Figure 1: Drivers and barriers of coal transitions. Source: Diluiso et al. (2021)
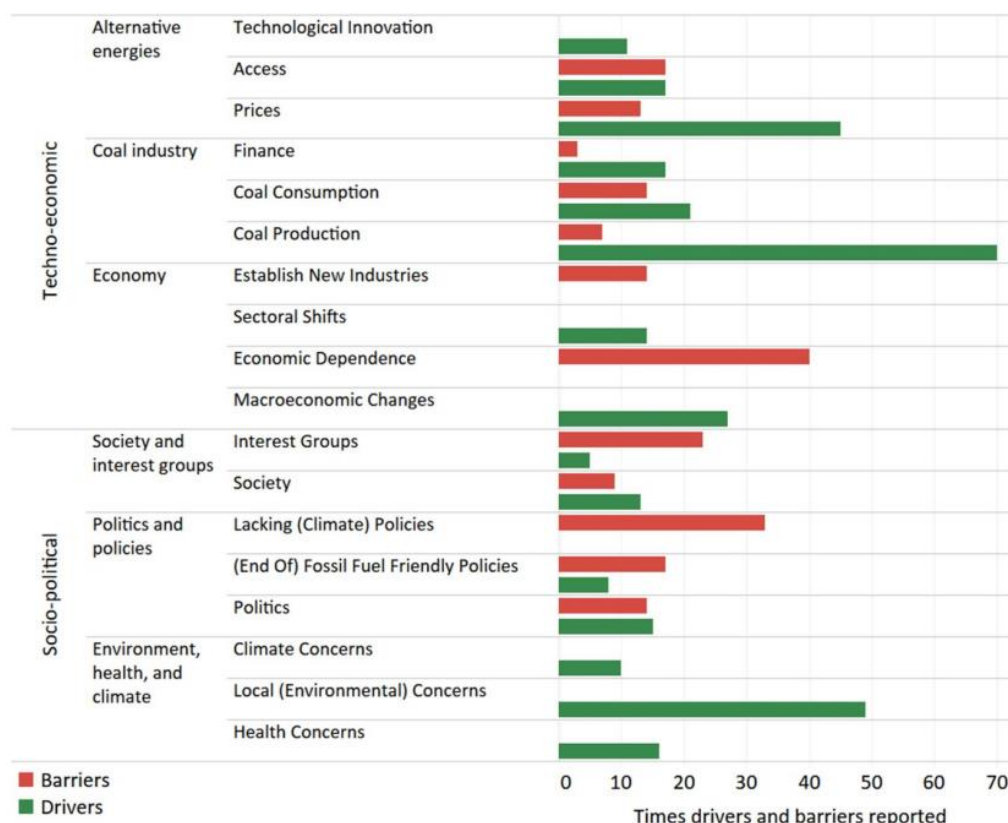
Economic dependence on the coal industry, including workforce transition issues, is the single most cited barrier to coal transitions in a survey of nearly 300 case studies, conducted by Diluiso et al. (2021).

Key barriers also often include influence of the coal producing or using industry, as well as a lack of climate policies and structural adjustment policies. By contrast, local environmental and climate concerns usually present as forces in support of coal transition.

Policy

Policy typically has a key role in facilitating transitions away from coal. Available analysis suggests that policy at the national level has been by far the most common type of intervention, followed by policy at regional/local level. It is also common for industry, unions, civil society, local interest groups, and other stakeholders to be actively involved in coal transition processes.

Regulatory instruments have dominated the historical international experience. Key examples of regulatory instruments include:

- Environmental regulations i.e., air quality regulation; local environmental considerations have often been a driver for coal transitions;

- Market regulations i.e., privatisation or nationalisation of the coal industry and electricity markets, public private partnerships; and

- Rationing, bans and moratoria e.g., production quotas, moratoria on mines and plants.

Economic instruments of various forms (such as market-based renewable energy subsidies or carbon pricing) are increasingly used, particularly to incentivise the transition from coal to renewable energy sources.

Socio-economic support policies also play a prominent role in managing coal transitions. Examples include:

- Programs to support economic diversification, including through public investment in regeneration activities, infrastructure, education, R&D;

- Creation of new employment opportunities and training programs;

- Financial support for coal producing/using regions, e.g., through support for business projects, social grants, energy bill assistance programs;

- Financial support for workers, e.g., through retirement incentives, lump sum financial packages, subsidies, revenue replacement; and

- Financial support to the coal industry, e.g., by way of government paying rehabilitation costs, subsidies for closing plants or mines, mine liquidation, redundancy payments, and grants.

Figure 2: Types of policies impacting coal transitions. Source: Diluiso et al. (2021)
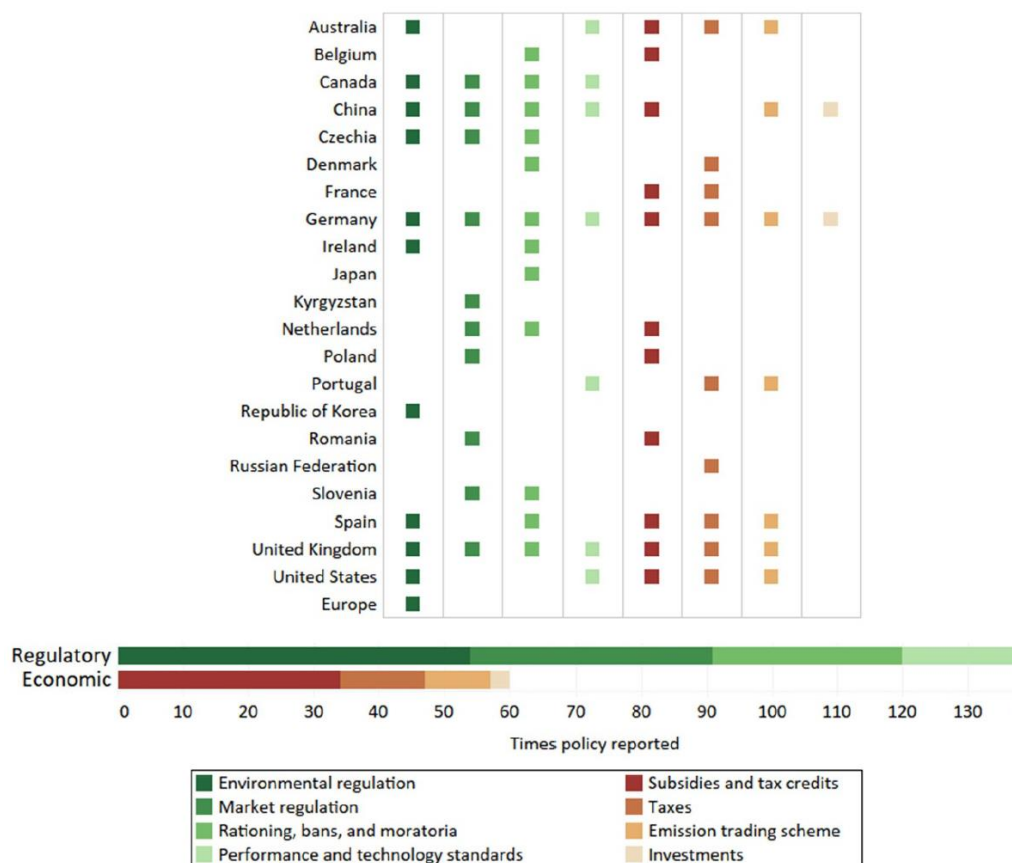
Institutions and processes

Coal transitions are typically handled by different government departments and agencies at national and sub-national level. In Australia, the transition support activities following the closure of the Hazelwood power station, including through the Latrobe Valley Authority, have provided valuable experience for future coal closures (Wiseman et al 2020).

An overarching insight from international experience is, in the recommendations of the Global Commission on People-Centred Clean Energy Transitions (2021), to "use social dialogue, robust stakeholder engagement and policy co-ordination to deliver better outcomes" (International Energy Agency n.d.).

In some prominent cases, institutions and mechanisms have been created specifically to work towards common understanding and perhaps enable consensus about coal transitions, or to determine strategies and broad directions for policy to support transition. This includes the creation of multi-stakeholder commissions in Germany and Canada to develop recommendations on how just transition and regional structural change can be organized (Gürtler et al 2021), and a Presidential commission in South Africa.

Canada has recently also established regional institutions with the goal to collaboratively identify opportunities in the energy transition and to forge consensus across a broad range of stakeholders, including indigenous groups, on actions and strategies.

Case studies

Germany's coal phase-out and Coal Commission

Germany's black coal mining sector was in decline for over 60 years before ending in 2018. The decline was managed in collaboration between different levels of government and industry, and with large fiscal expenditure to support regional economic diversification and worker transitions. A central characteristic to manage impacts on workers and regions has been the use of integrative policies based on a combination of policy goals and mechanisms (Furnaro et al. 2021).

Germany's black coal mining phase-out included the combination of policies addressing unemployment and the attraction of new energy corporations and investments, as well as measures to improve infrastructure, education, research facilities and soft location factors. Governments and other institutions at city, regional, and national level cooperated in a polycentric approach (Oei et al. 2019).

Germany now has a policy towards complete phase-out of coal fired power in place. Specific recommendations to underpin this policy were developed by a multi-stakeholder commission. The Commission on Growth, Structural Change and Employment, or colloquially Coal Commission, was established in 2018 by the German government. It included key stakeholders from the energy industry, energy users, trade unions, coal regions, environmental NGOs, research institutes and representatives from brown coal mining communities. Despite starkly different interests and perspectives,

the Coal Commission was able to arrive at a set of recommendations to government that were then translated into policy (Litz et al. 2019, Reitzenstein and Popp 2019).

Figure 3: Recommendations by Germany's Coal Commission. Source: Litz et al. (2019)
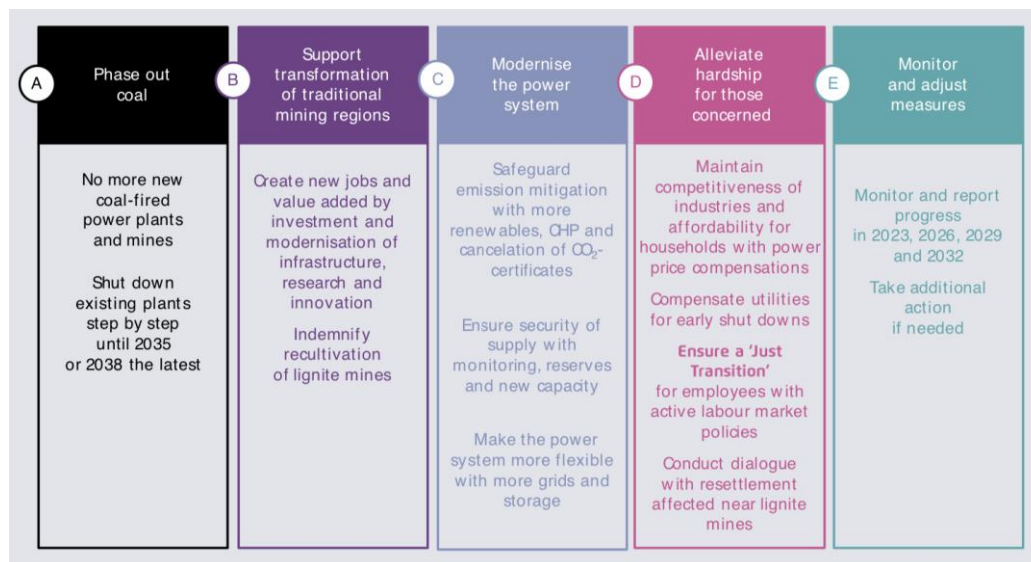
Canada's Just Transition Commission for Coal

Canada's Task Force on Just Transition for Canadian Coal Power Workers and Communities was established by the federal government in 2018 to undertake consultations with coal communities in Alberta, Saskatchewan, Nova Scotia and New Brunswick, and to make recommendations on a just transition to the federal government. The backdrop was a decision by the Canadian government in 2016 to accelerate phase-out of coal in electricity generation.

The Commission's central recommendation was for development of an inclusive 'just transition plan' for coal phase-out, with a focus on worker transition to retirement or alternative sustainable employment, and funding for communities (Government of Canada 2018).

South Africa's Climate Change Commission

South Africa has a Presidential Climate Change Coordinating Commission encompassing government, industry and civil society to co-ordinate government action and develop a framework for just transition, with a focus on the coal sector.

In a consultative process, the Commission defined a just transition framework that sets out a shared vision for the just transition, principles to guide the transition, and policies and governance arrangements to give effect to the transition (Government of South Africa 2022).

Canada's Regional Energy and Resources Tables

Canada has established Regional Energy and Resources Tables as a collaborative initiative between the national and territories/provinces designed to identify, prioritize and pursue opportunities for sustainable job creation and economic growth for a low-carbon future in the energy, electricity, mining, forestry and clean technology sectors (Government of Canada 2023). The Tables are designed as a "collaborative process that defines how governments work together, in partnership with Indigenous peoples, to build a prosperous and resilient net-zero economy" (Government of British Columbia 2023). The main question to be answered is "What are we transitioning to?" The tables also support the development of place-based industrial strategies, which are discussed in Section Three.

Elements are partnerships between federal, provincial and territorial governments to identify and accelerate a common list of the top two-to-four key economic growth priorities in each province and territory; a tailored approach to engagement with Indigenous governments and groups; and processes to seek input from municipal governments, experts, industry, labour, non-profit organizations and others.

The Regional Tables in the first phase aim to identify and agree on the highest potential clean growth opportunities for each region; then to develop action plans that will set paths forward for active collaboration between the federal and provincial/territorial governments over the next two years, including actions to align resources and investment, regulatory and permitting processes, policy tools, identification of key issues and barriers to be overcome; and finally to develop place-based economic strategies that identify the top economic opportunities in each region and plans to advance them.

Considerations for the Net Zero Authority

Coordination across federal government agencies and with State governments:
- Coal closure policy typically involves a number of different government departments at federal and State level. Important functions of coordination and harmonization could be provided by the NZA.

- As part of this, the NZA could take a role in the development or refinement of policy support for coal transition.

Creation of consensus-forging multi-stakeholder commissions for energy transition:
- Taking successful international examples as a guide, the NZA could create and shepherd multi-stakeholder commissions to explore options and agree on measures to support energy transition.

- This could be relevant immediately for impending coal fired power plant closures, and later for coal mining.

- Multi-stakeholder commissions or similar processes could be instituted at national scale with the goal of achieving broad overarching consensus, taking learnings from Germany's coal commission as well as national commissions in e.g., Canada and South Africa.

- Alternatively, or in addition, multi-stakeholder commissions could be instituted at regional level, taking Canada's new Regional Tables approach as inspiration.

2.2. Monitoring and evaluation of energy transition

Ongoing monitoring and evaluation of progress with energy transition can be an important facilitating factor for creating common understanding about what is working well and what needs improvement or a change of course, and to identify new issues in energy transition.

Such monitoring and evaluation can provide a suitable basis also for national net zero strategy development, including integration of different partial strategies produced for sectors nationally or for regions.

Synthesis of experience

The transition to net zero emissions encompasses a wide array of changes in different sectors and to different aspects of the economy. It involves and affects many different groups in society who collectively hold a multitude of objectives and who each tend to have particular concepts and perceptions.

This spells the need for comprehensive and integrative approaches to defining the full range of objectives, monitoring progress towards them, and objectively evaluating needs and options for further action.

For maximum positive effect on the transition process, such systems of monitoring and evaluation need to be public and contestable, be done on an ongoing or repeated basis, and be provided by an institution that has authority and expertise across the full range of issues.

Such monitoring can usefully extend to analysis of specific instances of energy transition, for example assessment of instances of plant closures and programs to facilitate smoother transition (as has been done for example for the aftermath of the closure of the Hazelwood power station, Wiseman et al 2020). It can also encompass comparative analysis of the performance of broader energy transition strategy, as has been provided by research groups (e.g., Waisman et al. 2019).

Case study

There is a plethora of different approaches to monitoring, evaluating and reporting on energy transition and the broader net-zero transition. These encompass national net-zero strategies (Jotzo et al. 2018) and similar broad national processes. The bulk of relevant processes consists of sector-based assessments which typically provide depth but do not, or not fully, take into account the economy-wide bigger picture, often omit important feedback effects between different sectors, and may not incorporate a clear and consistent set of long-term goals. Assessments are typically provided by government agencies or independent bodies and differ widely in their visibility and standing.

A useful example of energy transition monitoring and evaluation that is encompassing, integrated, regularly updated and has high standing is Germany's system of monitoring its energy transition (BMWK, 2023). It consists of annual monitoring reports and tri-

annual comprehensive stocktakes, provided by the German government, and complemented by an independent monitoring and assessment process run by a commission of eminent energy experts.

This model provides simultaneously the authority of the central government, and parallel independent assessment that is free to point out any deficiencies and suggest course corrections. Both use the same extensive base of data, and a defined range of criteria and indicators for energy transition is assessed repeatedly over time. Top-level assessments are provided by way of a 'traffic light' system, which facilitates public and policy communication (refer Figure 4).

As a result, the German energy transition monitoring has high standing in the community and among stakeholders, and provides a useful common reference point for many different stakeholders.

Figure 4: Part of Germany's assessment of energy transition monitoring. Source: BMWK (2023)

Table 1: **Summary of the overall assessment of the Expert Commission regarding the status of the energy transition in terms of attaining the 2020/2022 targets**

Dimension	Indicator	
Mitigating climate change	Reduction in greenhouse gas emissions (leading indicator or overarching target)	🔴
Phase-out of nuclear power	Operational nuclear power plants (leading indicator or overarching target)	🟢
Renewable energy	Increase in the share of renewable energy in gross final energy consumption (leading indicator)	🟢
	Increase in the share of renewable energy in gross electricity consumption	🟢
	Increase in the share of renewable energy in heat consumption	🟡
	Increase in the share of renewable energy in transport	🔴
Energy efficiency	Reduction of primary energy consumption (leading indicator)	🔴
	Final energy productivity	🔴
	Reduction in demand for heat in building sector	🟡
	Reduction in final energy consumption in transport	🔴
Security of supply	Expansion of transmission grids (leading indicator)	🔴
	Redispatch measures	🟡
	System Average Interruption Duration Index – SAIDI electricity and SAIDI gas	🟢
Affordability	End-user spending on electricity in terms of GDP (leading indicator)	🟡
	End-user spending on heating services	🟢
	End-user spending in road traffic	🟢
	Industrial electricity unit costs in the international comparison	🟡
	Residential electricity costs	🟡
Public acceptance	General approval of the goals of the energy transition (leading indicator)	🟢
	Approval of the implementation of the energy transition	🟡
	Approval on the basis of the personal impact	🔴

Target attainment: 🟢 likely 🟡 uncertain 🔴 unlikely

Considerations for the Net Zero Authority

A system for monitoring and evaluating national net zero transition:

- The NZA could consider establishing an integrated system of monitoring, assessing and analysing Australia's net zero transition.

- This could take elements of Germany's system of monitoring the energy transition as inspiration, such as combining the government led monitoring with regular assessment by an eminent expert body.

- Monitoring and evaluation would be tailored to include the full remit of the NZA, thereby covering e.g., trends and progress on energy transition objectives, economic and social developments including in priority regions of interest, and impacts over time of industrial closures and of new investments.

- The various existing processes of data collection and regular reporting by federal government departments, agencies and bodies (as well as in some instances State/Territory governments) would flow into the integrative monitoring and evaluation provided by the NZA. Delineation with the Climate Change Authority's assessment functions would be needed.

3. Identifying industrial opportunities

Governments are reconsidering industrial policies, defined as "policies that explicitly target the transformation of the structure of economic activity in pursuit of some public goal" (Juhász, Lane, and Rodrik 2023). OECD research attributes the reconsideration of industrial policy to the apparent success of policies in countries such as China in promoting rapid growth and concerns about the decline of manufacturing amongst advanced economies (Warwick 2013). Climate change is an additional reason support for Green Industrial Policies has increased, including in the context of coal transitions (Rodrik 2014).

In this section we address the theoretical and empirical evidence around industrial transition, including approaches to identifying opportunities for government intervention to support the net zero transition.

3.1. Industrial policies

Industrial polices have a controversial history. Rodrik (2014) notes that although market failures may justify the use of industrial policies, evidence suggests their performance has historically been mixed in practice.

Arguments in favour of industrial policies

- **Knowledge Spillovers:** New technologies – including low carbon technologies – generate positive spillovers, such as skills development or industry-wide learning, that are not captured by those making initial investments, leading to underinvestment. There can also be linkages between present investment choices and future production possibilities (Pack and Saggi, 2006).

- **Information Externalities:** Government and industry have imperfect information, making it rational to exchange information to learn about the costs and opportunities of strategic coordination (OECD, 2013). Uncertainty about the profitability of new activities can also only be resolved by making an investment that cannot be recovered if the outcome is unfavourable, and entrepreneurs may not be willing to make an investment ex ante (Pack and Saggi, 2006).

- **Coordination Failures:** New economic activities may be restricted due to high fixed costs and large-scale investments. Where projects require simultaneous investments to be made by independent agents to succeed there is no guarantee each agent would make the investment (OECD, 2013; Pack and Saggi 2006).

- **Absence of Sufficient Pricing of Carbon Emissions:** The private return to low carbon technology investments is likely to lie below the social return in the absence of the sufficient pricing of carbon (Rodrik, 2014).

Arguments against industrial policies

Critics of industrial policies argue the risk of government failure is greater than any cost from market failure. Assessing the performance of industrial policies is also difficult empirically given the challenge of identifying a counterfactual that would enable measurement of their causal effects (Pack and Saggi, 2006). Mechanisms underpinning government failure are:

- **Information constraints:** Governments lack information required to determine which industries and/or firms merit support (Warwick, 2013).

- **Regulatory capture:** Industrial policy design depends on political dynamics, meaning government support for an industry is likely to be based on political considerations rather than economic merits. This may also lead governments to continue to support industries beyond when necessary (Warwick, 2013).

3.2. Place-based Industrial Strategies

Two features distinguish new industrial policy from earlier approaches. First, place-based industrial strategies should be understood as a process of discovery, with strategies focused on designing institutional features in order to overcome market failures while minimising the likelihood of government failure.

Reflecting this, Rodrik (2014) argues well-designed industrial strategies share three features:

1. **Embeddedness:** Where governments and industry are uncertain about optimal policy design, place-based industrial strategies should be understood as an iterative process of mutual discovery, with the goal of "learning where the most significant bottlenecks are and how best to pursue the opportunities…interaction reveals" (Rodrik 2014).

2. **Discipline:** Monitoring and evaluation procedures established ex ante should focus on key measures derived from agreed-upon goals, such as patenting, industry cluster development, or other indicators. Automatic sunset clauses can reduce the difficulties with removing a program once initiated.

3. **Accountability:** Accountability is maintained through public transparency about programs and performance, and the incorporation of multiple stakeholders in strategy development.

Global Value Chains and industry policies

A key feature of the global economy - including for technologies and products involved in the low carbon energy transition - is the emergence of Global Value Chains (Asian Development Bank 2021). Global Value Chains (GVCs) are fragmented networks of production sharing, enabled by the codification of knowledge, falling costs of information technologies, and lower barriers to cross-border trade and investment. The range of industries and activities using GVCs has grown since the 2000s (Elms et al. 2013).

GVCs enable specialisation in productive activities and services, including for low carbon energy technologies. GVCs also enable regions to develop specialised niches in stages of the value chain, opening possibilities for upgrading capabilities (Haakonsson and Slepniov 2018). An additional feature of GVCs is that they are substantially regional - centred on Europe - the Americas, and the Asia-Pacific, with important implications for Australia (Baldwin and Evenett 2014).

GVC complicate the design of place-based industrial strategies, as governments and firms required to identify niches within GVCs rather than capabilities in final products or services (Baldwin and Evenett 2014). Evidence also shows the share of value added is shifting from the fabrication stages to pre- and post-fabrication services" (Baldwin and Ito 2021), known as "smile curve". This means place-based industrial strategies need to broaden to consider the service sectors.

3.3. Identifying capabilities

A core challenge for governments and firms is identifying potential capabilities. Top-down and bottom-up approaches are available to identify capabilities, and are complementary.

Top-down approaches

Evidence shows countries – and regions – more easily diversify into activities that build on existing capabilities (Mealy and Teytelboym 2022). These activities are defined as the 'product space', and can be measured by the likelihood a country will export a good, given that it exports another good (Hidalgo et al. 2007).

In low carbon energy technologies, Huberty and Zachmann (2011) study wind turbines and solar photovoltaics, concluding that "successful countries in green products today are...those who moved into those sectors from positions of strength in closely related sectors." Similarly, Fraccascia, Giannoccaro, and Albino (2018) study competitive advantage in Environmental Goods and Services (EGSS) globally, finding "the highest potential for growth among all green products in a given country are those being in close proximity to the products a country produces". They also identify EGSS where countries have proximate capabilities that are not yet existing strengths, arguing these represent opportunities for diversification.

Quantitative analysis can be used to identify underlying capabilities. In Australia, the NSW Innovation and Productivity Council has used this approach to analyse EGSS competitive advantage at the state level on a product basis, with outputs used to inform the formation of the NSW Circular Economy Innovation Network (NSW Innovation and Productivity Council 2019).

Analyses provide evidence of where diversification opportunities may lie on a national or regional basis given existing capabilities (the "what"). While this can help inform a place-based industry strategy, it does not provide information about institutional design and mechanisms (the "how") that might be effective in implementing place-based industry strategies.

Complexity and investing in innovation

An additional and relevant issue is economic complexity. The Australian economy performs poorly in measures of economic complexity, and Mealy and Teytelboym (2022) note countries that are narrowly focused on resource extraction may find capabilities are underdeveloped and not well aligned with green growth. Supporting innovation that increases economic complexity is thus a key issue. Hidalgo et al. (2007) note the difficulty of shifting to products far away in the product space, yet also propose these shifts that generate structural transformation and growth. In this context, it is notable that Australia's spending on research, development and deployment is low as a share of national income (see Figure 6). Consideration of the Australian innovation system in the energy sector is thus warranted.

Figure 5: Public spending on energy research, development and deployment. Source: International Energy Agency RD&D (2012-2022)
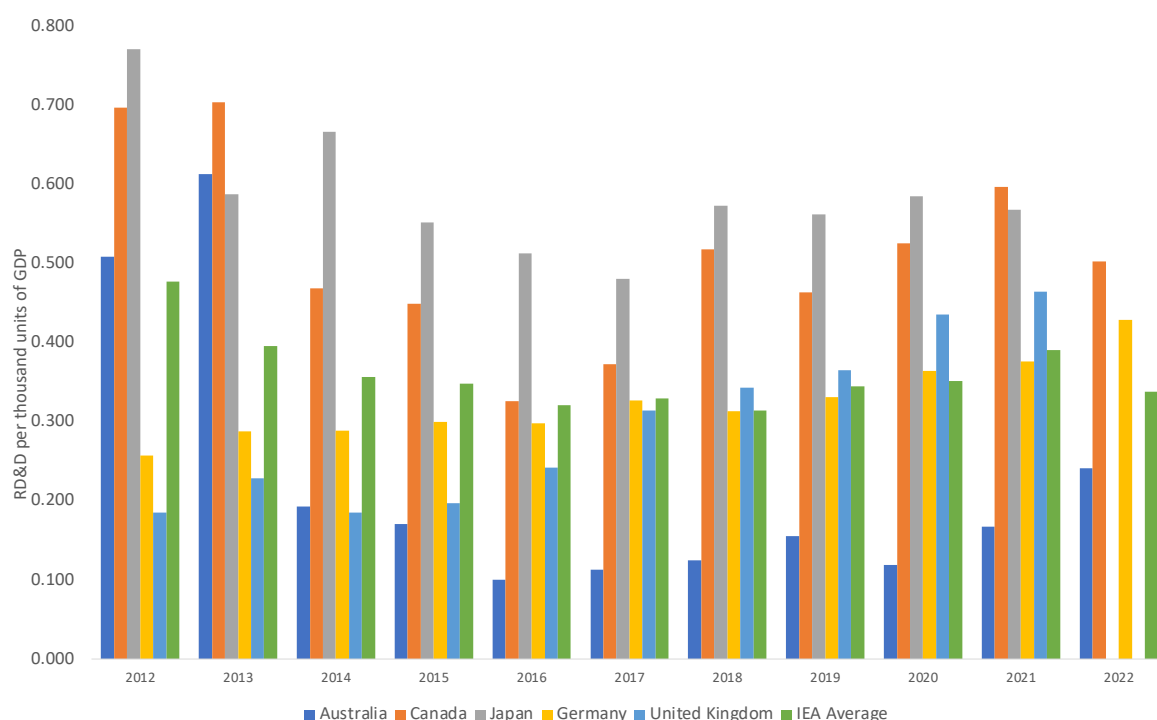
Source: International Energy Agency RD&D

Bottom-up approaches and case studies

Place-based industrial strategies require careful institutional design. In this section we review a number of international implementation cases. The cases illustrate the application of principles of embeddedness (including through iteration), discipline, and accountability in different international contexts.

United Kingdom offshore wind and the Scottish Offshore Wind Energy Council

The UK is a lead market for offshore wind globally. The UK Offshore Wind Industry Council (OWIC) is a government-industry forum created in 2013 to support offshore wind power development. It is co-chaired by industry representatives and the UK Minister of State for Energy Security and Net Zero. The OWIC has workstreams across aviation and radar, innovation, offshore transmission, supporting supply chain growth, environment and consenting, workforce planning, and supply chains and regional industry clusters (European Wind Energy Association 2014).

In March 2019 OWIC released the Offshore Wind Sector Deal (OWSD). The OWSD outlines agreed upon actions by the industry and by government. A Delivery Group is charged with monitoring outcomes, and is chaired by a member of the OWIC and supported by a project management office. The OWIC formally reports progress to the competent minister annually, with additional updates provided regularly to government. A list of agreed-upon initiatives is shown in the table below.

Table 1: Initiatives within the UK Offshore Wind Industry Strategy (non-exhaustive)

RD&D	Sector co-funds investment in UK-based Research, Development and Demonstration (RD&D) activities, working with UK universities and research institutions to help increase the productivity and competitiveness of the UK supply chain, and support export opportunities.
	Government funds collaborative RD&D on technologies such as including digital and robotic technologies for surveying and operations and maintenance to increase UK competitiveness and further reduce costs.
Skills training analysis	Sector establishes an Investment in Talent Group to identify skills needs and develop curricula and accreditation to deepen the skills base. This includes developing an Offshore Energy Passport to accredit offshore workers and facilitate job-mobility between offshore renewable and extractive industries.
	Government participates in Investment in Talent Group to ensure alignment with skills agenda. Group also collaborates with other sectors such as oil and gas, nuclear and automotive.
Competitive and export-oriented supply chains	Sector establishes a target of total lifetime UK content of 60 per cent for projects commissioning from 2030 onwards including increasing levels of UK content in the capital expenditure phase.
	Gov. develops programmes to help growing firms access international markets, trade and foreign direct investment promotion, supporting supplier competitiveness and productivity, and working with developers and suppliers to access new markets.
Cluster development	Sector works with local, regional, and devolved government and economic development agencies to identify areas of comparative advantage and define infrastructure and investments required to support increased earning power in local communities.
	Govt. supports regional cluster development using mechanisms such as the £115m Strength in Places Fund to build science and innovation capabilities and develop stronger local networks.

Separately, the Scottish government has created the Scottish Offshore Wind Energy Council (SOWEC), co-chaired by the Scottish Minister for Energy, and energy firm SSE, with the mission to "coordinate and grow the sector, ensuring the Scottish offshore wind industry is more sustainable, competitive, and commercially-attractive, both domestically and in the global offshore wind market." OWIC collaborates with SOWEC in developing and implementing its industrial growth strategy (Offshore Wind Scotland 2021).

Following leasing awards SOWEC invited successful bidders to join a Collaborative Framework Working Group (CFWG), which developed a Strategic Investment Model (SIM) structured around five workstreams, with each aiming to solve an agreed-upon list of issues related to infrastructure upgrades required for offshore wind development. The SIM aims to build a shared view of requirements for industry development by working across industry and the public sector. It has a governance structure shown below in Figure 6.

Figure 6: Scottish Offshore Wind Energy Council Institutional Design. Source: SOWEC (2021)
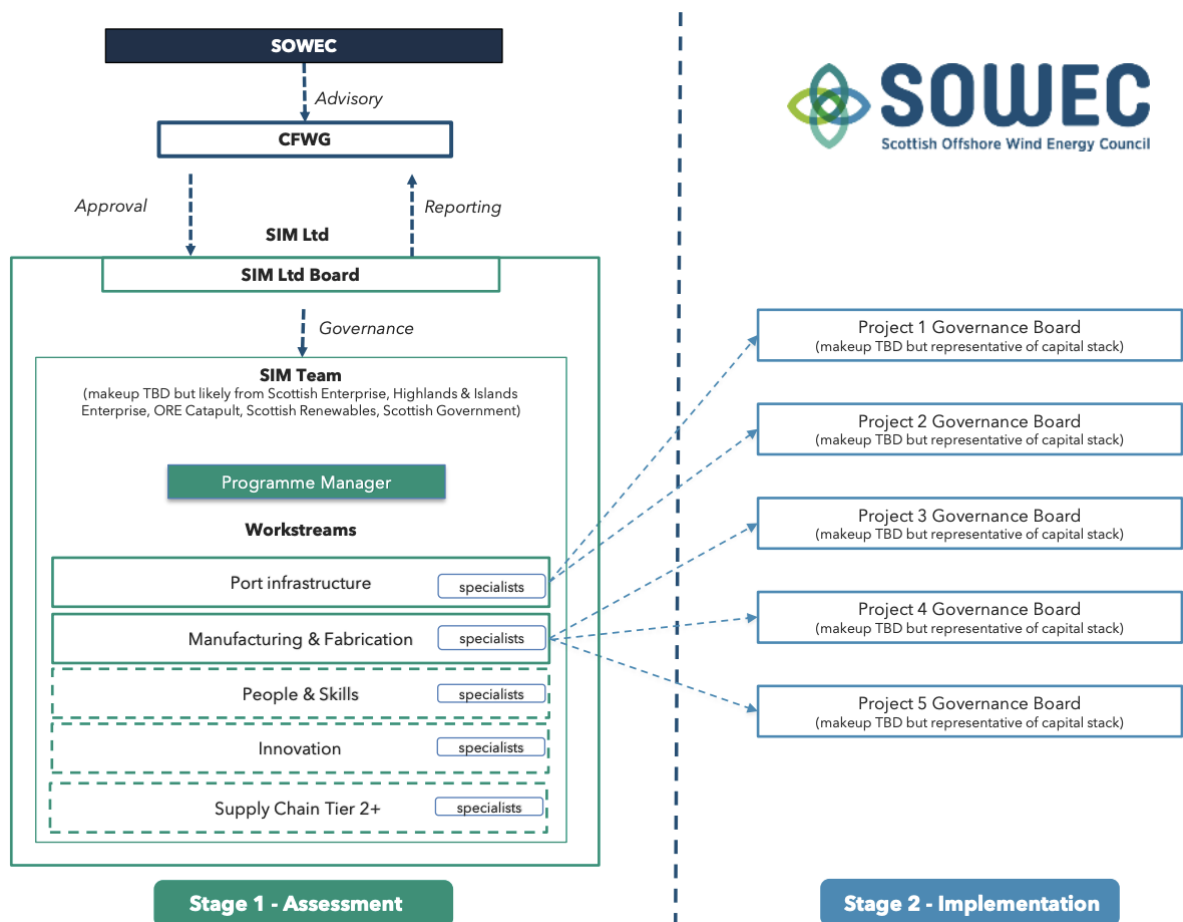
Participants in the SIM agree to co-fund a program manager, which is charged with progressing work under the SIM. The SIM has two phases. In the first phase investment proposals generated by industry - including companies involved in the supply chain as well as developers - are assessed with the goal of arriving at agreement on requirements. In phase two agreed projects develop a full commercial business case around individual investment proposals through joint work by developers, government, ports, and other supply chain members.

Participation in the SIM does not impose any financial obligation on members other than annual administrative costs, and the SIM does undertake direct investment in identified projects. Rather, its goal is to coordinate industry action to enable capital to be available for infrastructure investments, and to catalyse supply chain growth.

Canada Regional Energy and Resource Tables (RERT)

The Canadian Regional Energy and Resource Tables (RERT) are a new collaborative initiative between the Canadian government and provinces and territories, with the goal of identifying and prioritizing opportunities for sustainable job creation and economic growth. RERTs are planned for all provinces and territories across Canada, beginning with British Columbia, Newfoundland and Labrador, and Manitoba.

There are three elements to RERT process:

1. Federal, provincial and territorial governments jointly identify economic growth priorities for each province and territory;

2. Tailored consultation with Indigenous governments and groups; and

3. Input obtained from municipal governments, experts, industry, labour, and non-profit organizations.

The RERT process adopts a phased and iterative approach. In the first phase federal, provincial and territorial governments identify a small number of growth opportunities on a regional basis. The RERTs then jointly develop an action plan that aligns resources, investment, and regulatory and permitting processes, and identifies barriers. This process culminates in a place-based industrial strategies for economic opportunities in each region, which integrate Indigenous perspectives on regional opportunities, and includes input from experts, industry, and labour.

An example of the RERT process is in British Columbia (BC). The region identified six areas for potential development in the Framework for Collaboration on the Path to Net Zero: critical minerals, electrification, clean fuels and hydrogen, the forest sector, carbon management technology and systems, and regulatory efficiency. The federal and provincial government, and municipalities, delivered a framework statement following consultation with industry, labour, and experts, with the goal of increasing knowledge about "value chain opportunities in priority energy and resource sectors, as well as knowledge of workforce considerations, enabling factors, barriers to development, and projects of regional significance" (Natural Resources Canada, 2023).

As an example, in the forestry sector, a series of commitments were made through the process. Forestry is significant to the BC region. In 2022, the sector represented about

24 per cent of the province's total commodity export value, equal to CA$15.3 billion (Plowright 2014).

Table 2: Forestry Program – initial commitments

• Support research, development, and innovative forest practices to promote British Columbia's forest bioeconomy and advanced bioproducts.
• Support market development and commercialization of wood-based construction materials.
• Support bioproduct development to better utilize harvest slash pile residuals.
• Support technical and business development of uses for forest biomass by providing access to attract investment and inform decision-making.
• Increase First Nations participation and shared decision-making opportunities in forest management through forest landscape planning, incorporating traditional values and knowledge in managing forests for sustainability and resiliency.
• Analysis of impacts of forest management activities on social, ecological, cultural, timber values through forest landscape planning.
• Explore opportunities to accelerate support of reduced emissions technologies in the forest sector.

Table 3: Forestry Program – initial initiatives in support of commitments

• $9 million from existing federal and provincial programs to support the design and installation of a robotic multi-function processing line that produces high-performance mass timber panels.
• $1.6 million to deliver a project to help Indigenous communities become part of B.C.'s forest bioeconomy by harvesting non-timber forest products like consumer goods and industrial products. Through the Indigenous Innovative Bioeconomy Demonstration Project, Indigenous communities will increase energy resilience by harnessing energy from forest biomass and explore opportunities to generate revenue through GHG emission savings and carbon sequestration.
• $1.3 million to identify the most suitable pathway to de-risk fuel switching processes in large-scale lime kilns in Canadian kraft mills.
• $460,604 from the INRP program, to the B.C. First Nations Forestry Council, to develop and facilitate a series of three-day, online and in-person First Nations forestry basics courses followed by a career fair in four regions throughout the province of B.C.

The Minister of Natural Resources Canada and the Minister of Energy, Mines and Low Carbon Innovation of British Columbia are required to publicly report on progress in delivering the collaborative framework within one year, and will produce a more detailed strategy. The program initially draws on existing funding streams.

Europe Cluster Policies

Clusters can be defined as "dynamic geographic concentrations of interconnected firms and related economic entities that have reached a sufficient scale to develop specialised expertise, services, resources, suppliers and skills" (European Commission 2021). The rationale for government intervention to support clusters emerges because market agents may not be aware of the positive externalities they generate for others, and clustering also facilitates the flow of ideas and information (Warwick 2013).

Europe has had a long-standing policy mix supporting cluster development. Clusters affect competition through three mechanisms: 1) increasing the productivity of cluster firms; 2) driving the pace and direction of innovation; 3) stimulating the formation of new businesses (Johnston 2004). Evidence from Europe and the United States show clusters are a significant source of innovation and employment. Monitoring is carried out since 2015 through the European Cluster Collaboration Platform (ECCP). In 2021 the ECCP reported clusters across a wide range of sectors within the EU, including in renewable energy. Small and medium sized enterprises (SMEs) made up a large number of firms in clusters (Franco et al. 2021).

In 2021 the European Commission's Cluster Expert Group under the Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs recommended cluster policy should focus on green transition as one of three themes, alongside digital transition, and resilience. Amongst other initiatives the report recommended clusters should be used to:

- Mobilise and facilitate cooperation among stakeholders in industrial ecosystems;
- Develop and implement circular economy strategies;
- Develop capacity-building programmes to help clusters provide sustainable advisory services;
- Channel expertise and financing to SMEs for becoming more resource-efficient and carbon neutral.

There are differences in governance across clusters, they commonly are structured around enabling interactions between government, industry and research (the "Triple Helix"), based on principles of embeddedness. Two German examples are provided to illustrate institutional design and mechanisms for enabling industry, government, and research collaboration.

Example 1: Brandenburg-Berlin Energy Technology Cluster

The Brandenburg-Berlin Energy Technology Cluster ("Cluster Energietechnik Berlin-Brandenburg", https://energietechnik-bb.de/en) is managed by the Economic

Development Agency Brandenburg and the Berlin Partner for Business and Technology. It is supported by 6-10 staff and has 344 members, including 7 large firms, 250 SMEs, industry associations, and 34 research organisations, with a focus on local capabilities centred on renewable energy, energy efficiency, energy grids and storage, and power station technologies.

Cluster members are organised "along the value-added chains and the innovation topics agreed in the dialogue process" and are supported in forming consortia for project alliances. Activities focus on initiating and monitoring cooperation in agreed-upon areas, networking core players in energy technology in the region, promoting exchange between scientific institutions and firms through knowledge and technology transfer, and networking with international actors. The cluster also provides consulting services so members can identify regional, national or European funds.

Example 2: Hesse cluster Process4Sustainability

The Hesse cluster Process4Sustainability (Utilkal and Loewert, 2022) is supported by the Hessian state government and the European Regional Development Fund, and focuses on enabling companies operating in processing industries to implement CO_2 neutrality measures, with a particular focus on SMEs, by providing "practical knowledge about the levers of CO_2 neutrality, new markets and innovative business models." Core activities are driven by working groups with agendas determined by company members and focus on issues such as electrification, hydrogen, industrial heat, power-to-X, and biogenic waste.

Smart Specialisation and Energy Transition with case studies

Smart Specialisation Strategies (S3) is an approach to supporting innovation rather than decarbonisation, although in practice there are important linkages between them. A review for the European Commission by Navarro and Uihlein (2016) found 36 of 162 strategies related to energy across different technologies. Steen, Faller and Fyhn Ullern (2019) found energy is the most widely used focus of S3 strategies, with two-thirds of European regions with at least one energy-related priority. This suggests a synergy between S3 and decarbonisation. The EU is currently piloting 'S4', which adds 'Sustainability' to 'Smart Specialisation Strategies' (Kruse 2023).

Research has also noted some issues with the S3 initiative. Demand creation, for example, often depends on national policy initiatives that can be out of the control of regional stakeholders. Gianelle, Guzzo, and Mieszkowski (2020) review 39 smart specialisation strategies implemented across Poland and Italy also find an important implementation gap of S3 principles, which may be due to a lack of institutional and administrative capacity in implementing locations.

Europe Smart Specialisation

Smart specialisation is defined as "regional policy framework for innovation driven growth" (OECD 2013). The OECD (2013) notes smart specialisation complements cluster

policies, but that smart specialisation focuses on enabling the emergence of new activities through discovery and experimentation. These processes may later form the basis for the development of clusters with or without additional policy measures (Foray 2016).

In 2012 the European Commission produced a Guidebook to support applicants for EU funds under the initiative (European Commission Directorate General for Regional Policy, 2012). Six steps are identified in designing a strategy:

1. Analysis of the regional context and potential for innovation;
2. Ensure participation and ownership locally;
3. Elaboration of overall vision for the future of the region;
4. Identify priorities through a process of entrepreneurial discovery;
5. Define a roadmap and action plan; and
6. Integrate monitoring and evaluation mechanisms.

S3 was implemented as a core feature of EU regional policy, and consistency with Smart Specialisation principles was made a condition for accessing research and innovation funding under the European Regional Development Fund (OECD 2013). Policy goals look different to traditional research and development incentives due to the focus on enabling entrepreneurialism:

Table 4: Policy goals under Smart Specialisation

Incentives for entrepreneurs	• Reward entrepreneurs who discover new activities, and attract and facilitate market entry so agglomeration effects can occur.
Building inter-regional linkages	• Detect knowledge and capabilities in other regions, improve the capacity of stakeholders, facilitate labour mobility.
New mechanisms to detect novel ideas	• Incentivise firms to share information on experiments and explorations, and identify complementarities.
Supporting experimentation	• New activities may lack evidence of clear economic value, and new tools are required to enable policymakers to assess the potential of emerging activities.
Educational programmes	• Upgrade skills required by cross-sectoral and cross-technology training

A variety of policy mixes have been deployed, including subsidies, the introduction of new governance institutions, and education and training, reflecting regional differences (OECD 2013). Smart specialisation also requires monitoring and evaluation in pre-, during and post-implementation phases.

In Step 1 the European Commission recommends using a mix of administrative data – such as R&D investment, citations and patent applications, employment, surveys, interviews, and external experts to identify scientific and technological specialisations at the regional level.

In Step 2, which focuses on governance initiatives to enable entrepreneurial discovery processes, the approach focuses on incorporating public authorities, universities and other knowledge-based institutions, investors and enterprises, civil society actors, and international experts for benchmarking and peer review. Outcome evaluation tools include R&D investment levels, counts of newly established and extended networks and centres, and counts of joint research by scientists and engineers. (Technopolis Group and Manchester Institute of Innovation Research 2012).

Australia Gippsland and Latrobe Valley Smart Specialisation

Smart Specialisation has been trialled in Australia in the Latrobe Valley. Ward et al. (2021) examine the pilot application of the S3 strategy to Gippsland and the Latrobe Valley, while noting 3S was first examined in Australia in the Hunter Valley by Regional Development Australia in 2012-2014 working with the University of Technology, Sydney. Implementation in the Latrobe Valley was led by the Latrobe Valley Authority (LVA), which producing the Gippsland Smart Specialisation Strategy in 2018. The Melbourne Sustainable Society Institute (MSSI), based at the University of Melbourne, and researchers at RMIT supported implementation, which was co-led by a leading European researcher on regional innovation systems. They found that "local political and policy constraints" meant the strategy focused on four sectors of the regional economy – food and fibre, renewable energy, the visitor economy, and health services – identified as likely to be the centre of the regional economy. In the final implementation report the authors recorded that gaining local legitimacy for the approach was challenging, and that:

"If the development and implementation of Smart Specialisation across Gippsland has demonstrated one thing, it is that policy change indeed is possible, but it requires persistence and time. The one key lesson to be learned from this is that Smart Specialisation is not implemented overnight, that it requires very dedicated policy support and that immediate results should not be expected. This outcome is in line with much of the experiences recorded on the EU's Smart Specialisation Platform, and valid across a diversity of regions" (Goedegebuure et al., 2020).

Weller and Rainnie (2022) also examine the piloting of the S3 strategy to Gippsland and the Latrobe Valley, concluding that implementation was challenging because it required replacing a model of local development centred on local governments.

Considerations for the Net Zero Authority

Place-based industrial strategies increasingly focus on bottom-up approaches to industrial strategy development, with an emphasis on collaborative development with stakeholders, combined with institutions enabling ongoing monitoring, updating, and evaluation. This reflects the view that solving market failures through industrial

strategies represents a form of experimentalism, with a focus on services in addition to manufacturing. Support should be concentrated in areas where Australia can grow out of existing capabilities, which can be identified through complementary top-down and bottom-up approaches.

The administrative capacity required for coordinating the design, implementation and monitoring of place-based industrial strategies is substantial. The NZA potentially has an important role to play in:

- Support the development of place-based industrial strategies through coordinating with state and local governments and across federal government agencies, including acting as a knowledge broker and ensuring approaches are consistent across levels of government.

- Develop tools to provide ongoing monitoring and evaluation services for the performance of place-based industrial strategies.

- Support international engagement, with a particular focus on the Asia Pacific region given the regional structure of many Global Value Chains.

4. Social and regional dimensions

4.1. Socio-economic impacts of regional economic transition and mitigation options

The need for Australia to shift from fossil fuels to renewable energy has initiated significant socio-economic transformations in regional communities. Whilst some communities are experiencing this industry boom for the first time, others are managing a transition away from fossil fuels towards the renewable energy industry. Communities whose economies have been dependent on the resource industry will require careful coordination to limit the social impacts that can come with unemployment and economic downturn, whereas communities that are experiencing this industry boom for the first time will face a different set of challenges associated with the influx of large-scale developments and associated economic activities.

Common concerns surrounding this influx are linked to increased pressure on local resources and infrastructure, turbulence within the local economy and managing the initial increase in economic activity from construction to the subsequent decrease during operational phases.

Research that examined cycles of boom and bust of the fossil fuel industry in regional Australia show that the increase in number of private and public actors participating in regional governance can also lead to a confusing regulatory environment, creating an 'institutional void' where no single actor is responsible for coordination.

As Australia continues to transition from fossil fuels towards renewable energy, appropriate planning and coordination will be critical to limiting the negative social impacts associated with the economic transition and maximise the opportunities that such change brings.

Concepts and frameworks

Australia's shift away from fossil fuels, a sector that has long played a pivotal role in the Australian economy, will have significant social impacts on regional communities. The transition is not just a switch from one set of technologies to another, but relates to "broader changes of the social, cultural, political and material ordering of the world, influencing relationships to place, community cohesion, and labour processes" (Burke et al 2019). Regional resource-dependent communities are particularly vulnerable to decarbonisation due to their reliance on the economic and employment benefits associated with the fossil fuel industry (Burke et al. 2019; Fleming- Muñoz et al. 2019). Addressing the social impacts and inequities relating to the phase out of fossil fuel industry is central to the equitable distribution of benefits and burdens associated with the energy transition (Snell 2018).

There is also a new type of community in transition, which are those that have not previously hosted the resource industry but are set to host large-scale renewable energy infrastructure. Many of these communities are located in Renewable Energy Zones and will see a large influx of renewable developments in their region. These

communities will likely experience a different set of challenges to those communities facing the decline or withdrawal of the fossil fuel sector in their local economies.

Drawing on lessons from the expansion of the fossil fuel industry into regional communities, and emerging literature on regional experiences with renewables, the following concerns are likely to be present in communities experiencing a largescale local roll out of renewables (Franks et al., 2010; Everingham et al., 2015; Mottee et al., 2016; Sunak and Madlener, 2016; Measham et al., 2019):

- Shortages in affordable accommodation and housing due to price inflation
- Skills shortages in trades
- Difficulties retaining staff in the [non-mining] sectors
- Pressure on community services such as childcare, employment and skills training, local medical and dental services
- Socio-economic wellbeing in communities
- Effects of transient populations on the local social landscape
- Traffic congestion
- Increased crime and changes in social norms
- Increased demands on infrastructure.
- Perceived and real loss of community due to demographic change
- Disturbance to familiar [rural] lifestyles
- Feelings of 'social dislocation' and changing sense of place (e.g., solastalgia)
- Changing relations of power and social status among local social groups

The changes experienced by both communities that are transitioning away from fossil fuels and the communities that are experiencing the expansion of renewables (or other 'clean' industries) for the first time can lead to **cumulative impacts**, an important consideration in the energy transition. Cumulative impacts "result from the aggregation and interaction of impacts on a receptor and may be the product of past, present or future activities" (refer Figure 7, Franks et al. 2013). They can be difficult for regulators and industry to monitor as the impacts are often non-linear and be experienced differently by local actors (e.g., businesses, homeowners, renters) (Mottee et al. 2016).

Figure 7: A conceptual representation of 'cumulative impacts'. Source: Franks et al. (2010)
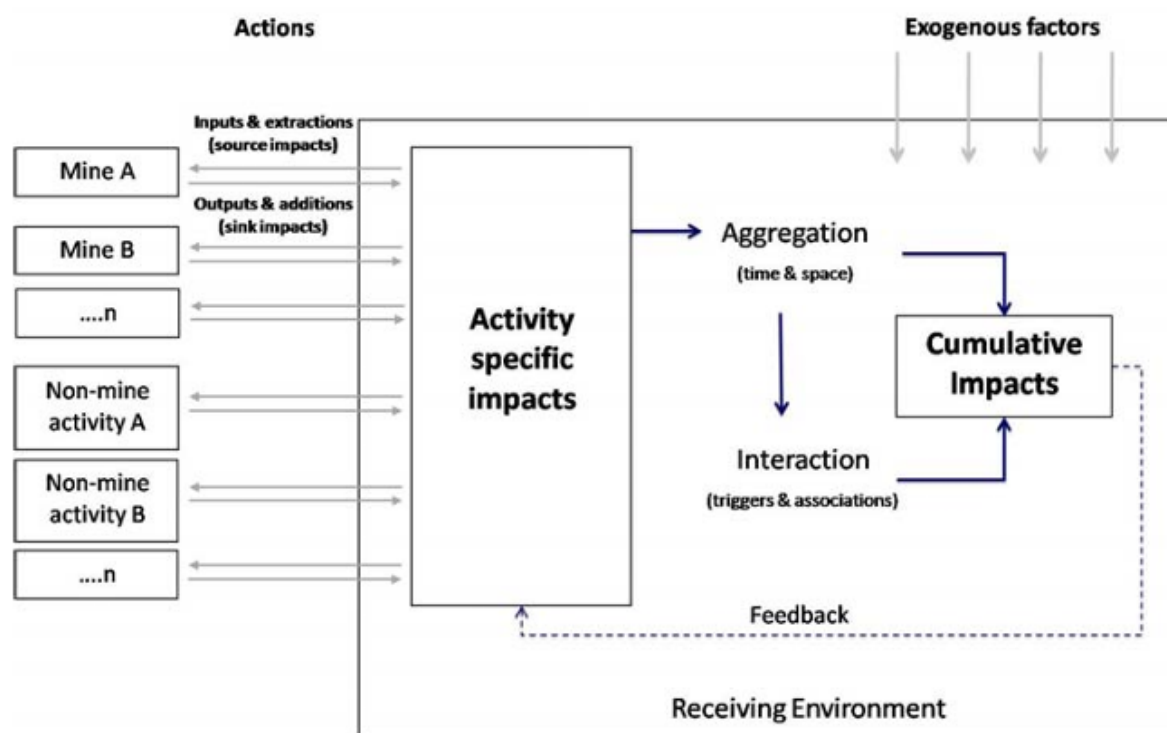
Typically, cumulative impacts refer to the impacts of industry expansion into a region. However, particularly salient for the net zero transition will be the cumulative impacts of both industry decline and new industry expansion occurring in tandem. From a community perspective, cumulative impacts are all those changes that occur within a region due to the total industry activity occurring. This sits in contrast to the formal recognition (and mitigation) of impacts via regulatory approaches that tend to be managed on a project-by-project basis. The community perspective on cumulative impacts, therefore, considers all change within a region that is attributed to the activity of industry change.

It is this perspective of the community experience of all change observed and experienced within the region, including the cumulative impacts of tandem industry declines (e.g., fossil fuels) and expansion (e.g., renewables), that will define how the social impacts of the net zero transformation are understood in the regions experiencing the change. While quantitative indicators can aid with tracking cumulative impacts and their effects on host communities, a strictly quantitative approach (e.g., metrics and dash-board type approaches) can overlook the qualitative experiences of communities (Measham et al. 2019; Colvin et al. 2019), leading to the risk that communities feel their experiences and concerns are not 'heard' by those in power.

Impacts on communities transitioning away from fossil fuels

Although large-scale renewable developments are a relatively recent occurrence in regional areas, many lessons can be drawn from the extensive literature on the social impacts of the resource sector in Australia.

The most significant social impacts felt by communities transitioning away from coal is linked to unemployment and economic downturn. Research has shown that closures of coal- fired power stations in Australia lead to a 0.7% increase in local unemployment which extends past the initial months of the closure (Burke et al., 2019). In some regions, such as the Upper Hunter, coal-fired power stations exist alongside substantial coal mines (both thermal and metallurgical). Thermal coal mines in Australia will be particularly susceptible to job losses as they directly supply power stations, unlike metallurgical mines which will still sell to international markets (Fleming- Muñoz et al., 2020). However, export and domestic thermal coal will be subject to varying pressures, notably the difference between Australia's emissions reduction (on domestic thermal coal) versus the emissions reduction of the countries to which Australia exports (particularly including Japan, South Korea, Taiwan, China, India, and Vietnam) (Colvin, 2023).

Impacts extend further then direct job losses from industry closure, as surrounding communities experience indirect losses due to the reduced demand of local services and commodities (Burke et al., 2019). As well as the immediate direct and indirect job losses associated with transitioning away from fossil fuels, communities can also experience deterioration of social support networks and structures, a loss of attachment to place and traditions, loss of identity, and adverse physical and mental health impacts (Green and Gambhir, 2020). As populations start to decrease, communities can cross critical thresholds where they then lose local support services, further compounding difficulties (Morris et al., 2019). The transition is made further complex by many coal producing communities having a valued social identity that is linked to the predominant economic activity (MacNiel and Beauman, 2022; Donnelly 2023). This identity has then been placed at the centre of a polarising 'jobs vs the environment' narrative in the public sphere (Colvin, 2020), which drives challenges in engaging in open and constructive debate on opportunities in the net zero transition. Whilst the renewable industry may offer new jobs, skillsets may not be immediately transferrable and the jobs may not be available in the same location as the coal-fired power stations (Fleming- Muñoz et al., 2020).

Mitigation measures for transitioning communities

There has been significant research into mitigation measures and 'transitional assistance policies' (TAP) to help limit the impacts of industry phase-out in regional communities. The following four categories of policy instruments were identified in a literature review of TAP (Green and Gambhir, 2020):

- **Financial compensation:** Financial compensation is a commonly used TAP tool to help limit the economic impacts associated with unemployment. Compensation can come in the form of grants, subsidies, capacity building, in-kind support services, redundancy packages and welfare payments. A study of coal

transitions around the world found that unconditional payments to workers is a commonly used method. However, this method is not sufficient on its own and can sometimes have intended consequences on future employment prospects. The study found that workers who received lower redundancy payments alongside relocation and capacity building initiatives (e.g., workplace training, paid relocation) systematically fared better than those who received higher redundancy payments and initiatives (Caldecott et al., 2017).

- **Exemption tools:** Strategic use of regulatory and legal exemptions for climate change laws and policies can ease transitional impacts for resource-dependent communities. They can offer full or partial relief from compliance with laws and regulations that are implemented as part of a climate action regime, aiding existing players and new entrants. Examples can include tax exemptions, temporary relief from liability, or a delay in enforcing the new policy.

- **Structural adjustment assistance:** Structural adjustment assistance aims to aid individuals in adapting to new economic conditions caused by structural change. This assistance can involve conditional monetary payments and in-kind support, such as retraining. Examples of structural adjustment assistance include the US Partnerships for Opportunity and Workforce and Economic Revitalization (POWER) Initiative, Scotland's Oil Workers Transition Fund, Canada's Coal Workforce Transition Fund (Piggot et al., 2019) and the Dutch Government's facilitation in the Limburg region that focused on retraining in sectors with an economic demand and educating the next generation to minimise intergenerational inequities (Caldecott et al., 2017).

- **Comprehensive Adaptive Support:** Comprehensive Adaptive Support encompasses financial and non-financial measures to assist agents in adapting comprehensively to structural changes. These tools aim to aid relevant agents in adjusting not only financially but also in various other aspects to cope with the new circumstances resulting from structural change and can include counselling and social services. It may also include worker transfer schemes and initiatives such as locally targeted public investment in line with decarbonisation goals.

For these policies to be successful, communities must be included in decision-making and ongoing governance processes. Participatory decision-making improves perceived distributional and procedural fairness and aids with the acceptability and sustainability of policies and initiatives (Green and Gambhir, 2020). This will be particularly important in communities that have had prior negative experiences with change prompted by the actions of industry and regulatory bodies. For example, the New South Wales Independent Planning Commission (IPC) which was set up to provide advice on planning proposals has been perceived by Upper Hunter Valley residents as being divisive, and there is variable but often low trust in the decisions of the IPC (Colvin and Przybyszewski, 2022).

Furthermore, allowing communities to shape policies and programs helps to disrupt binary discourses such as the 'jobs or the environment' narrative, as in reality, local opinions are nuanced and require space to be expressed (Colvin and Przybyszewski, 2022; Donnelly, 2023). Forums that are created in order to enable participatory

decision-making can be especially well suited to opening up space for productive dialogue, however appropriate resourcing is essential for such initiatives to lead to the success that they promise. Appropriate resourcing should be considered particularly in terms of compensation for participants, a suitably skilled third-party facilitator, appropriate timeframes, access to experts and information, and a commitment to abiding by the outcome/decision that results from the process) (Hendriks and Colvin, 2023; Colvin et al., 2016). All these elements that pertain to listening to, engaging, and partnering with communities contribute to the 'social licence' for the net zero transition, which is discussed in the next section.

Social impacts of economic activity decline

Impacts associated with a new influx of renewable energy developments mirror those experienced by resource-dependent communities when industry first arrived in their regions. Just like traditional resource projects, renewable energy projects bring about an initial economic 'hit' during construction where towns see an influx of workers and an increase in economic activity. Following the construction phase the level of economic activity declines, creating a second period of adjustment for host communities. This economic turbulence can be linked to the following impacts:

- **Increased risk for business owners:** Research into the experience of gas communities in Queensland reveals that small to medium businesses in regional communities were encouraged to capitalise on the initial economic 'hit' but faced difficulties in doing so due to inadequate coordination and communication. These businesses ventured into uncharted economic territory with uncertain supply chains and assumed substantial risks. In some cases business owners erroneously took the temporary construction phase to be a new normal, making decisions that were not aligned with the longer term view of economic cycles of construction and post-construction phases. There is a need for governance regarding groups with vested interests, such as developers, who champion rhetoric around a renewables 'boom', which can lead to unrealistic expectations for the community, particularly over the longer-term (Measham et al. 2019). Important is clear communication about the difference between the short-term economic 'hit' during construction phases and what can be expected in the longer-term, post-construction.

- **Fluctuating demand on services and facilities:** A study of communities in Queensland that experienced gas developments found that availability of services and facilities such as hospitality, entertainment, local utilities and trades people were a key driver of wellbeing during both the construction and operational phases (McCrea et al., 2019). Local procurement of services is often seen as a positive strategy in achieving distributional fairness and benefit sharing amongst the host community (Hall et al., 2017). However, during the initial influx of employment activity in a construction phase of a project, local procurement policies can produce unintended negative consequences if there are not enough workers available in the town to service both the new development and the continuing pre-existing requirements of the community. Locals can end up struggling to engage tradespeople and labourers, such as

mechanics or construction workers, if project developers can offer a higher wage. This can lead to negative economic consequences for the community and social licence consequences for the developer.

Conversely, the use of fly-in-fly-out and/or drive-in-drive-out (FIFO/DIDO) labour can likewise create negative impacts in communities. Communities that have experienced notable FIFO/DIDO workforces in their communities have described the 'flyover effect' "where nearby communities are unable to capitalise on the economic benefits of mining in their region" (Cheshire, 2010). Locals feel that the FIFO/DIDO workers act as a conduit for exporting economic benefits from the community that hosts the activity that generated the benefits. As a result, the legitimacy of the activities can be questioned by locals.

Social impacts of reduced availability of services

Due to a decrease in population and economic activity post-construction during the operational phase, communities may see a reduction in key services and facilities. Supporting the sustainability and longevity of them can help to ensure wellbeing during the fluctuating demand associated with the construction and operational phases of renewable developments.

- **Strain on local government:** Another lesson from the fossil fuel industry shows that local governments have previously become stressed after an influx of activity, as they are required to work with a significant number of stakeholders and navigate what may be for them previously unchartered territory (Cheshire et al., 2014). In Australian coal communities, local governments have previously experienced a shift in the nature of governance that saw an uptick in the involvement of state and national stakeholders in decision-making that was previously managed locally. The increase in the number and type of actors participating in local decision-making actors can lead to a confusing regulatory environment creating an "institutional void" as there is no single entity that is clearly responsible for overseeing local decisions (Cheshire et al., 2014). An institutional response is increased support for local-based coordination of local, state, national and industry stakeholders to avoid this institutional void, and to manage the cumulative impacts in transitional regions.

- **Impact on property market:** Resource booms can impact the property market in a variety of ways. The increase in population associated with resource developments, particularly during the construction phase, can cause a surge in demand that surpasses supply, resulting in increased house prices and rent. Although this can negatively impact homebuyers and renters, as existing homeowners benefit from the increased prices an acceleration of outward migration of long-term residents can result (Mottee et al., 2016). Furthermore, developments, especially windfarms, due to their visibility, can impact property values. A study of properties neighbouring windfarms in Germany found that property values decreased by 9-14% for owners whose views were strongly impacted (Sunak and Madlener 2016).

Case studies

The Netherlands coal transition to natural gas

Between 1965 and 1975 Limburg region in the Netherlands transitioned away from coal due to a shift in reliance on natural gas. The Dutch government strategically tackled economic challenges in the region by diversifying demand and employment through initiatives like relocating governmental bodies and universities. These institutions could bring about economic benefits and helped to bypass the need to attract new investments during the coal phase-out. The Government also focused on retraining workers for sectors that had high economic demand and facilitated employment shifts through hands-on learning to align with evolving job demands. Furthermore, they prioritised educating the younger generation to minimise intergenerational inequity; this involved investing in local education, offering financial support for higher education access, and enhancing educational infrastructure (Caldecott et al. 2017).

Australia cumulative impacts from coal seam gas projects: Gasfields BoomTown Toolkit

The rapid expansion of the coal seam gas industry particularly into parts of regional Queensland and New South Wales precipitated substantial socioeconomic impacts, often cumulative impacts due to multiple projects, in affected communities. Researchers from the University of Queensland developed key indicators to improve monitoring of the socioeconomic impacts from coal seam gas projects. These indicators were developed cooperatively with the communities, through qualitative research that first sought community perspectives on the types of changes they were experiencing, ahead of compiling the data that provided insight into these indicators. Key indicators included: population, income, employment, housing, education and skills, community safety and wellbeing and external influences (e.g., Rainfall and petrol prices). The indicators were developed by community, industry and government and offer an adaptive approach to social impact assessment methods that better captures the cumulative impacts on host communities. A similar set of indicators could be adopted to help manage the impacts from an influx of developments in regional areas due to the net zero transition (Mottee et al., 2016).

Considerations for the Net Zero Authority

As the net zero transition gains momentum, regional communities will be at the forefront of the positive, negative, and neutral impacts of significant change to their economies. This requires an expansion of consideration of transition impacts from a tendency toward a focus on worker support (which remains essential) to an inclusion of worker support in the broader context of regional development and wellbeing. Central is that community perspectives on impacts guide how the impacts are identified and defined (Weller and Tierney, 2018).

Evidence about how communities experience the socio-economic impacts of such changes, particularly from the expansion of the unconventional gas industry into regional Australia, notes cautions that can be addressed proactively to ensure that the net zero transition unfolds equitably and efficiently. The Net Zero Authority (NZA) has a clear opportunity in this regard.

First, the NZA can engage with **cumulative impacts** within geographically defined regions. To be most legitimate within communities, cumulative impacts should include both the quantitative and qualitative impacts, and the identification of what impacts are relevant be led by communities. Developing relevant indicators for tracking cumulative impacts should therefore occur through extensive community engagement. This might involve multiple avenues, such as meetings/workshops with targeted local groups (e.g., schools/P&C, sports groups, business chamber), open processes such as stands and booths at shopping centres and local events (e.g., agricultural days, markets, sports events), online platforms for submission of ideas.

To develop and maintain legitimacy, decisions about priority cumulative impacts for tracking and the selection of indicators can be led by community members, for instance through an advisory committee. An advisory committee will have greatest local legitimacy if it prioritises inclusion of local community members ahead of representation of key stakeholders or interests. In other words, broader trust in the committee outcomes can be built through the inclusion of 'everyday' people from the local community, which would offer assurances to other community members that even if they are not included in the advisory committee, 'someone like them' is. This approach can be expected to provide more legitimacy than a consultative committee comprised of representatives of key stakeholders, such as the resources industry, renewables industry, local institutions, and so on.

Cumulative impacts are poorly managed when they are expected to autonomously be identified and managed in aggregate by social impact management plans, as is the norm for project-based approvals and impact management. Existing evidence suggests that communities experiencing change to their industries and economy are best placed to navigate cumulative impacts with the presence of an **intermediary**, a role the NZA could fill. This could involve:

- Working with communities to generate meaningful quantitative cumulative impact indicators and methods for engaging with qualitative dimensions of cumulative impacts.

- Transparently reporting cumulative impacts, recognising that the trust engendered by transparency has a greater benefit than the potential risk of exposure of negative impacts (Weller and Tierney, 2018; Weller, 2019).

- Engaging proactively with relevant agencies and organisations on mitigation measures for cumulative impacts. This may include advocating to state and Commonwealth government departments to fund social and cultural programs in regions experiencing cumulative impacts of the net zero transition, alongside more traditional worker assistance policies.

As an intermediary that engages with communities on cumulative impacts, the NZA would be constructing measures for reporting the impact of the net zero transition that are contextually relevant to the regional communities experiencing the transition most tangibly. Based on experience in communities affected by the expansion of the gas industry, it is reasonable to expect that there will be some common indicators of cumulative impacts that emerge across communities/regions. If some consistent indicators emerge across locales, as can be expected, these will provide the

opportunity for a nationally consistent approach to measurement across some of the socio-economic impacts of the net zero transition.

Following the Gas Boomtown Toolkit project (described above) and indications of community concerns about transition, this may include indicators such as (indicative/illustrative list only: median house prices and rents, population (differentiating between permanent and itinerant residents), perceptions of the adequacy of health, education, transport and other public services, local educational opportunities and youth out-migration rates, opinion data on perceptions of the range of employment and economic opportunities in the communities, the community retention of economic benefits of activities conducted in the region, and so on.

Quantitative impacts can be measured and transparently reported, for instance through regional net zero progress dashboards. Live dashboards that are publicly visible and that update in 'real time' as data are available will offer the benefit of ongoing provision of information (increasing trust) and avoid the risk of a 'newsworthy' data release that might see data misrepresented or taken out of context. Qualitative impacts can be 'heard' through ongoing presence in and engagement with communities. Community advisory committees, such as those that might be established to guide the development of indicators for cumulative impacts, can act as a vehicle for interfacing between the broader community and institutions such as the NZA on qualitative community experiences.

In an approach of this nature, the role of the NZA would be to demonstrate that communities are being heard and enabling an understanding of their experiences of the transition, such that those experiences can inform action to mitigate negative impacts and maximise opportunities for positive outcomes. Actions that the NZA may take in response to the cumulative impacts on communities might include advocacy for mitigation measures to relevant agencies and actors, such as in health, education & social and cultural programs; expanding the scope of intervention in regions in response to the net zero transition beyond the standard approach of worker support.

Such an approach would see the NZA reporting on cumulative impacts of the net zero transition in parallel to the Climate Change Authority's (CCA) required reporting of the impacts of climate policies on rural and regional Australia. The CCA's First Annual Progress Report (2022) specifies that these impacts would be measured as part of the 'wellbeing' dimension of their methodology (s4.2, pp. 54-58). At present, specifics on what would be measured and reported do not appear to be published. However, the general approach to reporting (on impacts on regional and rural Australia, as well as the other elements of the CCA's methodology) appears to be intended to be relatively high-level, such as a national snapshot rather than localised reporting. The CCA has also committed to ongoing development of the methodology. As such, ongoing engagement with the CCA would be vital to avoid duplication, but also raises opportunities for the CCA's likely national-level reporting to complement, and be complemented, by a local approach taken by the NZA.

This comprehensive approach to the socio-economic impacts of the net zero transition will mitigate negative, and amplify positive, impacts on regional communities most directly and materially affected by the transition. Further, it will help to secure and maintain a 'social licence' for the transition, as will be discussed in the next section.

4.2 Social license dimensions of the net zero transition in regional communities

Australia's emissions reductions targets require rapid deployment of clean energy infrastructure. To achieve this, stakeholders need to garner widespread support from host communities, often referred to as a 'social license' or 'social licence to operate' (SLO). SLO is not a formal process, but a way of describing an informal, dynamic relationship between some sort of influential actor, normally industry but also including government, and its stakeholders. Failing to obtain a social licence can result in community disruption, costly delays and a slower clean energy transition.

Building a social licence is particularly critical in communities that will experience substantial material change due to the net zero transition. For example, communities hosting or neighbouring Renewable Energy Zones, where the cumulative impact of numerous proposals is being felt. Additionally, host communities that are simultaneously transitioning away from fossil fuels require consideration, as their prior experience with industry may contribute to pre-conceived opinions and attitudes towards other, net zero economy projects. Furthermore, the concentration of developments in these regions means that negative experiences can spread quickly amongst communities, for instance by communities observing or engaging with the experiences of others and transferring expectations to their own experience.

Common concerns raised by communities that are relevant to the social licence include landscape changes, disruptions to social cohesion and the local economy, effects on property values, and shifts in population dynamics. These issues are not dissimilar to those identified as socio-economic impacts of regional change. An important distinction is that from the social licence perspective, governing actors will be expected to mitigate such impacts in order to reduce negative (and enhance positive) impacts on communities. To understand the dimensions of the net zero transition in regional communities, we can look to the extensive literature on developing a social licence for fossil fuel projects, as well emerging literature on the experience of energy transitions in regional Australian communities.

Concepts and frameworks

Social licence to operate

The phrase 'social licence to operate' (SLO), commonly shortened to 'social licence' or a 'social 'contract' emerged in the 1990's as an amorphous term from the resource sector (Hall et al., 2014; Moffat et al., 2016; Santiago et al., 2021). More recently, the term has been adopted across contexts, including by the renewable energy sector. The social licence can be defined as "the ongoing acceptance or approval for a development granted by the local community and other stakeholders" (Hall et al., 2014). Developing SLO is a dynamic process that is commonly intangible and informal (Lacey et al., 2016). It has to be earned by the developer and continually renegotiated as new information is acquired and opinions and perceptions change (Hall et al., 2014). Hicks (2020) states that a social licence will "reflect transparency, legitimacy, credibility and trust, will address power inequalities and will develop meaningful partnerships".

Research on the antecedents of the social licence in the unconventional gas sector has identified five key factors that predict the SLO (Walton and McCrea, 2020):

1. Perceived industry effects, both positive and negative;

2. Distributional fairness – the perceived fairness of the costs and benefits shared by a local community;

3. Relational aspects between the host community and industry, such as trust in industry, relationship quality, and procedural fairness;

4. Governance of the industry (formal and informal governance, and trust in governing bodies); and

5. Knowledge of the industry.

The social licence has provided communities and advocacy groups with the means to operate as de facto regulators or 'watchdogs' of developments in their regions (Brand et al., 2023). However, there has been a rising consciousness of SLO in the Australian corporate sector, most notably culminating into the ultimately unsuccessful proposal to formalise SLO into the Australian Securities Exchange's Corporate Governance Council ('ASX CGC') Corporate Governance Principles. Although the proposal failed, mostly due to concerns around the ambiguity of the term, interest in SLO amongst the private sector remains. From a corporate perspective, SLO provides benefits surrounding corporate reputation, transparency and stakeholder relations (Brand et al. 2023). When SLO is not obtained, there is a high probability of protest action, disruption to project development and operations and associated financial losses (Vanclay and Hanna, 2019). From a public perspective, community opposition poses reputational and financial risks for governments. Associated costs surrounding net zero economy projects include renegotiations, delayed timelines, loss of tax revenue, loss of government confidence and potential decline in foreign investment.

Building a social licence to operate in regional communities is critical for Australia to reach emissions reductions targets. As political, regulatory and market environments continue to advance the roll out of renewable energy developments, community opposition could become a key hurdle in the energy transition. A 2010 study of windfarm proposals found that one in two proposed wind farms were contested by opposition groups (Hindmarsh, 2010). Renewable Energy Zones are particularly at risk of increasing opposition as communities start to feel the cumulative impacts of multiple proposals in their region. If a regional community has a negative experience, this sentiment is shared quickly amongst neighbouring communities and can create a domino effect, impacting regional attitudes and opinions.

Stakeholders relevant to SLO

There are no formal or elected SLO actors in relevant to the net zero transition, however, **key stakeholders that occupy important roles with Australian experiences of SLO** include:

- Local stakeholders. These include local council, business owners and landholders who hold significant influence amongst communities.

- Advocacy and renewable energy 'peak body' groups that are supporting the social licence dimensions of the transition by advocating for best practice community engagement and benefit sharing. Groups include the Clean Energy Council, First Nations Clean Energy Network, RE-Alliance, Yes2Renewables, Rewiring Australia the Next Economy and Community Power Agency, as well as local grassroots organisations. These advocacy groups have contributed significantly to SLO discourse, having developed multiple 'best-practice' guides for industry (e.g., Lane and Hicks, 2019; Clean Energy Council, 2018).

- Emerging oppositional groups who highlight the importance of developing SLO by slowing down renewable energy developments. In the New England Renewable Energy Zone, groups such has Responsible Energy Development for New England (RED4NE) and Voices for Walcha have been highly organised, hosting community meetings, producing online resources and garnering significant media attention. These groups can have a significant impact on the social licence, as higher levels of perceived land use conflict can cause higher levels of opposition (Colvin et al., 2020). Furthermore, creating 'us versus them' dynamics through community organising methods (e.g., protests or oppositional advertising) can exacerbate community conflict (Colvin et al. 2016; Della Bosca and Gillespie 2018; MacNiel and Beauman, 2022).

These key stakeholders are indicative of the types of actors that will be most actively involved in the range of activities that fall under the umbrella of the SLO. However, the broader social context, and therefore a wider range of stakeholders, also affects the social (and political) context in which the SLO is pursued in regional communities. This wider range of stakeholders can be considered the key stakeholders for the net zero transition, and includes groups and actors that can be broadly considered as representing interests or place, sometimes the intersection of both.

Key interest-based stakeholders for the net zero transition include:

- High-carbon industries, usually additionally represented through third party organisations such as peak bodies

- High-carbon industry workers and their representative, usually trade unions

- Low-carbon industries, with emergent representation by third party organisations such as peak bodies

- Low-carbon industry workers, with less established trade union representation compared to the high-carbon industry workers

- Value chain businesses, such as machinery parts and repair businesses that supply (and are dependent on) high-carbon industry but may be able to transition to serving low-carbon value chains

- General business advocacy groups, such as business councils and chambers

- Government at all levels, with distinct differences between levels for instance
    - local government as subject and manager of local economic impacts and
    - state government as regulator and beneficiary (e.g., through royalties)

- Media actors, with particular focus on commentators that advocate for or against the net zero transition as a key aspect of their public profile and reader/viewer retention

- Climate advocates, including non-governmental organisations and activist groups

Place-based stakeholders will tend to include local groups and organisations that form specifically in relation to the net zero transition, as well as pre-existing institutions. The former sit in intersection with the interest-based stakeholders above, and will often network across places to exchange knowledge and grow support. Whereas the latter represent existing networks of connectivity within communities. **Place-based stakeholders of the net zero transition** include:

- Local pro- net zero transition action groups (intersecting place and interest), such as those noted above

- Local anti-net zero transition action groups (intersecting place and interest), such as those noted above

- School networks including Parents and Citizens (P&C) associations

- Faith groups, including local places of worship and their broader networks

- Women's networks, such as the Country Women's Association

- Sporting clubs and groups for children and adults

- Social institutions such as men's sheds

- Business networks such as local business chambers

- Landcare and other environmental restoration groups

Alliances and shared identity-based associations between stakeholders can see some stakeholders acting together more akin to a bloc than to a group of separate interests. Such behaviour is amplified when complex issues are simplified into pro/anti stances, such as support or opposition to a new policy, initiative or project.

In general, more localised stakeholders will be likely to hold substantive concerns or interests in whatever is the focus of their engagement (policy, initiative, project), whereas stakeholders that are more general, i.e., operating at a national scale, will be more likely to engage on symbolic lines. To illustrate, public conflict in 2019 about Bravus Mining's (then Adani Mining) development of its Carmichael coal mine saw local stakeholders arguing on themes of local employment and environmental impacts (extending to regional self-determinism in response to the 'Stop Adani' protest movement). Whereas national stakeholders were arguing on more symbolic matters such as the importance of climate action and positioned the Carmichael coal mine as a moral illustration of the need for climate action (Colvin, 2020).

In summary, while efforts toward the social licence for the net zero transition will necessarily be localised, broader social and political dynamics will shape the context in which the social licence can be pursued.

Achieving SLO for the net zero transition

The pursuit of the SLO for the net zero transition can be understood as bringing benefit in both normative and strategic ways. From a normative perspective, the vast volume of literature on regional transitions highlights the importance of people in the regions exercising agency in driving their own futures (Weller and Beer, 2022; Colvin and Przybyszewski, 2022). With pursuit of the social licence, interventions in the regions can be best aligned with the vision that residents in those regions have for their future. In many cases, adopting engagement/participatory practices that are considered central to the pursuit of the social licence will see these visions and interventions – and their interaction – cooperatively generated by governance agencies and the community.

From a strategic perspective, pursuit of the social licence will best position the Net Zero Authority to achieve its goals across other dimensions of work, such as enabling investment and influencing regulatory change. When communities, especially those that are geographically defined and local to a place of material activity (such as industry or economic transition) accept and see as legitimate a regime of intervention, there will be lower social risks to the agency driving that change (Lacey et al., 2016). For instance, negative press and legal challenges are reduced when the social licence lens is applied to agency-industry-community relations. Importantly, centring the social licence in engagements with communities can be expected to yield returns in reduced community conflict (Colvin et al., 2016).

Research on the social licence in regional communities, particularly those that experienced significant change due to the expansion of the unconventional gas industry in the 2010's, has shown that the social licence may be best understood as a "community" licence (Parsons et al., 2014). This is because when the social licence is associated with material change to regional communities as is the case for the net zero transition, the interests of local stakeholders and the unique make up of local context define the nature of government-industry-community relations. However, and as noted above, macro social and political forces are also influential. This includes the nature of debate in the public sphere and particularly across the media, as well as communities' observations and experiences of their own or others experiences with analogous changes in the past. For instance, within communities experiencing conflict over a wind energy development, project opponents drew inspiration and meaning from geographically distanced communities' experiences in opposition high voltage transmission lines (Colvin et al., 2016). In other words, while the operational space for the social licence remains local (Parsons et al., 2014), broader macro factors play an important role in setting the context in which the social licence is pursued.

Of special note for the net zero transition is the discourse in Australia that positions climate policy and action as an agenda that is grounded in the cities and imposed on the regions (Colvin, 2020). Navigating around perception and reality of a city-country divide will be central to pursuit of the social licence for the transition. This means adopting practices that are sensitive to city-country dynamics, and in particular implementing strategies that demonstrably counteract the potential for city-country divide narratives to come to define (at least in part) institutional efforts toward net zero in regional Australia. Particularly important are efforts to foster trust with governing

agencies and actors, recognising that the city-country divide discourse may challenge this.

Key dimensions for SLO

Drawing on a range of literature reviews on social licence in the resource sector and case studies on renewable energy projects, the SLO can be understood as comprised of two key dimensions; community engagement and benefit sharing, of which best practice is underpinned by procedural fairness, distributional fairness and participatory methods.

Dimension 1: Community engagement

One of the most prominent findings in social licence literature is the importance of early and genuine community engagement. Engaging with community stakeholders early in the project planning process and not proceeding unless there is broad support will result in a better outcome than if stakeholders are excluding from decision making (Hall 2014; Vanclay and Hanna, 2019). Researchers have found that opposition to a project is more likely to occur if consultation occurs after the announcement of a project plan (Hall 2014). However, early announcement does itself not guarantee the social licence (Colvin et al., 2016). There is a trade-off between early announcement/ engagement and clear project boundaries and scope. Ideally, the social licence will be best enabled by project proposals adhering to a socially legitimate planning guide that outlines pre-agreed land use preferences.

A key aspect of community engagement is trust in governance and that stakeholders perceive procedures and outcomes to be fair (Moffat et al., 2016; Hicks 2020; Walton and McCrea, 2020). To achieve this, community engagement practices should provide community stakeholders with 'meaningful' opportunities to participate in decision making which has been found to increase perceived fairness (Hicks, 2020). Sufficient communications from a range of perspectives also helps to build trust and develop realistic expectations amongst community stakeholders (Hall, 2014).

Good communication in community engagement (and therefore in pursuit of the social licence) is supported by consistent and coherent messaging, that provides a stable 'overarching narrative', that has the ability to adapt to a range of local contexts. This involves consistent 'high level' messaging across locales, and acknowledgement of the primacy of local contexts. Research has shown that overly optimistic messaging that serves to 'disguise' genuine challenges is ineffective for genuine community engagement. Instead, communication that explicitly acknowledges challenges but consistently outlines a credible 'way through' these challenges will build trust (Weller and Tierney, 2018). The presence of a range of messengers, who reinforce key messages but speak from a range of identity positions (e.g., spanning across interest- and place-based stakeholder groups) will add more credibility and memorability to the communications.

Importantly, all community engagement is not equal (Hendriks and Colvin, 2023). The same technique can be implemented with varying amounts of commitment and genuine intent for collaboration, leading to vastly different outcomes in communities. While valuable resources on engagement methods abound (e.g., Rowe and Frewer, 2000),

what is most important to distinguishing effective engagement from tokenistic and potentially counterproductive engagement is consideration of the degree to which the approach to sharing decision-making power with communities aligns with the community expectations. Engagement that adopts the language of empowerment or power-sharing while failing to deliver on these comments not only squanders the opportunity for effective engagement in the project or initiative under consideration, but also burns the goodwill of the community and ultimately undermines trust in the institutions leading the engagement.

Good practice community engagement is therefore less a series of activities or techniques that can be deployed, and more about the nature of the commitments made to communities and the degree to which power-holders uphold those commitments. If there is no genuine space for communities to influence decisions being made, then techniques that are well aligned with communities leading decisions should not be used. Where decision-making power can be genuinely shared, good community engagement involves sustained interactions with a range of avenues for involvement. As described in the section above, this can include more intensive forms such as community advisory committees, which are resourced to connect in a deeper way with issues and decisions, presence at community events such as markets, sporting events, agricultural shows and so on, and online platforms for feedback. Social data such as surveys can be helpful for providing insight into broad trends in public opinion, however on complex matters that relate to localised industrial and economic chance, qualitative insights gathered from a range of sources will prove most valuable in providing insight into the social 'pulse' of a community.

Importantly, while distribution of newsletters and other one-way material is helpful for maintaining consistent and coherent communication, this alone is not sufficient for genuine community engagement. What is most important is that all community members can see that there is a space for them (or people 'like them') to shape the decisions being made.

Culturally appropriate community engagement with First Nations stakeholders is also critical in developing a SLO. Research into low-carbon development in Central and Southern America shows that a failure to do so can lead to a continuation of harms on Indigenous peoples (O'Neill et al., 2021). Furthermore, large-scale renewable developments and poor engagement practices have the potential to exacerbate existing inequalities (Sovacool, 2021). This is particularly salient in cases with a legacy of poor treatment of First Nations by governments and industry (Banerjee, 2000). In Canada, the state has played a key role in supporting the capacity for First Nations communities to benefit from the clean energy transition (O'Neill et al., 2021). The 'Canadian Pact for A Green New Deal' links the energy transition to the goal of Indigenous reconciliation and emerged in-part from Canada's Truth and Reconciliation Commission process.

There has been work in Australia to develop better practice surrounding First Nations engagement with the renewable energy sector. The First Nations Clean Energy Network has developed a guide on clean energy negotiations for First Nations people and a best practice guide for industry (First Nations Clean Energy Network 2022). There has also been research into applying a 'free, prior and informed consent' standard, a widely-recognised framework for engaging with Indigenous people for

developments on their land. The framework follows the 'information, consultation and consent' method for proposed developments on First Nations peoples' land (O'Neill et al., 2021). The net zero transition would be well supported by consideration of this framework, as well as the development of ways to support First Nations communities to benefit from the transition as part of a broader SLO strategy.

Dimension 2: Benefit sharing

Central to the social licence is the concept of distributional fairness in that community benefits and burdens should be distributed fairly (Walton and McCrea, 2020). Furthermore, benefits and burdens must be perceived to be distributed fairly, which can be achieved through appropriate community engagement and participatory processes as previously outlined. A key method for achieving distributional fairness is by developing a benefit sharing strategy, a method increasingly being used by renewable energy developers. Such approaches may involve (Hall et al., 2017):

- Community ownership, investment, or co-ownership models,

- Community grant programs

- Neighbour rents in addition to landholder rents (for hosting distributed renewable energy infrastructure),

- Non-financial host and neighbour benefits such as subsidised energy or energy efficiency upgrades,

- Local procurement commitments as a form of employment benefits, and

- Community contributions optimally with a long-term agreement to avoid communities feeling that they are beholden to the contributor (e.g., leading to a fear of speaking out in case of future contributions being withheld).

Benefit sharing strategies should be tailored to the local community and be delivered alongside community engagement to avoid communities feeling 'bought' (Lane and Hicks, 2019). Models of benefit sharing that are 'contextually appropriate' have higher levels of community support (Hicks, 2020). Projects that create legacy benefits result in the community having a positive association with the project, long after the development process. Benefit sharing can also overcome some of the perceived burdens that can arise with renewable energy projects.

Case studies

Tasmanian Government mapping important places initiative

A positive example of participatory design has been recently demonstrated by the Tasmanian Government who launched an interactive map to help communities mark their important places (Tasmanian Government, 2023). Residents of north-western Tasmania have been encouraged to submit locations that are of importance and should be considered in the design of the state's first renewable energy zone. Although there are limitations to this process in that it requires digital literacy and access, the initiative offers residents a meaningful opportunity to participate early in the decision-

making process, which is an important aspect of 'perceived fairness' and garnering a social licence (Hicks, 2020). Importantly, not every candidate community member must opt into participatory processes in order to perceive greater fairness of the outcomes of the processes. Understanding that genuine participation was possible, and that 'people like them' had their say, can be enough.

Tasmania King Island windfarm conflict

Research into conflict surrounding a wind farm proposal on King Island offers helpful insights into the nuances of developing SLO. Despite the developers claim to have implemented a 'best practice' community engagement strategy, significant conflict arose from the proposal. The study found that (Colvin et al., 2016):

- Although early engagement is important, announcing a proposal where the project is undefined and lacks details can lead to anxiety, speculation and rumours amongst the community. Communication around community involvement in decision making is critical.

- Voting is often considered a democratic, participatory process. However, organising a vote to determine the viability of a project can lead to increased polarisation as seen in the King Island community. 'Yes' and 'no' campaigns promoted an intergroup 'us versus them' dynamic and exacerbated community conflict.

- It is critical to consider the local context both before and after proposed developments. For example, the King Island community had recently experienced local elections, the closure of a local abattoir (a key employer), whilst simultaneously engaging with the developer who were getting involved in local initiatives, such as sponsoring local sport. These circumstances impacted on local opinions and attitudes towards the development.

- The physical size of the project was a cause for some community concerns, suggesting that the factors driving decisions regarding economic viability of the project were misaligned with the social viability of the project, at least for some local stakeholders.

This case study highlights the challenges in harmonious community relations that can be present even when 'good practice' community engagement has been used. In this case, while many good practice techniques and approaches were adopted, there were challenges in the way in which they were implemented, and how they interacted with the local social context, which produced sub-optimal social outcomes, including substantial community conflict, media attention, and a legal challenge to the wind energy proposal.

Community owned renewable energy sector in the UK, Australia and Canada

Although limited in their scalability, community owned renewable energy (CORE) projects offer demonstrations of good practice SLO dimensions. Studies of CORE projects in the UK show that they enjoy high levels of community support due to their adoption of participatory processes that result in perceived increased procedural and

distributional fairness (Warren and McFadyen, 2010). This has also been evidenced in Australia through the success of CORE projects 'Hepburn Wind' in Victoria and 'Denmark Community Windfarm' in Western Australia (Hicks, 2020). Researchers who studied these CORE projects argue that policymakers should consider ways to adopt CORE methods into large-scale developments by creating opportunities for local participation in ways that are multifaceted and "sustained throughout the project lifecycle" (Sovacool, 2021).

In Canada, community ownership for First Nations communities has been identified as a potential pathway for reconciliation as part of the broader 'Canadian Pact for A Green New Deal'. Key benefits to this pathway include energy security, energy autonomy, participation and an opportunity to assert their collective rights to land and self-determination (Hoicka et al., 2021). In Australia, similar work is being achieved by groups such as Original Power who have been delivering small-scale community owned projects for First Nations communities (Original Power, 2023). Recently, the Aboriginal Clean Energy Partnership announced their East Kimberley Clean Energy Project, a large-scale 100% green energy, hydrogen, and ammonia export development which offers a co-development and co-ownership model for Traditional Owners in the region. This model offers insights into how community ownership models for First Nations communities could be scaled up (Aboriginal Clean Energy Partnership, 2023).

Innovative governance structures and missed opportunities across Australia, New Zealand, and California

There are many examples of innovative governance structures which offer direction for good structures for pursuit of the social licence. However, missed opportunities also provide insight on some of the pitfalls of approaches that adopt partial good practices but fall short.

- Creation of community-government partnerships for water management in Queensland proved capable of overcoming water management conflict, through genuine power sharing and joint decision-making. This particularly included the use of "processes for joint fact finding and joint discovery of solutions to complex problems" leading "participants to adopt a 'mutual gains' approach to negotiation and decision-making" (Boully et al., 2005). Boully et al. (2005) outline 20 key points that underpin the success of these processes:
    1. Ministers with portfolio responsibility support and champion the process.
    2. Senior departmental staff are actively involved and committed to the process.
    3. All interests and 'opinion shapers/leaders' are represented at the 'table'.
    4. Ensure that participants are 'signed on' and able to participate fully.
    5. Create a safe environment for government and non-government participants to be able to speak honestly and openly through the development of behavioural guidelines or operational values and talk and talk and talk until the talking starts.
    6. Focus on building relationships — 'people matter'.

7. Acknowledge and respect roles and responsibilities of all parties.

8. Allow the participants to self-organise and design processes to suit their needs in achieving the overall outcomes.

9. Acknowledge values and work hard to address the needs, desires, concerns and fears through focus on mutual gains.

10. Use informal processes to move discussion of difficult issues forward.

11. Participants agree to take responsibility for wider industry/community engagement. This requires that the 'circle of trust' is expanded beyond those 'at the table'.

12. Acknowledge the past, learn from it and move to the future.

13. Articulate individual and shared needs/values/objectives.

14. Reach a collective understanding of all of the information/data (joint fact finding) and the degree of confidence in it. Agree on what is not known. Use an independent scientific process that intersects with the participants in the planning process to assist this.

15. Reach a collective understanding of the relevant policies and legislation and the opportunities and constraints they create.

16. Encourage and support participants to challenge assumptions.

17. Through a process of joint discovery, generate and test options to determine what is 'do-able'. Do not attempt to reach consensus until issues are fully explored and effort is given to finding creative responses that address differences.

18. Create a 'writing' group to draft reports or agreements and give all participants opportunity to provide comment/edits/new ideas at all times (electronic).

19. Make sure that tasks are time bounded.

20. Having fun along the way.

- A relatively well-resourced community consultative committee in King Island, Tasmania, concerning the development of a large-scale wind energy facility was undermined by the lack of appointment of a third-party facilitator. The result was that a community member became committee chair, and then as that community member (rightly) formed a stance on the proposal through the process of discovery on the committee, members of the community within and beyond the committee questioned the trustworthiness of the committee's insights (Colvin et al., 2016).

- Water management in Canterbury, New Zealand, was supported by a collaborative decision-making process. This first involved elicitation of ranked preferences for overarching water management principles, which succeeded in identifying a shared compromise solution that was not present in the polarised public debate. Next, place-based committees were formed of local community members with fair representation across the various interests involved

(irrigation, recreation, conservation, etc.). These committees were tasked with developing a consensus position on local plans for achieving the overarching water management objectives. The committees operated under the risk of being 'disbanded' and replaced if they were unable to reach consensus, however this was never enacted as the committees were successful (Jenkins, 2013).

- Bringing together stakeholders into a deliberative space that identifies them as 'citizens' (or in other words – some sort of 'together' identity), rather than as representatives of various stakeholder groups at odds with each other engenders cooperation (Kahane et al., 2013). This is evidenced by the case of community-led forestry management conflict resolution in California, in which a place-based collaborative group that included the range of interests, but was defined and identified by its association with the local place, was able to develop compromise approaches that overcame prior polarisation and stagnation in forestry management (Bryan, 2008).

- Small group deliberative sessions regarding responses to sea level rise can counteract the effects of ideological and identity polarisation in the public sphere. However, investment of time and resources is essential to creating the opportunity for this positive outcome (Akerlof et al., 2016).

- The South Australian 'nuclear citizens' jury' process proved capable of producing a considered and generally shared position among participants about preferences for the state's management of nuclear waste. However, despite the process leading to participants recommending against the state developing nuclear waste storage facilities, governments (state and federal) proceeded regardless (Calyx and Jessup, 2019). This is not dissimilar to the experience with the climate citizens' jury in France, where participants developed thoughtful recommendations for policy, yet the results were left largely unimplemented by power-holders.

- The Tasmanian forest 'peace process' highlights the importance of developing meta-consensus, that is "recognition of the legitimacy of other perspectives" for advancing decision-making, yet that this is not in itself a 'solution' for achieving an outcome that is perceived universally as legitimate (Schirmer et al., 2016). Further, analysis by Schirmer et al. (2016) of the opportunities and pitfalls of this process shows that rather than viewing the process as monolithic, with a series of consistent objectives across time, the process should be considered a series of 'mini-processes' that are adapted to the needs of the deliberative and decision-making priorities at the given stage.

- Selection of participants is an important and consequential aspect of developing successful processes. It is practically necessary to include participants who will be constructive and not 'white ant' the potential for collaborative decision-making. However, explicit exclusion of participants can lead to an erosion in the short or longer term of the legitimacy of the process. In King Island, the perception that opponents to the wind energy development did not have a space in decision-making processes led to them developing their own 'spaces' for decision-making and engagement (Colvin et al., 2016).

Considerations for the Net Zero Authority

For the Net Zero Authority, the pursuit of the social licence will necessarily be multi-pronged. This is because as a coordinating governance body, the NZA will be seen as both a driver of regional change as well as a regulatory check (even if not in a formal regulatory role) on other actors, such as private industry. In this way, the NZA can conceptualise its social licence activities as operating across four key scales:

- the net zero transition generally,

- the industries that are implicated in the net zero transition, whether they are exiting industries such as fossil fuels or growing industries such as renewables or clean energy value chain industries,

- influential and relatively high-power actors, generally private companies but also including other governmental departments and agencies, engaging in the net zero transition, and

- Individual projects that are understood as being part of the net zero transition, e.g., a solar energy development.

According to this conceptualisation of the social licence for the net zero transition, the role for the NZA is as both a figurehead for the transition generally, but also as coordinator of other actors with more direct influence across the four levels outlined above. Importantly, these other actors may have deviating views on the relative importance of social licence related activities, depending on their interests and nature of engagement within regional economies. The NZA can realise this through three main avenues:

- Producing coherent and consistent public messaging that is highly visible in regions,

- Tracking and transparently reporting on change in the region, particularly including cumulative social, economic and environmental impacts, and

- Engaging and influencing other actors to adopt good practices in their relations with communities.

Public messaging

Research in communities that are exposed to structural adjustment in the fossil fuel sector – those regional economics with a strong dependence on coal for example – has shown that people in the communities received mixed and often contradictory messages about transition and what transition means for their communities. Addressing the lack of consistent information from a trustworthy source is a key ask of the communities (Colvin and Przybyszewski, 2022; Donnelly, 2023).

An opportunity for the NZA is to engage in public messaging which is nationally consistent yet tailored to the regional communities in which it is most active. Such communications by the NZA may be contradicted by other actors' messaging, e.g., from industry and climate advocates, however, such consistency and interpretation/translation by the NZA will build public trust with both the Authority, and

the net zero transition generally (and therefore contribute to pursuit of the social licence).

Cumulative impacts

As discussed in the previous section, research on the Australian experience in regional communities that have experienced substantial industrial and economic change has highlighted that communities feel the cumulative impacts of the range of activities occurring at the same time are poorly managed. As a consequence, communities lose trust in government, and can act in opposition to the range of activities that they see as being responsible for their experience of impacts. In the regional communities that experienced the expansion of the gas industry there was a widespread sense of a 'void' in governance of these impacts. Scepticism about the benefit of the industrial change and a lack of trust in government were consequences of this.

A challenge for managing cumulative impacts is that it is not simply a matter of collating the range of social, economic, and environmental impacts as documented by the proponents of individual projects in impact assessment processes. Relevant cumulative impacts, instead, should be defined by communities, and include types of changes that may not be directly attributable to any singular activity or project. For legitimacy with communities, transparent documentation of cumulative impacts, including negative impacts is key. Research on engagement and communication emphasises repeatedly that Pollyanna style messages that highlight only the positives and downplay the negatives are considered out of touch and illegitimate within communities. Although transparent reporting of cumulative impacts, particularly including those that are experienced by communities to be negative, risks exposure of the net zero transition to scrutiny, on balance the trust that is built with communities can be expected to produce net positive outcomes for the social licence of the net zero transition.

Guiding good practice community engagement

As a coordinating governance body, the NZA is unlikely to have direct control over the engagement and participatory practices adopted by other actors engaging in the net zero transition across the four levels of the social licence outlined above. However, the NZA can engage with these other actors and raise awareness of the importance of mutual commitment and cooperation to good practice engagement, given the contingent nature of the SLO across the macro and the micro. This might involve private meetings focused on relationship building and awareness raising, as well as more public activities. Public activities might include the preparation of good practice guidelines for community engagement and benefit sharing in the net zero transition, which become a standard against which other actors are measured as they interact with communities. Other options include the development of benefit sharing best practice indicators which may be used for influence via corporate social responsibility channels, or the preparation of 'scorecards' on the conduct of transition actors. The NZA may also seek to influence other government agencies, such as those seeking to purchase renewable energy, and outline standard that other agencies may demand from the electricity provider in terms of engagement and benefit sharing.

Finally, the NZA may consider how its own governance can be informed by good practices in engagement. The transition will be well served by harnessing the knowledge and expertise of local people who live in and understand the regions undergoing transition. Such an approach would also advance pursuit of the social licence, and could simultaneously address the need for clear structures for engaging community on matters to do with socio-economic impacts.

The NZA might consider the adoption of a 'community boards' structure, where people local to priority regions are appointed to boards, and suitably resourced including remuneration. This might reflect the 'community board members' on the Queensland Parole Board, who are appointed on three-year terms into part time positions[1]. However, as noted above the process for selection of members should be considered carefully, for instance through nomination/ election rather than appointment.

If adopted by the NZA, community boards could advise on all manner of locally relevant aspects of the net zero transition, and importantly the NZA could adopt an approach in which the actions of government are answerable to the community boards (Colvin 2023), rather than running the risk of the community boards becoming a tokenistic waste of the time of participants (and therefore eroding their goodwill). This would mean implementing processes for genuinely sharing decision-making power with the community boards. Such a power sharing arrangement would go a great deal toward advancing the social licence for the transition.

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[1] https://pbq.qld.gov.au/about-us/board-member-profile/

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6. Appendices

Australian institutions and programs in the space of NZA

The list below outlines Australian institutions and programs in the space of the NZA at the federal and state levels.

Federal Government

CLIMATE AND ENERGY	
Institutions	Department of Climate Change, Energy, the Environment and Water (DCCEEW)
	Energy and Climate Change Ministerial Council (ECMC)
	Australian Energy Infrastructure Commissioner (AEIC)
	Australian Energy Market Commission (AEMC)
	Australian Energy Regulator (AER)
	Australian Renewable Energy Agency (ARENA)
	Bureau of Meteorology (BOM)
	Clean Energy Regulator (CER)
	Climate Change Authority (CCA)
	Greenhouse and Energy Minimum Standards (GEMS) Regulator
Programs	Powering Australia plan
	Climate Active
	Guarantee of Origin scheme
	Net Zero 2050 plan
	National Electric Vehicle Strategy
	Offshore Renewable Energy Infrastructure proposals:
	Southern Ocean Region off VIC and SA: ongoing public consultations
	Bass Strait off Gippsland, VIC
	Pacific Ocean off Hunter, NSW
	Carbon Farming Outreach Program
	Emissions Reduction Fund
	Energy Price Relief Plan
	Daintree Microgrid Program
	Nationwide House Energy Rating Scheme (NatHERS)

	Energy Efficiency in Government Operations (EEGO) policy International Clean Energy Partnerships Australian Carbon Credit Unit (ACCU) Scheme Australian Carbon Exchange National Greenhouse and Energy Reporting Scheme (NGER) Safeguard Mechanism Renewable Energy Target Scheme National Energy Transformation Partnership (NETP) National Hydrogen Strategy 2019 First Nations Clean Energy Strategy
Finance	
Institutions	Department of Finance Australian Securities and Investments Commission (ASIC) Australian Taxation Office (ATO) Australian Prudential Regulation Authority (APRA) Clean Energy Finance Corporation (CEFC) Future Fund (Australia's Sovereign Wealth Fund)
Programs	Commonwealth Fleet Vehicle Selection Policy Household Energy Upgrades Fund Powering Australia Technology Fund Rewiring the Nation
Industry and Resources	
Institutions	Department of Industry, Science and Resources Coal Mining Industry (Long Service Leave Funding) Corporation Commonwealth Scientific and Industrial Research Organisation Geoscience Australia
Others	
Institutions	Department of Foreign Affairs and Trade (DFAT) Australian Trade and Investment Corporation (Austrade)

	Department of Employment and Workplace Relations
	Department of Infrastructure, Transport, Regional Development Communications and the Arts
	Infrastructure Australia
Programs	Regional Precincts and Partnerships Program

State Governments

NSW	
Institutions	Environment Protection Authority
	Mining, Exploration and Geoscience
Programs	Coal Innovation NSW Fund
	Net Zero Industry and Innovation Programme
	NSW Electric Vehicle Strategy
	NSW Hydrogen Strategy
	NSW Waste and Sustainable Materials Strategy
	NSW Primary Industries Productivity and Abatement Program
QLD	
Institutions	Department of Energy and Public Works
	Department of Resources
Programs	Pioneer-Burdekin Pumped Hydro Energy Storage
	Queensland Energy and Jobs Plan
	Solar for rentals trial
SA	
Institutions	Department of Energy and Mining
	Department for Environment and Water
	Environment Protection Authority
	Funds SA
	Invest SA
Programs	Net Zero Essentials Program
	Hydrogen Jobs Plan
	Project EnergyConnect
TAS	

Institutions	Department of Natural Resources and Environment
	Environment Protection Authority
VIC	
Institutions	Department of Jobs, Skills, Industry and Regions
	Department of Energy, Environment and Climate Action
	Department of Transport and Planning
	Invest Victoria
	Solar Victoria
Programs	Bulgana Green Power Hub
	CarbonNet Project
	Community Microgrid and Sustainable Energy Program
	Energy Storage Initiative
	Latrobe Valley Energy and Growth Program
	Neighborhood Battery grants
	New Energy Jobs Fund
	Renewable Hydrogen Business Ready Fund
	Solar for Business Program
	Solar Homes Program
	Zero Emissions Vehicle Grants
	Zero Emissions Vehicle Subsidy
WA	
Institutions	Department of Mines, Industry Regulation and Safety
	Department of Jobs, Tourism, Science and Innovation
	Environmental Protection Authority
	Western Australian Planning Commission
Programs	Collie Just Transition
	Energy Transformation Strategy
ACT	
Institutions	ACT Climate Change Council
	Environment Protection Authority
Programs	ACT Zero Emissions Vehicle Strategy
	Business Zero Emissions Vehicle Grants Program
	Community Zero Emissions Grants Program

	Energy Efficiency Improvement Scheme
	Renewable Energy Innovation Fund
	Sustainable Business Program
	Sustainable Household Scheme
NT	
Institutions	Department of Environment and Natural Resources
	Environment Protection Authority
	Land Development Corporation
Programs	Electric Vehicle strategy and implementation plan
	Emissions Reduction Strategy
	GHG Emissions Offsets Policy
	Hydrogen Strategy
	Remote Power System Strategy