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# Enabling Agri Energy Justice: Incorporating agricultural and energy justice into utility-scale onshore wind development on agricultural land

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This study aims to examine the critical socio-legal interaction between agriculture and onshore wind by offering a novel Agri Energy Justice (AEJ) framework. The AEJ Framework builds on existing energy justice conceptualisations and emphasises the significance of addressing agricultural interests and risks as a foundational step for onshore wind development through the unique pillar of ‘nexus justice’. The Australian state of Victoria is undertaking a significant socio-technical energy transition in response to net-zero policies and increasing climate change risks. While immense renewable energy potential exists in Victoria, including onshore wind energy, successful development requires a reoriented strategic approach to co-locate with agriculture and provide a potential blueprint for regions hosting wind development. In examining legal gaps and stakeholder perspectives in the Wimmera Southern Mallee (WSM) region of Victoria, Australia, this study highlights the often-perceived conflicting policy objectives of concurrently achieving energy decarbonisation and agricultural land preservation. We adopt a mixed-methods socio-legal and qualitative approach, including semi-structured interviews with experts from the agricultural and energy sectors in the WSM, to capture critical stakeholder perspectives. Building on existing energy transition literature, we identify several factors and regulatory principles to enable or potentially limit agricultural activity coexistence with onshore wind and identify key themes from semi-structured interviews categorised in the four principles of the AEJ framework. Our proposed AEJ framework introduces a new paradigm recognising agricultural landholders and activities as an essential sociotechnical and legal process relevant to countries aiming to align onshore wind development with agricultural land uses. AEJ can clarify the values embedded in agricultural sectors, reduce social conflicts, enhance economic benefits, and ultimately, lower socio-technical risks associated with onshore wind development. The resulting study provides insights into the need for proactive legal reform to ensure countries prioritising agricultural land uses can simultaneously achieve justice, decarbonisation, and sustained agricultural output enshrined in AEJ principles.

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## Introduction

Examining the acceptability and co-benefits of decarbonised technologies with agricultural systems is relevant for the cross-sectoral success of the global energy transition. Several countries face increasing land use spatial conflicts typified by resource competition among stakeholders (Zheng et al., 2025; Lin et al., 2025). To achieve multi-regional decarbonisation (Poulter et al., 2025), integrated management of the food – energy nexus (Liu et al., 2025), and progress toward the Sustainable Development Goals (SDG), renewable energy and food production must be developed in synergy (Pradhan et al., 2025). Additionally, addressing the co-benefits between the energy and agricultural sectors is crucial for promoting social development, driving technological advancement, and ensuring a successful and just energy transition. (Pandey et al., 2025).

In several countries, mitigating socio-spatial conflicts during onshore wind development is fundamentally linked to farming communities (Albanito et al., 2022). Onshore wind resources are typically rich in agricultural regions due to the favourable topography and proximity to transmission and other ancillary energy infrastructure (Bessette and Mills, 2021). Consequently, many agricultural regions globally will host onshore wind projects creating a strong impetus to develop solutions to effectively combine land uses and benefits (Shoeib et al., 2022). A failure to recognise agricultural interests and values may hinder energy transition targets, culminating in social conflicts and curtailing onshore wind development in agricultural areas (Kandy et al., 2024). This raises the underexplored question of whether onshore wind co-located with agricultural activities can reveal norms and principles to enhance social acceptance and accelerate just wind development (Hielscher et al., 2025) (Hall et al., 2013).

Recent sustainable and transformational development research proposes dynamic models for mining land use conflicts (Zheng et al., 2025), water-emissions-food integrated collaborative management (Liu et al., 2025), and climate change effects on agricultural production (Grosse-Heilmann et al., 2024). Energy transition literature identifies concepts influencing social acceptance of wind energy projects on agricultural land, including energy justice (Park et al., 2024), energy democracy (Chewinski et al., 2023), social licence (Lai et al., 2025), sustainability (Banerjee, 2022), and social development (Luna-Nemecio et al., 2020) (Heeter and Reames, 2022). Several studies focus specifically on solar energy social acceptance and agricultural co-location in the form of agrivoltaics (Dupraz et al., 2011; Taylor et al., 2023; Taylor et al., 2025). For example, Pandey et al. examine agrivoltaics as a catalyst for achieving the SDGs, as a socio-technical conduit for sustainability, decarbonisation, and co-benefits for agricultural productivity, enhancing socio-economic outputs (Pandey et al., 2025) (Widmer et al., 2024).

This study builds upon these energy transitions, agriculture, and sustainability studies by examining the intersection of onshore wind and agriculture. Specifically, existing energy justice models do not include a general evaluation of opportunities and social norms for agricultural landholders hosting onshore wind (Ciplet, 2021). Our study addresses this critical literature gap by integrating relevant factors identified by energy and agricultural stakeholders into a unified model and presenting an empirically grounded and pragmatic overarching framework – the AEJ Framework.

The Agri Energy Justice Framework (AEJ Framework) proposed in this study identifies justice variables to simultaneously balance energy and agricultural interests. In so doing, the AEJ Framework offers dynamic mechanisms for countries to realise optimal land use and achieve sustainable, renewable energy and agricultural systems. (Hübner et al., 2023; Zheng et al. 2025) (McKenna et al., 2024). Our socio-legal and qualitative analysis

examines legal settings and stakeholder perspectives to conceptually summarise factors reflecting the sociotechnical process of onshore wind deployment on agricultural land. The AEJ Framework can inform laws, policies, and energy transition strategies to facilitate an acceptable and just energy transition globally.

Our study provides three key novel interventions to existing energy transition literature. First, drawing on doctrinal legal analysis and qualitative semi-structured interviews with stakeholders, our study provides the first agricultural region-specific analysis examining empirical interview data from one of Australia's leading agricultural areas, the Wimmera Southern Mallee (WSM) region in Victoria. Second, our study provides evidence of current stakeholder perspectives of justice conceptualisations applied specifically to wind development in agricultural areas. It adopts a pragmatic socio-legal approach (Heldeweg and Saintier, 2020) exploring how legal reform can enable future wind energy development on agricultural land against the backdrop of increasingly ambitious renewable energy and farming growth targets globally. The role of justice embedded in regulation, defined as rules, practices, and norms (Freiberg, 2017), is critical to realise a successful energy transition and tangible benefits addressing Sustainable Development Goals (SDG) 7, 13, and 16 (Pradhan et al., 2025).

Finally, our study proposes the first dual-sector AEJ Framework specifically crafted to assess wind energy development on agricultural land. Agricultural land is defined broadly as land capable of supporting grazing or cropping activities. The AEJ Framework presents a new model, building on established energy justice framework norms (Hielscher et al., 2025), to introduce the novel pillar of 'nexus justice'. Nexus justice is defined as activities supporting cross-sectoral benefits, risks, and decision-making probing how onshore wind energy projects contribute and potentially benefit agricultural activities. Performing a text mining analysis, we examine stakeholder perspectives applying the AEJ Framework to interpret interview data results, harnessing grounded theory, performing qualitative thematic and analytic induction (Ragin, 2023). The AEJ Framework and our findings provide a diagnostic tool based on an expanded energy justice conceptualisation to encompass agricultural needs and recognition.

## Conceptualising energy justice for agricultural communities

**Energy justice: the triumvirate of tenants and their role in social acceptance.** Energy justice is readily recognised as a central pillar of the energy transition by analysing “the embeddedness, equitability, benefits, and costs of energy technologies” (Taylor et al., 2023, pg 2). Energy justice builds on broader, well-established justice formulations, including environmental and climate justice (Schlosberg, 2007, 2012a) (Bullard, 2005) (Agyeman, 2005), and encapsulates a normative and conceptual framework of analysis to examine the distribution of benefits and burdens associated (Heeter and Reames, 2022). Energy justice is complementary to the broader Just Transition literature focusing on ensuring equity and inclusiveness for all stakeholders within the energy supply chain (Sovacool et al., 2025) and the growing swell of Just Transition litigation (Vivoda et al., 2024).

Similar to Just Transition research, energy justice is universally applicable as a framework for “a global energy system that justly disseminates both the benefits and costs of energy services and one that has representative and impartial energy decision-making” (Sovacool and Dworkin, 2015, pg 436). Over the past three decades, energy justice has been applied to specific energy projects, systems, and systems (Park

et al., 2024). Energy justice studies are inherently multi-disciplinary by design, encompassing energy systems and reflecting concepts underpinned by “normative goals” (Bidwell and Sovacool, 2023, pg. 317) from sociological, ethical, jurisprudence, and geographical perspectives (Jenkins et al., 2016). While energy attracts several different frameworks and norms, the triumvirate of three key energy justice tenets, recognition, procedural, and distributive justice (McCauley et al., 2013) is acknowledged as the fundamental energy justice framework. First, recognition justice acknowledges diversity in values and rights of stakeholders across the energy supply chain. Second, procedural justice calls for meaningful participation and potential ownership of stakeholders and individuals in energy development. Finally, distributive justice addresses the distribution of resources, benefits, and impacts of energy development and operations (Bidwell and Sovacool, 2023).

Energy justice seeks to rebalance and redress perceived or actual instances of injustices fortified in community acceptance and Just Transition literature (Govindarajan and Ganesh, 2022). Community acceptance scholarship seeks to map and examine the level and nature of community support or conflicts against particular energy systems and infrastructure. Community values (Ruggiero, Onkila, Kuittinen, 2014), place attachment (Dugstad et al., 2023), and Social Licence to Operate (Minadakis and Vega-Araujo, 2024) are all prevailing themes in community acceptance studies (da Silva et al., 2021).

More recently, community acceptance scholarship has called for community ownership or financial stakes in energy development, participatory co-design of energy projects, and community use of energy infrastructure, including offshore wind (Bacchiocchi, Sant, and Bates, 2022) and onshore wind (Langer and Wooliscroft, 2018). This critical approach shifts an oft-perceived ‘burden’ of hosting energy infrastructure for rural communities to a beneficial justice-driven approach in energy and planning regulation (Hielscher et al., 2025). For example, previously in the Danish offshore wind context, section 13(1) of the *Promotion of the Renewable Energy Act* (DE) provided communities the option to purchase shares in an offshore wind project, with guidance that each development maintain at least 20% local ownership. Although this specific participation scheme was repealed in 2020, it remains a notable example of recognition justice translated into renewable energy regulation (Maitre, 2024).

As examined in Section “Energy Justice: The Triumvirate of Tenants and their role in Social Acceptance” of this study, community acceptance, place attachment, the Social Licence to Operate, and energy justice have been widely applied to offshore and onshore wind studies across multiple countries and disciplines (Mejia-Montero et al., 2023). Despite most onshore wind infrastructure being in rural areas, it is striking little attention has been given to applying energy justice specifically to agricultural communities hosting onshore wind projects (Stohr et al., 2024).

**Beyond food justice and rural environmental justice: situating justice within agriculture and renewables.** Dimensions of social justice intersections with agriculture typically focus on aspects of food security (Wang et al., 2021), affordability, sustainability (Leknoi et al., 2023), and adequacy for human populations (Lappé et al., 2013). Inclusiveness in agricultural innovation systems to create capacity-building of agrarian practices, particularly in developing states, is also well studied (Sen, 1981; Timmermann, 2020). Social justice applied to agriculture through the traditional lens of food production readily adopts concepts of procedural and restorative justice. For example, procedural justice applies to plant breeders’ intellectual property rights (Tambo et al., 2020), and

restorative justice may enable self-determination of Indigenous agricultural methods (Jones and Clarke, 2018).

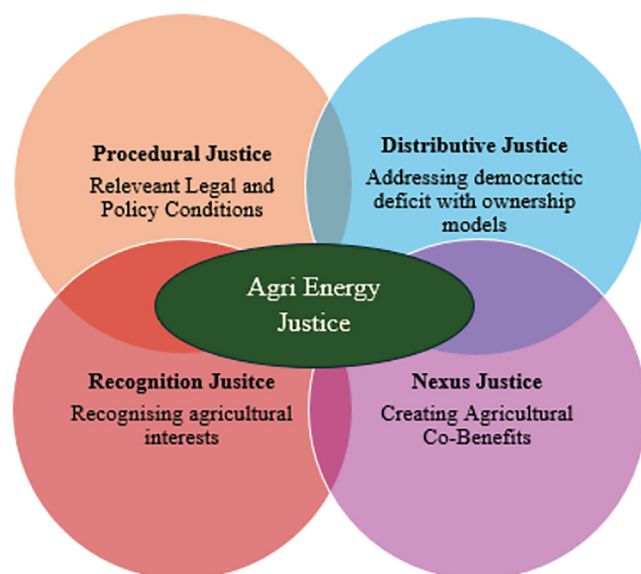
Food justice studies examine aspects of food autonomy, accessibility to healthy and affordable food, and the intersectionality of these with concepts of race, class, and gender (Alkon and Agyeman, 2011). Food justice literature arose from responses to community food insecurity, particularly in marginalised urban communities, framing “the right to food as essential to creating an equitable and just society” (Ren et al., 2023, p. 1467) (Wekerle, 2004). Food justice builds upon the environmental justice movement, focused on environmental burdens and exposure to pollution, waste, and carbon-intensive energy activities in marginalised populations (Schlosberg, 2009).

Finally, rural environmental justice aims to investigate how environmental justice is experienced in rural communities. Rural environmental studies examine the pursuit of just transformations toward sustainability in rural areas and the dynamics of “agrarian struggles” (Newell, 2022, pg 916) often linked to rural communities’ “closer connections to the land” (Brown et al., 2024, pg 8). Land-based conflict and mitigation strategies in rural communities are a key focus in rural environmental justice literature, particularly in the transformation of rural landscapes hosting energy transition infrastructure (Cambou, 2020). Stock, for example, links renewable energy development in India to rural population displacement and heightened land-based conflicts (Stock 2023). Rural environmental justice is largely limited to burdens, as opposed to benefits, creating social vulnerability for rural communities and landholders across a wide range of technologies, from transportation infrastructure to carbon-intensive technologies (Pellow, 2016; Carolan, 2020).

Existing research lacks a structured understanding of traversing justice applications to both agriculture and onshore wind, examining how agricultural landholders can participate and benefit from the just energy transition paradigm (Carolan, 2020; Mahon et al., 2023). This study addresses this evident lacuna in the scholarly literature to consider how and why agricultural landholders and communities, by hosting and benefiting from onshore wind development, create a unique justice ecosystem. It proposes the AEJ Framework as a normative and pragmatic approach to analysing gaps, burdens, and benefits of agricultural communities hosting wind discussed below in Section “Defining Agri Energy Justice (AEJ): Expanding from Triumvirate to Quadrumvirate with Nexus Justice”

**Defining Agri Energy Justice (AEJ): expanding from triumvirate to quadrumvirate with nexus justice.** Creating justice for agricultural communities hosting energy generation and transmission infrastructure is a pervasive global challenge (O’Sullivan et al., 2020). However, no justice-driven guiding framework exists to assess the burdens, benefits, costs, risks, and gaps for agricultural landholders and communities, while recognising socio-legal energy transition solutions. As renewable energies encompass differing spatial (across geographic scales) and temporal (across generations) scales within the social contract paradigm (Heffron & Fontenelle, 2023), justice issues hinge upon the size, scale, and purpose of each renewable energy project. Hence, a cross-sectoral analysis of onshore wind and agriculture is required (Sovacool et al., 2022).

The AEJ Framework builds on existing energy justice norms and provides a novel analytical paradigm specifically focused on the energy and agricultural “spatial dimensions” (Upham et al., 2022) of justice. Stemming from the traditional justice pillars of distributive, procedural, and recognition justice, it introduces a new fourth pillar focusing on nexus justice to analyse the intersections between agriculture and energy. Nexus justice



**Fig. 1 The Agri Energy Justice Framework demonstrates the interrelationship of the four different AEJ pillars to analyse policy and legal instruments.** Source: (Taylor, 2024, p. 53).

clarifies key concepts grounded in agriculture and energy justice norms within a cross-disciplinary matrix, raising shared justice, benefits, risks, and decision-making considerations to promote an equitable balance between the two sectors. Nexus justice builds upon Middleton et al.'s study of energy-food-nexus theory in Southeast Asia, linking nexus governance and environmental justice, arguing that fairness and institutional accountability are central to nexus-framed policies on sustainable development (Middleton et al., 2015). Consequently, the AEJ Framework applies energy-food-nexus governance to balance interlinkages, offering the first normative contribution to navigate justice between the energy and agricultural sectors (Ma et al., 2023).

The four AEJ pillars harness the breadth of existing justice scholarship in the “triumvirate of tenets” (Heffron & McCauley, 2017) to act as a distinct yet complementary and interrelated framework alongside energy justice. For example, procedural justice is critical to legitimacy, openness, inclusiveness, and independence as argued by Grasso in the context of stratospheric aerosol injection (Grasso, 2022) and climate governance systems (Grasso and Sacci, 2015). Zimm et al. synthesise justice considerations with climate research, concluding that frameworks developing a comprehensive incorporation of justice must be adaptive to the complexities of decarbonisation and climate change (Zimm et al., 2024).

In this vein, AEJ aims to address the lacunae in existing justice literature applied to rural energy transition contexts by combining existing energy and agricultural justice scholarship and building on rural justice conceptualisations coalescing in the AEJ framework. Importantly, the AEJ pillars are interdependent and synergetic, requiring analysis of all four pillars within the relevant policy or regulatory context applicable at the intersection of renewable energy and agriculture. This integrated approach is necessary to mitigate the risks of siloed policymaking and the failure to achieve regulatory objectives. As a distinctly cross-sectoral framework traversing agriculture and energy, rather than subcategories of energy justice, the AEJ framework holds potential for expansion to other multifaceted justice applications, including multispecies justice (Celermajer et al., 2021), climate justice (Sultana, 2025), and restorative justice (Schlosberg, 2012b).

The AEJ Framework, as outlined in Fig. 1, aims to create regulatory enhancement by embedding justice principles recognising the nuance of potential conflicts between onshore wind and agriculture in project planning, assessment, determinations, and incentivisation.

The AEJ Framework is neither a comprehensive nor an exhaustive model of socio-legal principles embedding justice. In contrast, it creates initial core overlapping principles stemming from socio-legal and qualitative interview data findings presented in this study and existing energy and rural environmental justice to enable the benefits of onshore wind with agricultural activities in future research. As illustrated in Fig. 1, the overlapping and interrelated nature of each AEJ pillar creates conceptual mutually reinforcing objectives in a multi-directional relationship.

Context-specific policy interventions must be analysed to devise energy solutions and investigate legal and social benefits and burdens (Upham et al., 2022) reflected in energy regulation and stakeholder views. Energy justice scholarship critiques moral hazards, regulatory capture, or technocratic applications, creating unclear and incomparable outcomes across scales and sectors (Jenkins et al., 2020; Santos Ayllón et al., 2025). Importantly, each pillar in the AEJ framework is interdependent, with no pillar attracting greater weighting. When applied in socio-legal contexts, if a project were to meet selective pillars or three pillars but not the nexus justice pillar, this would deprioritise its merit within the AEJ framework. Section “Mixed Methods Research Design” below outlines the study research design, methods, and contextual justification for the WSM case study region as the subject of this study.

### Mixed methods research design

Following the research context and key concepts elucidated in Section “Conceptualising Energy Justice for Agricultural Communities”, this section outlines the selection of interview participants, interview data, research design, and the limitations of this study. To address the aim of analysing justice factors enabling onshore wind development on agricultural land and avoiding land use conflicts, this section analyses stakeholder perspectives in Victoria’s WSM region to identify perceived or actual injustices (Sovacool, Axsen, and Sorrell, 2018), blending socio-legal and qualitative research design methods.

**Socio-legal methodology.** Doctrinal methodological analysis is defined as “[a] synthesis of various rules, principles, norms, interpretive guidelines and values” (Hutchinson and Duncan, 2012, 84). Traditional doctrinal models of legal research can be supplemented by social research methods. As highlighted by McCrudden, “law is not a datum; it is in constant evolution, developing in ways that are sometimes startling and endlessly inventive” (McCrudden, 2006, pg. 648). Building upon a traditional legal doctrinal interpretation of rules, laws, and principles, a socio-legal analysis is employed within this study (Cownie, 2004). Socio-legal methods enable nuanced understandings and interpretations of the law reflected in society and jurisdictions. Socio-legal methods and data are particularly important to inform policy design and regulatory reform as a supplementary method to qualitative research.

**Qualitative research design.** Online semi-structured interviews were performed for data collection and narrative analysis. Interviewees comprised 12 onshore wind and agriculture expert stakeholders, broadly divided into agricultural landholders, policy and/or government officials, and onshore wind developers. Interview recruitment adopted a ‘snowballing’ approach. Snowballing sampling “relies on and partakes in the dynamics

| Table 1 WSM interviewee participant characteristics.                |                                                                                                                 |              |
|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------|
| Categories                                                          | Affiliations and Relevant Social Groups                                                                         | Interviewees |
| Agricultural landholder with current or future onshore wind on farm | Cropping agricultural landholders, livestock agricultural landholders, organic farming agricultural landholders | 5            |
| Policy and/or Government                                            | Local councils, regional development corporations, Victorian government representatives                         | 6            |
| Energy Developer                                                    | Onshore wind development, land development specialists                                                          | 2            |
| Source: Compiled by authors.                                        |                                                                                                                 |              |

of natural and organic social networks” (Noy, 2006, pg. 329). The employment of snowballing serves two purposes. First, snowballing captures social knowledge situated in a place-based context. Second, snowballing enables analysis of power relations, including socio-legal and justice power dynamics, by harnessing these social networks within natural social networks (Curtis et al., 2000).

The 12 interviewee participants constituted a purposive ‘snowball’ sample. This sample consisted of stakeholders with specific knowledge and experience concerning onshore wind and agricultural intersections in the WSM region of Victoria (Palinkas et al., 2015), coupled with theoretical sampling (Corbin and Strauss, 2008) to capture representatives from the agricultural, energy, and governmental sectors. As a result, the study draws on a relatively limited sample of participants, harnessing the ‘snowballing’ method to select representatives of key stakeholders. This method was applied to identify representatives from key stakeholder groups to obtain diverse perspectives and minimise the risks of perspective clustering. ‘Snowball sampling’ enabled chain-referral recruitment of participants with expertise at the intersection of agriculture and wind energy, capturing perspectives across the three sectors relevant for this study: agriculture, renewable energy, and policy sectors. (Saunders et al., 2009). Interviews ranged from 30–60 minutes in duration. All interviewees provided informed consent, their data was anonymous, and data collection occurred until the point of data saturation defined by Guest et al. as “the point in data collection and analysis when new information produces little or no change” (Guest et al., 2006, pg. 82). However, the limited interview sample size ( $n = 12$ ) inherently creates risks of biases, insufficient cross-sectional views being captured, and limited application and reliance of resulting reform recommendations.

Interviewees represented key social groups to denote institutions sharing diverse experiences attached to onshore wind development. These social groups, agricultural landholders, policy and/or government, and energy developers, constitute the ‘environment’ of analyses to analyse a relevant technology combined with specific land uses (Pinch, 1996). Social groups are critical to shaping and defining benefits and risks arising during technological development (Pinch, 1996; Sovacool, 2010). Table 1 provides a summary of the Interview Participant Characteristics examined within this study, applying the ‘snowballing’ purposive sampling method. To address the literature gap of agricultural landholders often remaining unrepresented in justice literature (Jett, 2020), purposive sampling resulted in a positive bias toward agricultural landholder recruitment ( $n = 5/12$ ).

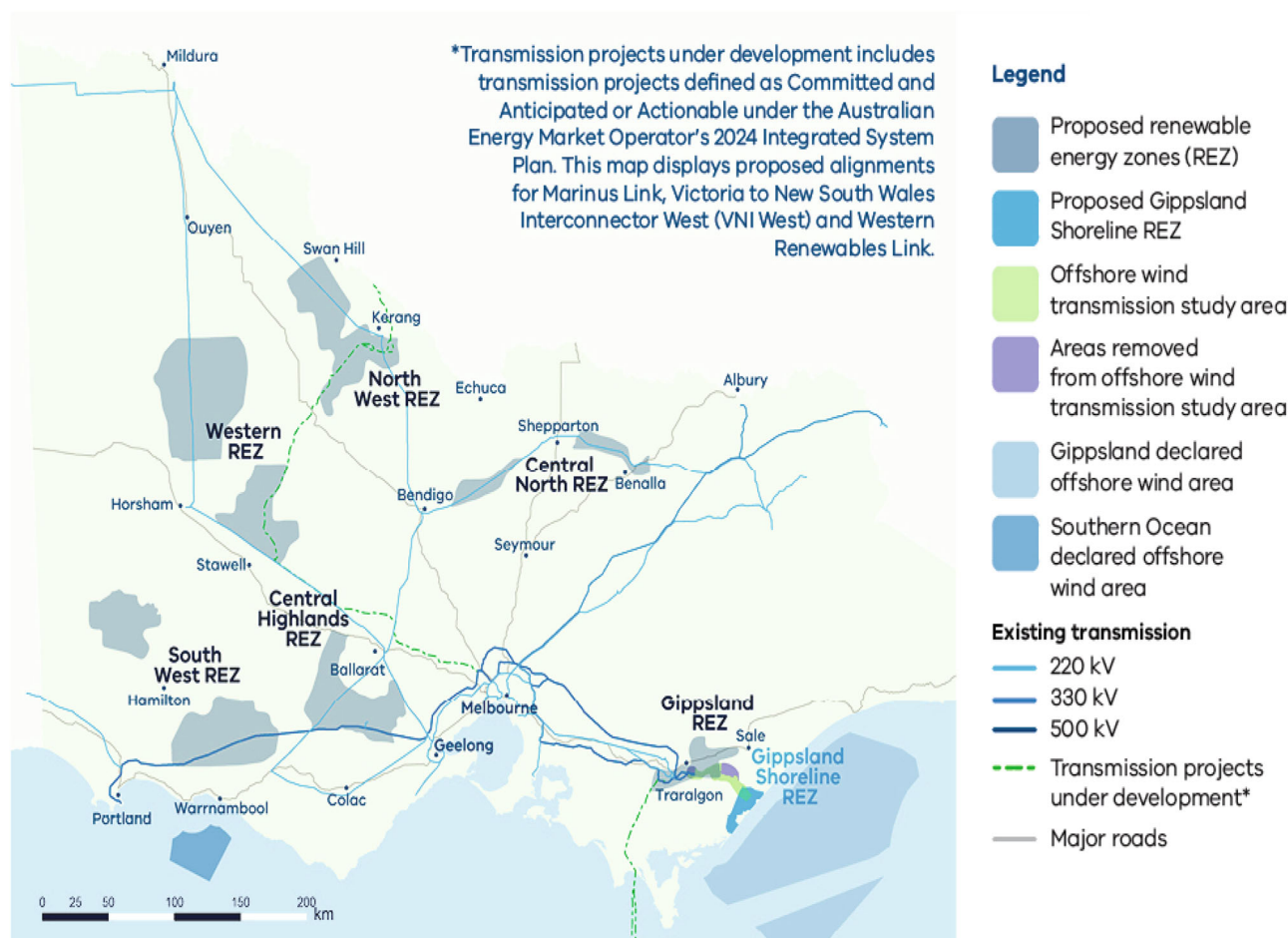
Interview protocols and development centred on three key lines of enquiry (1) Risks to agricultural land and activities hosting onshore wind; (2) Benefits to agricultural land and activities hosting onshore wind; and (3) Current opportunities for reform to support justice-driven actions to strengthen agriculture and onshore wind co-location.

Recorded interview data was transcribed and analysed applying a series of codes prescribing data to the four coded themes of AEJ as illustrated above in Fig. 1: (1) distributive justice; (2) procedural justice; (3) recognition justice; and (4) nexus justice. Coded data was analysed to explore patterns and processes to observe common themes and differences among responses, harnessing an analytic induction (Ragin, 2023) to derive generalisations. The coding analysis on a line-by-line basis is consistent with grounded theory, enabling data derived from personal experiences to be considered and analysed (Sarantakos, 2005). The results of the qualitative thematic and grounded analytic induction process capture frequently raised socio-legal reform recommendations offered by interview participants.

**Study region.** Case study regions are essential to specific and contextual qualitative and socio-legal analyses, adopting a pragmatic approach to justice-based analyses. To align with our study’s aim to identify and analyse agricultural stakeholders’ understandings and opinions of onshore wind, the WSM region was selected as the specific region of the study. The WSM rural community hosts major onshore wind projects and is a key site for new development within the Western Victorian Renewable Energy Zone, now proposed in two sections shown in Figs. 2 and 3.

Situated in central western Victoria, the WSM region hosts some of Victoria’s best wind resources and grain growing enterprise. The WSM region contains five municipalities outlined in Fig. 3: the Hindmarsh Shire, Horsham Rural City, Northern Grampians Shire, West Wimmera Shire, and Yarriambiack Shire (Regional Development Victoria, 2024). The coalescence of grain growing and other agricultural activities, coupled with increasing projections to host large-scale wind projects, has led to increasing socio-legal tensions in the WSM (Taylor, 2024).

The WSM region is central to the proposed western section of the Western Victoria REZ, depicted in Fig. 2. VicGrid has released drafts for access and connections outlining how projects inside REZs gain access and how projects outside REZs are assessed, including community benefits. These drafts foreshadow REZ access allocation in early 2026 and a Grid Impact Assessment for out-of-REZ projects (VicGrid, 2025a, 2025b, 2025c) (VicGrid, 2024) (Energy Grid Alliance, 2024). By 2040, the Western Victoria REZ may host an additional 1.5 GW of wind generation from the current 1 GW of committed and existing onshore wind projects (Victorian Government, 2021a). The WSM region is a leading agricultural region, creating a Gross Regional Product of \$2.52 billion (WSM, 2024). Broadacre agriculture employs 20% of the WSM workforce (WSM, 2024), contributing \$1.34 billion to the Victorian economy. Overall, the WSM region contributes 33.33% of Victoria’s grain production and 20% of its pig, sheep, lamb, and wool commodities (WSM, 2024).



**Fig. 2 Proposed Victorian Renewable Energy Zones identify key zones where renewable energy and transmission capacity will be built in Victoria.** The WSM region is primarily located within the western section Western Victoria REZ. Source: Victorian Government. 2025. <https://www.energy.vic.gov.au/renewable-energy/vicgrid/renewable-energy-zones> (accessed 13 September 2025).

Six onshore wind projects are operational in the WSM region in 2025, generating a total capacity of 0.698 GW as illustrated in Table 2 below.

11 potential onshore wind projects are currently under consideration, which may represent an estimated 9.7 GW. As a rural community with substantial agricultural activities, WSM serves as a testbed for socio-legal approaches to onshore wind development on agricultural land.

**Data and analysis limitations.** The themes analysed and the AEJ framework are informed by interview participants' data, examined by harnessing qualitative data methods. Our interview data represented a mix of sampling strategies, consistent with the study's research design. This data seeks to complement the socio-legal analysis within the study rather than provide a comprehensive dataset for statistical and coding analyses, particularly due to the limited nature of the qualitative study size (N=12). The themes categorised through text-sampling (Emmel, 2013) of interview transcripts create findings to identify opportunities to deploy the AEJ framework. We compensated for the limited data sample by supplementing interview data thematic analyses with socio-legal analysis of Victoria in Section "Embedding Agri Energy Justice in Victoria, Australia" and comparative analyses of relevant jurisdictions in Section "Results". The analysis of interview transcripts applied a qualitative thematic analysis to interpret patterns and ascribe meaning to the collected interview data,

providing the foundation for a systematic analysis (Noy, 2008). Our small sample size may shape indirect and direct biases in data translation and analysis. While this study captured a cross-section of stakeholder attitudes, including opposing views on onshore wind on agricultural land, further research is needed to test and validate the findings and AEJ reform recommendations. The study's limited focus produces a selective interview sample, serving as a foundation for future research to more comprehensively analyse stakeholder dynamics using larger datasets.

### Embedding Agri Energy Justice in Victoria, Australia

A socio-legal perspective is required to provide a nuanced understanding of relevant regulation and policies. Victoria currently does not hold policies, nor has it embedded in its planning and environment or energy regulation the concept of energy or agricultural justice. Unlike several EU Directives that encourage the consideration of energy justice, including the European Green Deal (Hyldmo et al., 2024), Victoria has focused on vulnerability for consumers, including energy consumers, in its 'Getting to Fair' strategy rather than energy justice (Essential Services Commission, 2024). The 'Getting to Fair' strategy includes developing the Payment Difficult Framework for consumers facing financial hardship (ESC, 2024). A consumer-centric policy focus can lead to socio-legal tensions and perceived or actual energy injustices for rural communities hosting renewable energy



**Fig. 3 The Wimmera Southern Mallee Regional map.** Source: Regional Development Victoria. 2025. Grampians' Wimmera Southern Mallee Region <https://www.rdv.vic.gov.au/victorias-regions/grampians/wimmera-southern-mallee> (accessed 3 August 2025).

infrastructure, potentially creating "rural exploitation" narratives (Ko, 2025) (Oaks, 2025).

Since 2006, Victoria's renewable energy development has been stimulated by the Victorian Renewable Energy Target (VRET) auction scheme (Victorian Government, 2024). The VRET creates a contract for difference system based on a reverse auction to attract capacity bids. Winning auction proponents are awarded a guaranteed NEM wholesale 'strike price' (Nelson et al., 2021). Victoria holds a legislated target of 95% renewable electricity generation by 2035 enshrined within the *Renewable Energy (Jobs and Investment) Act 2017* (Vic). Achieving the energy transition targets through REZs has raised salient questions of energy justice (Victorian Government, 2021b; Taylor, 2024).

The *Planning and Environment Act 1987* (Vic) (P&E Act) regulates onshore wind development supplemented by planning policy under the Victorian Planning Provisions (VPPs) (Victorian Government, 2023). The primary planning objective is to "facilitate the establishment and expansion of wind energy facilities, in appropriate locations, with minimal impact on the amenity of the area" (Victoria Planning Provisions, VC148, Clause 52.32). Similar to most EU member and US state jurisdictions, Victoria requires utility-scale wind energy facilities to develop an Operational Environmental Management Plan (OEM Plan) and may need to complete an Environment Effects Statement (EES) pursuant to the *Environment Effects Act 1978* (Vic) to obtain a planning permit. The OEM Plan acts as the assessment mechanism to gain a planning permit, the regulatory tool to operate and generate electricity (Victoria Planning Provisions, VC148, clause 52.32-3).

The complex planning legal system and onshore wind licensing process in Victoria result in a fragmented licensing process with no single regulator overseeing all four components, as illustrated below in Fig. 4.

The socio-legal analysis of onshore wind siting on agricultural land in Victoria exposes several regulatory gaps. The Victorian

planning policy and regulatory framework lacks enforceable mechanisms over a project lifecycle to specifically assess the benefits of onshore wind development on agricultural land. Secondly, there is currently no single-regulator approach to planning and development of renewable energy specifically on agricultural land. Sustainable agricultural landholder and community benefits, beyond leasehold rent or community benefit funds, are also needed to reduce social contestation (Potter et al., 2024).

## Results

To assess social benefits, burdens, and attitudes of WSM stakeholders, building on the socio-legal gaps in onshore wind development examined in Section "Embedding Agri Energy Justice in Victoria, Australia", we analyse the top 10% of words in our stakeholder interview data. The 20 most frequently cited keywords were selected, and weighted percentages were identified to represent target keywords presented in Table 3. Community appears as the most frequent keyword combating potential notions of 'NYMBISM' as a top concern of participants (van der Horst, 2007).

Building on the keyword analysis, codes were assigned to the four pillars of the proposed AEJ Framework to reveal benefits, burdens, and opportunities. Table 4 presents the frequency and references to the four AEJ pillars within interview data.

Results are presented based on the frequency and expressed magnitude of benefits, burdens, and opportunities analysed within the AEJ Framework. Select direct quotation results and comparative socio-legal analysis are presented to enunciate insights into perceived and actual injustices in onshore wind development on agricultural land within the WSM region.

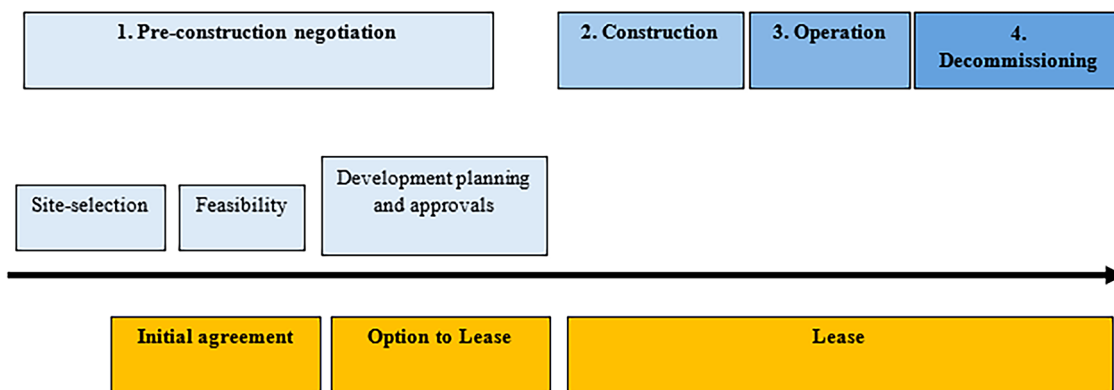
**Distributive justice.** Distributive justice addresses potential "democratic deficits" (Crawford et al., 2022) perceived by the agricultural sector when hosting onshore wind. Hosting wind development can act as an important enabler of additional income streams for agricultural landholders hosting onshore wind projects. However, information asymmetry between host agricultural landholders and feelings of a lack of democratic inclusion may result in injustices in the distribution of "benefits and burdens" (de Looze, 2024). This information asymmetry and democratic deficit were highlighted by most interviewees ( $n = 11/12$ ), including interviewee #8, "*They (the agricultural landholders) actually don't even know where the turbines are proposed. So they're jumping at shadows because they don't know they're making assumptions, and they don't know where they're located*". This led to agricultural communities feeling that community engagement specific to the needs of rural communities has not been the norm, "*understand what the community is, what their traditions, myths, beliefs, virtues are. And only then can you start this saying, Well, is this outcome what? What can we design to make their fit to this, this desire? ...no one's got the incentive to do it*" (Interviewee #3).

The majority of interviewees ( $n = 11/12$ ) expressed the need to address democratic deficits in onshore wind planning stages by embedding community investment models. Community investment models may entail a mix of community-owned and developer-owned onshore wind projects or benefit funds, typically in the form of community cooperatives, common in Germany (Herbes et al., 2021), shared ownership common across several EU jurisdictions, and community development trusts frequently adopted in Scotland. Interviewee #5 expressed the desire for community-ownership in onshore wind development options to be regulated, "*We're actually saying it's the State's role to require that that discussion is had. It's a statutory responsibility that the proponent has to offer a suite of different ownership*

**Table 2 Onshore wind projects in the Wimmera Southern Mallee Region (2025).**

| Asset Type                                         | Municipality                                                                                    | Site Name                                                                                 | Owner                                                                                                                                        | Proposed MW | Op MW                 | Technology Type                                                            |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------------------|----------------------------------------------------------------------------|
| Existing Plant<br>Project                          | Northern Grampians Shire Council<br>Northern Grampians Shire Council/Yarriambiack Shire Council | Bulgana Green Power Hub - Wind Farm<br>Campbells Bridge Wind Farm                         | Bulgana Wind Farm Pty Ltd (HMC Capital)<br>RWE                                                                                               | 1000        | 204                   | Wind Turbine - Onshore<br>Wind Turbine - Onshore                           |
| Existing Plant<br>Project                          | Buloke Shire Council                                                                            | Coonoor Bridge Wind Farm                                                                  | Coonoor Bridge Wind Farm Pty Ltd (Atmos Renewables)                                                                                          |             | 19.8                  | Wind Turbine - Onshore                                                     |
| Project                                            | Buloke Shire Council                                                                            | Corack East Wind                                                                          | ACEN Australia (investigating connection to VNI-West)                                                                                        | 850         |                       | Wind Turbine - Onshore                                                     |
| Project                                            | Buloke Shire Council/<br>Yarriambiack Shire Council                                             | Curyo Wind Farm                                                                           | Cubico Sustainable Investments                                                                                                               | 1000        |                       | Wind Turbines -Onshore                                                     |
| Existing Plant<br>Existing Plant<br>Existing Plant | Hindmarsh Shire Council<br>Hindmarsh Shire Council<br>Yarriambiack Shire Council                | Diapur Wind Farm (Nhili, Hindmarsh)<br>Kiata Wind Farm<br>Murra Warra Wind Farm - Stage 1 | Diapur Wind Farm Pty Ltd (Prime Super)<br>Atmos Renewables (via Kiata ProjectCo Pty Ltd)<br>Murra Warra Project Co Pty Ltd (Squadron Energy) |             | 7.4<br>31.05<br>225.7 | Wind Turbine - Onshore<br>Wind Turbine - Onshore<br>Wind Turbine - Onshore |
| Existing Plant                                     | Yarriambiack Shire Council/<br>Horsham Rural City Council                                       | Murra Warra Wind Farm - Stage 2                                                           | Murra Warra II Project Co Pty Ltd as Trustee for the Murra Warra II Project Trust (Squadron)                                                 |             | 209                   | Wind Turbine - Onshore                                                     |
| Project                                            | Yarriambiack Shire Council/<br>Horsham Rural City Council                                       | Murra Warra Wind Farm - Stage 3                                                           | RES Australia Pty Ltd                                                                                                                        | 500         |                       | Wind Turbine - Onshore                                                     |
| Project                                            | Northern Grampians Shire Council                                                                | Navarre Green Power Hub - Wind Farm                                                       | HMC Capital                                                                                                                                  | 600         |                       | Wind Turbine - Onshore                                                     |
| Project                                            | Horsham Rural City Council                                                                      | Rifle Butts Wind Farm                                                                     | NewEn Australia                                                                                                                              | 40          |                       | Wind Turbine - Onshore                                                     |
| Project                                            | Northern Grampians Shire Council                                                                | Stuart Mill Wind Farm                                                                     | Pacific Blue                                                                                                                                 | 1000        |                       | Wind Turbines -Onshore                                                     |
| Project                                            | Yarriambiack Shire Council                                                                      | Warracknabeal Wind Farm                                                                   | WestWind Energy Pty Ltd                                                                                                                      | 1650        |                       | Wind Turbine - Onshore                                                     |
| Project                                            | Northern Grampians Shire Council                                                                | Watta Wella Power Station                                                                 | RES Australia Pty Ltd                                                                                                                        | 345.6       |                       | Wind Turbine - Onshore                                                     |
| Project                                            | Buloke Shire Council/<br>Yarriambiack Shire Council                                             | Wilkur Energy Park                                                                        | West Wind Energy                                                                                                                             | 776         |                       | Wind Turbine - Onshore                                                     |
| Project                                            | Horsham Rural City Council                                                                      | Wimmera Plains Wind Farm                                                                  | BayWa re.e                                                                                                                                   | 312         |                       | Wind Turbine - Onshore                                                     |
| Project                                            | West Wimmera Shire Council                                                                      | Wombelano Wind Farm                                                                       | FERA Australia                                                                                                                               | 24          |                       | Wind Turbine - Onshore                                                     |
|                                                    |                                                                                                 |                                                                                           |                                                                                                                                              | 0.513 GW    | 0.698 GW              |                                                                            |

Source: Compiled by authors.



**Fig. 4 Wind Energy Development Stages categorised as: (1) pre-construction negotiation; (2) construction; (3) operation; and (4) decommissioning.** The four key stages of onshore wind development activities are shaded in light and dark blue across the timeline. While the key legal agreements are indicated in yellow below the timeline. Source: (Taylor, 2024, p. 34).

**Table 3 Top 20 keywords of study interviewee participants.**

| Word       | Count | Weighted Percentage |
|------------|-------|---------------------|
| Community  | 1604  | 0.89%               |
| Property   | 1297  | 0.08%               |
| Farm       | 453   | 0.78%               |
| Need       | 743   | 0.74%               |
| Region     | 1246  | 0.64%               |
| Changes    | 1811  | 0.63%               |
| Messages   | 1436  | 0.52%               |
| Working    | 728   | 0.51%               |
| Activities | 976   | 0.49%               |
| Happening  | 714   | 0.48%               |
| Farmers    | 160   | 0.47%               |
| Conditions | 1176  | 0.47%               |
| Thinking   | 1245  | 0.45%               |
| Talking    | 886   | 0.44%               |
| Period     | 796   | 0.41%               |
| Language   | 657   | 0.41%               |
| Organised  | 969   | 0.41%               |
| Areas      | 473   | 0.40%               |
| Entities   | 766   | 0.40%               |
| Moving     | 1323  | 0.40%               |

Source: Compiled by authors utilising NVivo 14.

**Table 4 Agri energy justice pillars reference frequency by study interviewee participants.**

| Agri Energy Justice Pillar | References |
|----------------------------|------------|
| Recognition Justice        | 46         |
| Procedural Justice         | 29         |
| Nexus Justice              | 32         |
| Distributive Justice       | 39         |

Source: Compiled by authors utilising NVivo 14.

options". The Hepburn Energy wind farm offers an example of energy cooperatives in Victoria, and Interviewee #3 confirmed the limited contractual types currently offered to agricultural landholders and communities in the WSM region, "There's only really two types of contracts, or, let's say, financial arrangements that they have with landholders for generations, generally per turbine or per megawatt. Those are the that's really what the conversation starts and stops. And then there's obviously some access agreements and some hosting of critical infrastructure... but, yeah, I haven't

heard of any (wind cooperatives)". These two contractual types, without ownership options in Victoria, are symptomatic of the lack of renewable energy cooperative regulation, incentives, or requirements forming part of planning permit applications for developments to consider cooperative options for community members.

67% of interviewees ( $n = 8/12$ ) expressed interest in developing onshore wind cooperatives regulation and a specific energy cooperative peak body in Victoria, "I think that would be the number one thing that could really change the discussions is how do we actually create the communities to be able to negotiate equity positions? Or maybe it's just compulsory that there is, as soon as you do that, but there should be a minimum, community ownership" (Interviewee #9). Community development trusts are statutory advisory bodies, to guide economic grants for regional entities to create ownership models for community members, "The proponents outsource the delivery and management of their discretionary community benefit stream. But if there was tighter... regulation around that, there would just be more certainty around being able to quantify... around how we can leverage the benefit." (Interviewee #5) However, other interviewees ( $n = 2/12$ ) expressed concern over the need for clear governance and training structures for effective cooperative management "for us, you know, that's a whole, you know, another business (cooperatives) that we wouldn't be, you know, we've got our farming business... you know that that would just be something else that we wouldn't be wanting to do personally" (Interviewee #6).

**Procedural justice.** Procedural justice is critical to creating transparent and equitable legal processes and regulatory conditions, ensuring fairness across three key onshore wind regulatory functions: assessment, operations, and decommissioning. Lack of training, guidance, and accessible knowledge concerning the intersection of planning regulation, biosecurity risks, and onshore wind lease negotiation to minimise risks to agricultural activities was consistently raised by 33% of interviewees ( $n = 4 = 12$ ). For example, Interviewee #2 states "The biggest issue with all this at the minute is misinformation, you know, from political level all the way down, that's actually causing angst. So as a company, we're looking at, how do we, how do we overcome some of this stuff that's actually not legislated, so decommissioning is a big one. Again, the fire risk and insurance risks and these other things all come in. But generally, we're working with the willing. You know, these people that either approached us first or happy enough to have the negotiations in regard to the wind". Victoria does not currently have an agricultural landholder-specific renewable energy toolkit or land access framework within its planning regulations specific

to onshore wind. This was highlighted by Interviewee #4 concerning the need for wind developers to have “*education about how farms work and guidelines required to that we are required to follow a grow grain high and meat the enemy consumption, or even for stock, grain for stock, it all has to be to a standard*”.

The most prevalent procedural justice issue raised by 67% of interviewees overall ( $n = 8/12$ ) concerned decommissioning and the need to create repowering regulations to incentivise circular economy targets and updated technological infrastructure. As articulated by Interviewee #10 “*for us, it’s around the disruption to the, you know, farming business during the build phase, the decommissioning is a risk. And mainly, I guess, due to the, you know, if the developer goes insolvent*”. Decommissioning plans are a requirement of planning permitting conditions in Victoria. However, there is no regulation concerning the standards specifically for decommissioning as highlighted by Interviewee #2 “*So we’ve actually got to make sure that these, these guarantees are in place, and that the farmers won’t be left kind of holding the holding the can, and that the money doesn’t actually come out of there fees. It’s actually money set aside by the company*”. Robust decommissioning and repowering regulations could enhance procedural justice and reduce information asymmetry regarding end-of-life impacts of onshore wind on agricultural land.

**Recognition justice.** Recognition justice acknowledges the rights and duties of different groups within society (Van Uffelen, 2022), in the context of this study, agricultural landholders and communities. Recognition justice is critical during the assessment, authorisation, and monitoring of onshore wind development on agricultural land, empowering agricultural landowners to actively participate in the siting, construction, and operation of onshore wind projects. As illustrated in Table 3, recognition justice issues were the most frequently raised in participant interviews.

Two key recognition justice themes emerged from interview data. Firstly, the unique risks and benefits of operating onshore wind projects on agricultural land were raised as a concern by ( $n = 5/12$ ) interviewees, particularly during the environmental impact assessment planning phase of onshore wind development. This is because Victoria does not currently have clear parameters for Agricultural Impact Assessments (AIAs) beyond relevant VPP requirements and the current Planning Guidelines for Development of Wind Energy Facilities (Victorian Government, 2023) as a supplement to an EES assessment. Without detailed AIA requirements, onshore wind projects may undertake varying standards to monitor and manage cumulative impacts and benefits for agriculture. This knowledge gap for wind proponents was acknowledged by Interviewee #2 “*I went out and started having negotiations with a wind farm company, they didn’t understand farming... here they are trying to plonk turbines willy nilly. And so you’ve actually got to sit down and have the discussions about where the best placement might be that to have least impact on their farming practices*”. Interviewee #7 also recognised legal planning and development permit reform to consider cumulative AIAs on agricultural land to ensure “*compatibility of different agricultural production systems, with wind development, the ancillary understanding the impacts of ancillary infrastructure, with the development, including hard stand road accesses, connection assets for the infrastructure and their transmission lines, both on their own property and on others properties*”. Interviewees #2 and #7 recognised a knowledge gap among onshore wind developers regarding agricultural activities, citing previous incidents where a developer produced inaccurate GPS boundary lines.

Secondly, Victoria does not have a binding Agriculture and Renewable Access and Land Use Code for renewable energy

(Queensland Government, 2024). The need for a mandatory code of conduct requirements for land access and land use, communication, biosecurity, fire risks, or engagement represents pervasive themes raised ( $n = 11/12$ ). Interviewee #3 “*detailed an incident of road misuse by contractors. ‘We had the contractors driving down the wrong roads, ripping up our roads. I’ve got a stone road just to the north of the main farmyard here that’s now absolutely gassed, and I reckon would have had another 20 years left in it’*”. Interviewee #7 acknowledged recognition of farmer’s cropping cycles for legal negotiation was also needed, “*The risks and issues that either need to be worked through by the landholder and known or need the developer and others need to be attentive to site remediation insurance the compatibility of different agricultural production systems, with wind development, the understanding the impacts of ancillary infrastructure*.” The potential for strategic support for landholders to negotiate was also raised by Interviewee #1 who argued this was needed “*to have elevated conversations, targeted strategic conversations, be better at negotiating outcomes and just not feel powerless in these conversations*”.

**Nexus justice.** The fourth pillar of AEJ builds on the established principle of the energy-water-food nexus (Serdar et al., 2024; Liu et al., 2025) to balance the interlinkages of the agriculture and energy sector to integrate regulation and policy, activating equitable coexistence. The novel nexus justice pillar of AEJ creates interlinkages with procedural and distributive justice in focusing on cross-sectoral co-benefits and justice outcomes. Co-benefits are oft categorised as voluntary procedures or incidental outcomes of planning regulatory processes (Productivity Commission, 2025). Yet, nexus justice extends norms of legal transparency and fair distribution of benefits and burdens, requiring multi-criteria regulatory analyses to evaluate and ensure co-benefit synergies between agriculture and renewable energy. Nexus justice performs a distinct justice function by identifying and mitigating interconnected cross-sectoral risks to promote policy and regulatory coherence and long-term land stewardship at the intersection of agriculture and onshore wind energy. For example, the development of sustainability metrics within a regulated framework can advance nexus justice by enabling sustainable land use and carbon offsetting practices, thereby offering potential circular economy opportunities on agricultural land. Some interviewees ( $n = 3/12$ ) understood the importance of hosting wind development as a potential value creation and nexus justice opportunity, encouraging sustainable land practices (Kolapo et al., 2022), and agricultural export sustainability requirements. “*However, if you’re hosting a turbine, I think you possibly have a right to know what the biodiversity studies have found on your property. And I don’t want to know because of the turbine. I want to know, because it may help me, in other aspects of my business, prove my case of being sustainable or meeting the sustainability criteria*.” (Interviewee #1). Interviewee #11 reiterated sustainability metrics linked to onshore wind could incentivise farmers hosting projects, “*this is complex enough, we don’t want to do that. And I actually think probably had we had that discussion with our landholders, that probably would have done their heads in it... the concept of, you know, dollars per year worked for them, but the (sustainability) markets gradually shifting*”. Participants explained their interest and willingness to host wind energy development linked to sustainability reporting in light of the EU Carbon Border Adjustment Mechanism (Zhong and Pei, 2023).

Evidencing the importance of business integration with wind energy, Interviewee #3 raised the importance of scoping business opportunities in hosting wind energy development, including the

potential for sustainability value-adding benefits for farmers “*I would say every farmer that’s involved in these projects really does need to have a business plan, to both understand the taxation implications, but then also just to get their businesses houses in order, or help them anyway, take them to that water, give them that give them the sniff of the trough*”.

Elevating agricultural landholder bargaining power, trusted sources of information stemming from agricultural landholders with experience hosting onshore wind, and an energy community advisory hub were also key recommendations ( $n = 7/12$ ) from interviewee participants. For example, Interviewee #10 states, “*farmers haven’t got, shouldn’t have to be trying to do this sort of independently and by themselves. There needs to be somebody that’s getting that integration of the policies and the, you know, best practices and whatever, to the farmers*”.

### Discussion: assessing the agri-energy justice framework through comparative legal examples

Our socio-legal review and qualitative thematic and grounded analytic induction analysis captures a purposive sample of interviewee perceptions, attitudes, and recommendations. These insights aim to address the currently perceived or actual “rural burden” (Nilson and Stedman, 2023) experienced by rural communities through unequal benefits distribution and regulatory and governance gaps. These perspectives are critical for regulatory reform, applying justice conceptualisations to rural communities (Buechler and Martinez-Molina, 2021). Interview-driven results were organised and examined within the four proposed AEJ pillars as analysed within Section “Results” of this study with reform options for each AEJ pillar stemming from comparative law examples analysed in the remainder of Section “Discussion: assessing the agri-energy justice framework through comparative legal examples”.

**Distributive justice.** Article 2, paragraph 16 of the EU Renewable Energy Directive II regulates renewable energy communities, which may take the form of cooperatives. In Germany, proximity to development constitutes a 50 km radius (*Law for the expansion of renewable energies (Renewable Energy Sources Act - EEG 2023 (GE) s 15*). While Australia holds enabling federal cooperative legislation, Victoria does not have a legal definition or a regulatory framework to support the creation and operation of onshore wind cooperatives. In order to address “democratic deficits” (Crawford et al., 2022) raised by ( $n = 9/12$ ) representing 75% of interviewees, the development of community investment models supplemented by renewable energy vehicles, including cooperatives, may respond to the information asymmetries experienced by interviewees, currently limited to leasehold contracting based on a turbine or generation output capacity. In the EU, energy cooperatives are gaining increasing momentum to reposition community stakeholders with direct interests in wind development to achieve mutual goals. However, cooperative models face structural challenges, particularly concerning governance capacity building (Huybrechts et al., 2024). The European Federation of Citizen Energy Cooperatives provides an example of an energy cooperative peak body supporting stakeholders to develop cooperatives (ICA, 2025). A similar peak body could be explored in the Victorian context.

**Procedural justice.** Decommissioning was one of the most frequently raised concerns by raised by 67% of interviewees overall ( $n = 8/12$ ). No large-scale wind farm developments have been successfully ‘repowered’ in Australia nor is repowering required under the *Planning and Environment Act 1987* (Vic). Germany, as one of the leading repowering jurisdictions (Stetter et al., 2022),

defines repowering as modernising onshore wind components, including “the complete or partial replacement of systems or operating systems and equipment to replace capacity or to increase the efficiency or capacity of the system” (*German Wind on Land Act § 5.3*). Requirements for onshore wind repowering are evident across the EU, particularly in Germany and Spain. In 2023, the Spanish Circular Repowering Programme allocated €132.5 million towards subsidising repowering and wind turbine recycling. Amending the Victorian planning regulatory regime to require decommissioning bonds and repowering funds may counter procedural injustices of decommissioning costs.

**Recognition justice.** The general understanding of risks during onshore wind farm constructions and operations to agricultural businesses was a prevalent recognition justice theme raised. To ensure wind energy developers “*put the effort in to understand agriculture*” (Interviewee #2) by creating legal conditions for agricultural land access and entry, particularly to minimise bio-security risks, was consistently reiterated by landholder interviewees ( $n = 4/12$ ). For example, TasFarmers created a Farm Access Code of Conduct providing general consultation principles, rather than legislated land use and land access requirements, for general infrastructure rather than specific guidance for renewable energy on agricultural land (TasFarmers, 2024). Other jurisdictions, such as Scotland, have produced a Good Practice during Wind Farm Construction Guide, including some specific consideration of agricultural operation impacts (Scottish Renewables, 2015). Requiring consideration of agricultural practices and the development of mutually agreed on-farm practices could be a clear aim of an Agriculture and Renewable Access and Land Use Code.

**Nexus justice.** The perceived lack of nexus justice in planning regulation was highlighted as a key thematic insight from participants ( $n = 6/12$ ). A significant opportunity exists to achieve nexus justice synergies and mitigate cross-sectoral risks between agriculture and wind energy by redesigning market mechanisms and renewable energy auctions to increase transparency and data sharing protocols for onshore wind and agricultural activities. While market redesign and auction incentives interlink with other AEJ pillars, including procedural and distributive justice, nexus justice uniquely enables a more comprehensive and holistic system integration with energy and agriculture synergies and goals as a foundational requirement for any potential commercial reforms, rather than a singular sectoral focus. This approach prioritises sustainability and requires enhancement of agricultural operations as a pre-qualification criterion.

For example, the European Economic and Social Committee (EESC) has recommended that EU member state wind energy auctions be redesigned for pre-qualification criteria (EESC, 2024). Pre-qualification criteria could enable aspects of environmental sustainability, occupational safety, and, importantly, social benefits requirements. The proposed auction redesign may prioritise projects generating power near consumption sites to ensure energy sharing and ownership underpinned by monitoring mechanisms and accessible data provisions. This approach may better optimise grid capacity and flexibility through service integration (Nelson et al., 2021).

Deploying a nexus justice approach could give rise to opportunities to combine onshore wind, agricultural activities, and nature-positive co-benefits, adopting the regional strategic planning approach within the slated reforms to the *Environment Protection and Biodiversity Conservation Act 1999* (Cth). Nexus reform recommendations adopting this lens could include requiring not only impact management for biodiversity loss but

| Table 5 Agri energy justice and socio-legal reform recommendations. |                                                                                                                                 |                                                                                                                                                                         |
|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Agri Energy Justice Pillar                                          | Description                                                                                                                     | Key socio-legal reform opportunities                                                                                                                                    |
| Distributive Justice                                                | Highlighting the distribution of benefits and burdens and allocation of corresponding responsibilities                          | Onshore wind cooperative regulation                                                                                                                                     |
| Procedural Justice                                                  | Identifying legal and policy processes benchmarking criteria to foster co-benefits and promote inclusiveness in decision making | Decommissioning, recycling, and repowering regulation                                                                                                                   |
| Recognition Justice                                                 | Acknowledging distinct needs of differing social groups, particularly agricultural landholders and farming communities          | Farm Access Code of Conduct and Agricultural Impact Assessments                                                                                                         |
| Nexus Justice                                                       | Encouraging development of agricultural and wind energy co-benefits                                                             | Agriculture and Wind Auction Pre-Qualification Criteria<br>Biodiversity Net Gain and Sustainability Metrics: Agriculture and Renewable Energy Association and Ombudsman |

Source: Compiled by authors.

also requiring biodiversity net gain within a specific threshold for agricultural landholders hosting onshore wind, to proffer sustainable land stewardship opportunities. The UK provides an example of this, requiring renewable energy development to achieve a minimum of 10% biodiversity net gain.<sup>1</sup>

**Potential for agri-energy justice socio-legal reform.** Table 5 conveys the key socio-legal reform opportunities in the WSM region and greater Victoria, Australia, connecting the results to the AEJ pillars captured in Sections "Results" and "Discussion: assessing the agri-energy justice framework through comparative legal examples". Grounded in the AEJ framework, this study's examination of the WSM region offers a case study with potential global relevance for distilling justice-led benefits and burdens in agriculture-renewable energy siting.

Applying distributive justice, participants expressed the desire and interest to form onshore wind cooperatives due to feelings of imbalance in bargaining power, misalignment with farmer compensation and lease agreement terms, and interest in ownership stakes during onshore wind energy development. The current absence of a clear regulatory and policy framework to define and support the creation of onshore wind cooperatives in Victoria elicits an important opportunity to advance distributional justice.

Second, procedural justice was widely considered absent in the Victorian regulatory framework, particularly concerning planning permitting breaches and enforcement on agricultural land. Decommissioning, recycling, and future repowering were all raised as risks to the ongoing viability of farming practices. Victoria does not currently regulate to provide clear provision and support for repowering or decommissioning and rehabilitation requirements associated with recycling requirements beyond planning assessments and permits (Taylor, 2024). The opportunity to encourage circular economy recycling practices within onshore wind decommissioning, coupled with future repowering auctions, as is the case in Spain (Garcia et al., 2024), was highlighted.

Third, recognition justice was the most frequently raised AEJ pillar by participants. The complexity and conflicts between agricultural landholder rights and duties throughout the onshore wind development lifecycle have created feelings of marginalisation and spatial injustice (Perez-Sindin, 2022) for rural communities. Creating more detailed AIA requirements for renewable energy on agricultural land was cited as a core function and need for the planning regulatory system in Victoria to recognise benefits, risks, and mitigation strategies. A Farm Access Code of Conduct, acting synergistically with AIAs, particularly concerning biosecurity risks were also highlighted.

Fourth, nexus justice proposes a strategic coupling of agriculture and onshore wind to create commercial benefits for farmers beyond lease compensation. Participants conceptualised opportunities to benefit from onshore wind hosting including: (1) Developing measurable financial incentives tied to sustainability reporting; (2) Leveraging agricultural export labelling to showcase sustainability efforts; (3) Establishing pre-qualification criteria that prioritise agricultural benefits and impact mitigation in onshore wind auctions and tenders; and (4) creating sustainability co-benefits, potentially adopting a biodiversity net gain approach.

Each of the four AEJ Framework pillars is dynamically interdependent. Their mutually reinforcing relationship must be considered to avoid policy silos and potential regulatory failures in practice arising from individual or selective pillar prioritisation. For example, while robust law and policy reform to develop onshore wind consultation practices for host communities and landholders may assure procedural justice, distributive, recognition and nexus justice cannot be achieved without parallel consideration for strategic social impacts and benefits through regional consultation and land use planning and mapping. Similarly, the application of nexus, procedural, and distributive justice to create novel incentives for agriculture and wind energy co-benefits, such as through competitive auctions or sustainability standards, may produce suboptimal AEJ outcomes if the distinct needs of existing and diverse agricultural sectors are not mapped. In this case, without developing recognition justice pathways for existing agricultural activities, this may lead to co-design and biosecurity protocols being developed without adequate regard to the location, scale, and characteristics of existing agricultural processing infrastructure.

Throughout this study, the AEJ Framework has been tested and assessed from empirical and socio-legal perspectives. Results support the entrenchment of distributive (39 references), recognition (46 references), and nexus justice (32 references) pillars. The emphasis on distribution of benefits through community ownership structures in projects was one of the most highly cited findings for distributive justice ( $n = 12/39$  references overall), while recognition justice raised important issues of mitigating potential risks of onshore wind co-locating with agricultural practices, particularly through the development of cumulative AIAs supplemented by agricultural training and codes of conduct for land access ( $n = 26/46$  reference overall). However, procedural justice (29 references) was raised specifically in relation to decommissioning and contractual negotiations ( $n = 10/29$ ), rather than wider systemic changes to legal processes beyond planning.

Neglecting nexus justice dimensions of benefits for both agriculture and decarbonisation as mutually weighted outcomes could undermine socio-legal legitimacy and result in

“performative local consultation” (Sovacool et al., 2025, pg 2) in planning decisions, loss of intersectional and mutually reinforcing co-benefits, and potentially stakeholder opposition (Devine-Wright and Sherry-Brennan, 2019). Nexus justice applications could potentially be extended to other beneficiary objectives beyond decarbonisation, including biodiversity, nature recovery, health and safety, rural economic opportunity, and rural self-determination.

Other justice dimensions beyond the AEJ Framework were also raised by participants, particularly in relation to ecosystem management. While this reform opportunity is currently captured within the nexus justice pillar, there is scope to explore greater engagement between AEJ and widely recognised environmental justice literature (Schlosberg, 2007, 2012a).

Overall, the study validates the preliminary assessment of the AEJ as a potential critical novel socio-legal framework addressing the intersections between the energy transition and agriculture. The small interview sample size (12) within the WSM area limits the study findings. Future research can strengthen the theoretical contribution of our study by conducting wider longitudinal empirical studies across differing jurisdictions, technologies, and energy systems.

## Conclusion

To meet the ambitions of onshore wind development, an enabling framework embedding justice is required. This study presents a mixed-methods socio-legal qualitative analysis of interview stakeholders in the WSM case study region in Victoria. It reveals the varying approaches to conceptualising and regulating onshore wind developments on agricultural land. Lack of coordination, injustices, and planning regulation complexity have led to misalignment between the onshore wind and agricultural sectors, causing social conflict within the WSM region. As analysed throughout this study, Victoria’s planning framework for large-scale onshore wind projects on agricultural land presents opportunities for AEJ reform, including clearer and more detailed AIA requirements, enhanced regulatory support for farmer-led cooperative ownership models, and more explicit consideration of repowering processes and opportunities. Without regulatory mechanisms to enable agricultural and onshore wind synergies, project delays, increased costs, and litigation risks may become increasingly evident in Victoria.

Extending beyond the stakeholder views examined in this study, AEJ holds potential for critical engagement in the role, rights, and relationships of Traditional Owners in land use and renewable energy development. Future AEJ studies could explore the important intersection of Traditional Owner benefits, equity, and ownership in onshore wind through integration with existing Indigenous Justice principles and scholarship (Hendry et al., 2018). Views of other essential rural stakeholders, including health, education, and rural women’s networks, could refine AEJ for differing contexts, especially nexus justice, where inter-generational rural benefits may enhance future AEJ applications.

Finally, there is potential to extend the AEJ framework to other elements of the net-zero transition beyond onshore wind, including carbon dioxide removal (CDR) and ecosystem recovery. Similarly, these tecmulti-scalar interventions traverse complex socio-legal dynamics, land use trade-offs, co-benefits, and justice considerations (Kuhn et al., 2025). For example, the incorporation of enhanced rock weathering may offer dual AEJ benefits encapsulated in capturing atmospheric CO<sub>2</sub> and soil fertilisation as a nexus justice opportunity (Beerling et al., 2025).

AEJ is an iterative cycle to guide policymakers to realise the full suite of synergies between agriculture and onshore wind. The AEJ framework is ripe for more scholarly and practitioner attention

and forms a fertile foundation to prone new hypotheses including: (1) implementing justice in agricultural decarbonisation programmes will entrench funding for AEJ outcomes; (2) current legal or regulatory restrictions limit the ability to support pre-qualification merit criteria for wind auctions and tenders aligning with AEJ synergies; and (3) collective ownership of onshore wind development presents both significant benefits and potential risks to influence the advancement of AEJ.

## Data availability

The datasets generated during and/or analysed during the current study are not publicly available due to participants’ privacy and confidentiality requirements, but are available from the corresponding author on reasonable request.

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## Note

1 See also *Environmental Act 2021* (UK) and Schedule 7 A of the *Town and Country Planning Act 1990*.

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## Author contributions

MT wrote the main manuscript text and CS prepared Table 2. All authors reviewed and provided feedback on the manuscript.

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## Competing interests

Associate Professor Madeline Taylor holds interests as a Board Member of ReAlliance, Fellow of the Climate Council, and Australian Research Council Industry Fellow Partnerships with the NSW Department of Primary Industries and Spark Renewables. Associate Professor Madeline Taylor is a Guest Editor for the Special Issue this manuscript is submitted to for consideration (SI: Climate action with justice: aligning climate and energy transition policies with energy equity). Chris Sounness serves as a Board Member of the Regional Leadership Collective and the Wimmera Southern Mallee Local Learning Network. He is also a member of the Soils Cooperative Research Centre (CRC) Research and Development Committee and a State Government-appointed member of the Wimmera Southern Mallee Regional Partnership. Additionally, Wimmera Southern Mallee Development (WSM Development) has a Memorandum of Understanding with The Energy Charter, through which both organizations collaborate to enhance regional outcomes.

## Ethics approval

Ethics approval was obtained by the Macquarie University Research Ethics Subcommittee on 19/08/2024, Reference No: 520241807258842 and Project ID: 18072. All research was performed in accordance with relevant guidelines/regulations applicable when human participants are involved pursuant to the National Statement on Ethical Conduct in Human Research 2023. All participants consented to participate in the research study by undertaking interviews, and participants received basic project information about this research via the Human Research Ethics Application (HREA) Project Description form, and Participant Information and Consent Form (PCIFC) were reviewed and signed by all participants.

## Informed consent

Informed written consent to participate in interviews was obtained between 4/08/2024 and 29/08/2024 before the commencement of each interview pursuant to the Macquarie University Research Ethics Subcommittee requirements and the Participant Information and Consent Form (PCIF). All participants were made aware of the scope of the research project within both the Human Research Ethics Application (HREA) Project Description form and the Informed Participation and Consent Form. Participation was explicitly stated as being voluntary and provided the option for participants to withdraw at any time without giving a reason. All raw data is anonymised due to any sensitive economic or political opinions and will remain confidential.

## Additional information

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