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The UK's Wicked Net Zero Transition

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Abstract

This thesis investigates the narratives that shape the United Kingdom's Net Zero Transition (NZT), focusing on how different visions of legitimacy, justice, and agency emerge and interact within multi-stakeholder processes of climate governance. While technical solutions to climate change dominate policy discourse, this study foregrounds the narrative dimensions of transition, drawing on the Delivering Net Zero (DNZ) project, a research collaboration involving a series of structured workshops with policymakers, business actors, academics, and civil society representatives. The study employs narrative analysis and abductive thematic coding (Braun and Clarke, 2006; Fereday and Muir-Cochrane, 2006) to interrogate how diverse stakeholders frame the problems, pathways, and politics of NZT.

Four narratives were identified across the dataset: *Ecomodern*, *Crisis*, *Justice*, and *Technocratic*. The *Ecomodern* narrative promotes a vision of decarbonisation led by technological innovation, market incentives, and state investment in infrastructure, drawing on discourses of ecological modernisation (Hajer, 1995; Bernstein, 1991). It emphasises continuity-led logic in governance and economic growth (Winskel & Kattirtzi, 2019). In contrast, the *Crisis* narrative constructs NZT as an urgent and disruptive response to ecological breakdown, often linked to broader critiques of capitalism and ecological overshoot (Boulton, 2016; Hickel, 2019).

The *Justice* narrative centres procedural and distributive justice, positing that NZT must be socially inclusive and participatory to be legitimate. It draws on energy justice literature (Jenkins et al., 2018; Sovacool et al., 2022) and social movement framings of equity and democracy (Newell and Mulvaney, 2013; Jasanoff, 2018). Finally, the *Technocratic* narrative constructs NZT as a problem of coordination, information, and

expertise. It privileges expert-led planning, behavioural nudges, and institutional efficiency, resonating with models of depoliticised governance (Pielke, 2007; Sarewitz, 2010). While each narrative represents a coherent view, they are often in tension, particularly around themes of urgency, justice, and public agency.

The study engages theoretical literature on wicked problems (Rittel and Webber, 1973; Head, 2008), socio-technical transitions (Geels et al., 2018; Köhler et al., 2019), and deliberative governance (Dryzek, 2009; Stirling, 2014) to interpret the narrative divergences observed. It finds that narratives act as framing devices that structure stakeholder perceptions of feasibility, responsibility, and legitimacy. Further, the analysis suggests that dominant institutions tend to foreground *Ecomodern* and *Technocratic* logics, often marginalising justice-centred framings. Even within participatory processes, pluralism is constrained by tacit norms about what counts as 'reasonable' discourse, a pattern that mirrors broader critiques of post-political climate governance (Turnhout et al., 2020).

Methodologically, the research reflects critically on its own embeddedness within the DNZ project, identifying a tension between the project's implicit orientation towards consensus and the thesis's more constructivist, pluralistic analytic framework. This disjunction mirrors broader tensions in climate research between instrumental and reflexive epistemologies. The thesis concludes by arguing that understanding the NZT as a narrative and political project is vital to ensuring more inclusive, democratic, and legitimate transitions.

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List of Acronyms

BECCS – Bioenergy with Carbon Capture and Storage

BEIS – [Department for] Business, Energy and Industrial Strategy (now "DESNZ," see below)

CC – Climate Change

CCC – Climate Change Committee

CCS – Carbon Capture and Storage

CCUS – Carbon Capture Utilisation and Storage

DAC – Direct Air Capture

DNZ – Delivering Net Zero project

DESNZ – Department for Energy Security and Net Zero

GGR – Greenhouse Gas Removals

GHG – Greenhouse Gases

IPCC – Intergovernmental Panel on Climate Change

NBS – Nature Based Solutions

NGO – Non-Governmental Organisation

NZT – Net Zero Transition

RCT – Rational Choice Theory

SCT – Social Cognitive Theory

SLT – Social Learning Theory

STS – Science and Technology Studies

UKRI – UK Research and Innovation

1.0 Introduction

Climate change, driven by anthropogenic greenhouse gas (GHG) emissions (Fyfe et al., 2016: p.227; IPCC, 2021: p.43), shows urgent need for sweeping societal transformations to mitigate its most severe impacts (Aghahosseini et al., 2023: p.8). While a range of policies and technological innovations have been proposed to tackle climate change (see Martin et al., 2022), the *narratives* we construct about these solutions, what they entail, who benefits, and how they unfold, influences their adoption, acceptance, and long-term viability (Moser, 2010: p.36; McComas & Shanahan, 1999: 49-50). This thesis contends narratives, in tandem with justice considerations and stakeholder engagement, influence the United Kingdom's Net Zero Transition (NZT), but these narratives also exacerbate tensions and inequalities if poorly managed.

Narratives about climate solutions are shaped by stakeholders: policy-makers, industry, academia, civil society, and local communities, whose perspectives are in tension (Hermwille, 2016: p.240). These tensions are exacerbated when framing the UK's NZT as a "wicked problem", a problem defined by conflicting interrelations and highly uncertain solutions (Rittel & Webber, 1973; Head & Alford, 2013). As such, NZT is widely regarded as more than a technical challenge of increasing low-carbon energy production, instead it is primarily a societal change (Stirling, 2014). This thesis thus investigates how narratives shape the UK's NZT, exploring how energy justice and wicked problems inform stakeholder engagement and policy-making.

1.1 Net Zero

Net Zero, as defined by the Intergovernmental Panel on Climate Change (IPCC, 2018; Steffen et al., 2015), refers to a balance between GHG emissions produced and removed from the atmosphere, effectively negating overall emissions. The UK adopted a legally binding Net Zero target for 2050 in alignment with the 2015 Paris Agreement, underscoring the necessity of transformative changes across energy, transport, housing, and agriculture (CCC, 2019; UK Government, 2019.a; UK Government, 2019.b; UNFCCC, 2015). However, this transition demands more than new technologies or policies, involving reevaluating social norms, economic structures, and politics driving high-carbon lifestyles (Berners-Lee, 2021; O'Neill & Nicholson-Cole, 2009). Despite initiatives like *The Ten Point Plan* and *Race to Zero*, how the UK enacts an NZT remains contested, with persistent gaps in transport electrification, renewable energy scale-up, and building retrofits, among others (BEIS, 2020.a; National Grid, 2020). Recent policy shifts in the UK highlight how fluid and uncertain this transition can be, with the previous Conservative governments both committing to Net Zero, and subsequently attempting to distance themselves from interim targets (Kumar, 2023; Parker et al., 2023). However, uncertainty offers opportunities to reimagine more equitable and sustainable societies, if such transitions consider justice (Moser, 2010; Hermwille, 2016).

1.2 The Delivering Net Zero Project

Delivering Net Zero (DNZ), funded by UK Research and Innovation (UKRI), ran until 2023, exploring NZT using cross-sectoral workshops. DNZ sought consensus among academics, policymakers, industry, and others. However, the research team moved

from consensus-building' to 'agenda-widening,' finding consensus difficult, if not impossible, but also potentially not the most valuable avenue to pursue (Burch et al., 2014). Data came from three rounds of workshops; these revealed clashing views: some looked to technical fixes like carbon capture, some called for social and ecological fairness, and all highlighted disagreements about technology, funding, and justice. DNZ marked these matters as 'wicked' (Rittel & Webber, 1973; Stirling, 2014) and reframed its goal, making room for multiple stories. A turn mirroring changes in UK energy policy, where alternating government pledges and public debates over fairness, cost, and workability redraw NZT (Parker et al., 2023; CCC, 2020).

My doctoral work developed in tandem with DNZ; embracing tensions through a narrative-based methodology. Contrasted narratives reflect power dynamics in NZT, and where techno-fix-centred arguments challenged calls for equity (Parker et al., 2023). Narratives in NZT debates were found, pushing DNZ from consensus-building in its first workshop, to agenda-widening questions in its second, and what 'just' transitions mean in its third.

1.3 Research Problem, Hypotheses and Questions

The UK's NZT is uncertain, housing contradictory stakeholder perspectives, and evolving political and economic contexts. While narratives, the stories that may be shaping our understanding of climate issues, have been seen to mobilise collective action (Moser, 2010; Nisbet, 2009), the extent of their influence in driving (or hindering) the UK's NZT is not known. Previous studies suggest framing climate issues in terms such as *energy justice* (Sovacool et al., 2022) or *wicked problems* (Rittel & Webber, 1973; Head & Alford, 2013) could provide accountability (Stirling, 2014). However, there is a risk in diffuse responsibility framings complicating consensus

building and slowing urgency in meeting decarbonisation targets (Shove & Walker, 2007).

An inquiry driven approach treats narratives' roles' and climate framings as propositions to be tested. As the DNZ project changed from a "consensus-building" process to one of "agenda-widening", it exposed tensions in NZT, including challenges in integrating justice-oriented and holistic approaches with more technocratic or cost-driven solutions (Burch, et al., 2014). Climate transitions research suggests narratives could be influencing the UK's NZT efforts (Moser, 2010; Hermwille, 2016). While energy justice movements call for fair processes and sustainable outcomes (Sovacool et al., 2022), rapid decarbonisation agendas prioritise efficiency and cost-effectiveness over equity (Head & Alford, 2013). All of this combines into a wicked-problem lens through which to view the UK's NZT (Rittel & Webber, 1973), simultaneously it may be creating practical difficulties in forging clear, unified strategies (Shove & Walker, 2007). This thesis will explore whether this framing is beneficial, detrimental, or somewhere in-between.

In response, this thesis explores the narratives shaping the UK's NZT with three hypotheses, and three open-ended research questions to guide this exploration:

Hypothesis 1: Narratives (e.g. technocratic vs. holistic) shape transitions.

- **RQ1**: How are experts conceptualising the role of NZT narratives in the UK?

Hypothesis 2: Justice framings are in tension with the UK's emission reduction objectives.

- **RQ2**: How do justice framings challenge or complement the UK's emissions-focused NZT policies?

Hypothesis 3: Framing the NZT as a *wicked problem* complicates consensus-building.

- **RQ3**: How can broad conceptual framings (e.g. *wicked problem*) be applied to the UK's NZT to yield valuable insight?

The thesis seeks not to assert predetermined truths about narratives, justice, or wicked problems, but rather to test, refine, or contest the assumption such framings fundamentally shape the outcomes of the UK's transition to Net Zero.

1.4 Research Significance, and Novelty

Primarily, this thesis analyses tensions between the UK's technocratic and holistic NZT narratives. This narrative angle is relevant as policymakers and stakeholders increasingly recognize successful climate action as dependent on more than technological innovation (Hermwille, 2016).

This research also proposes two concepts:

1. **Transition Artefacts**: Tangible and intangible elements, such as policies, technologies, and discourses, facilitate or impede transitions. In this thesis, narratives themselves emerge as crucial "artefacts" shaping collective action or inaction. Extending the above concept by suggesting "wickedness" in itself (i.e., the persistent uncertainty and conflicting stakeholder values) can become an artefact against which transition strategies coalesce or break down (Rittel & Webber, 1973).
2. **Wicked Narratives**: The layered, sometimes contradictory stories within and surrounding wicked problems, reflecting how societal, technological, and

political issues become woven into discourses about Net Zero (Moser, 2010; Stirling, 2014).

1.5 Thesis Structure

To guide readers through these issues, chapters are organized as follows:

- **Chapter 2.0 Literature Review**: Examines previous work on theories of change, socio-technical and societal transitions, just transitions, and the evolving role of narratives and wicked problems in climate action. Identifying gaps where narrative-focused and justice-oriented approaches to Net Zero remain underexplored.
- **Chapter 3.0 Methodology**: Details the research design, including DNZ workshops, using thematic coding and narrative analysis, and the ethical considerations of researchers' insider status.
- **Chapter 4.0 Results and Initial Analysis**: Presents key findings from DNZ workshops, focusing on emergent narratives, tensions, and stakeholder perspectives.
- **Chapter 5.0 Discussion**: Interprets findings in light of theoretical debates on transitions, wicked problems, and narratives' role in climate policy. Considering how transition artefacts and wicked narratives shape or reshape NZT.
- **Chapter 6.0 Conclusions**: Summarizes insights, reflects on research questions, and any implications for future policy, practice, and research, including recommendations for a just NZT.

2.0 Literature Review

This chapter reviews four strands of scholarship that shape how UK net-zero is framed and pursued: theories of change, transitions research, narrative studies, and work on wicked problems. Together they clarify who or what is imagined to drive change, how change unfolds across systems, how stories organise sense-making and legitimacy, and why climate governance resists tidy solutions.

More specifically, I (i) explore a broad selection of sociological literature on theories of change (Ajzen, 1991; Bandura, 1997); synthesise recent work on socio-technical transitions and policy mixes (Geels et al., 2018; Köhler et al., 2019), and within this, consider energy justice and the distributional/procedural stakes of decarbonisation (Jenkins et al., 2018; Sovacool et al., 2022); (ii) the "narrative turn" in policy and STS showing how storylines enable or constrain agency (Hermwille, 2016; Jasanoff, 2018); (iii) I also draw on classic and contemporary accounts of wicked and super-wicked problems to explain the limits of consensus, the role of values, and why evidence alone rarely settles debate (Rittel & Webber, 1973; Head & Alford, 2015; Levin et al., 2012).

At the end of the chapter, I identify two gaps: (i) the need for a clearer 'narrative theory of change' that bridges individual behaviour and social practices; and (ii) a vocabulary for the tangible and intangible elements that mediate change, treated here as 'transition artefacts', alongside the 'wicked narratives' that accompany them (cf. Winskel & Kattirtzi, 2020). The chapter's structure mirrors these aims and prepares the ground for the methods and analysis that follow:

- **2.1 Theories of change**

  Surveys behavioural, social-practice, and power-oriented accounts of change; weighs their relevance for net-zero policy; and motivates a narrative theory of change to link meaning-making with action (Ajzen, 1991; Shove et al., 2012; Bandura, 1997).

- **2.2 Transitions**

  Introduces socio-technical transitions and UK net-zero pathways; examines justice, legitimacy, and *transitional injustice*; proposes transition artefacts (technologies, policies, institutions, practices, and narratives) as mediators of change (Geels et al., 2018; Köhler et al., 2019; Heffron et al., 2018; Sovacool et al., 2022).

- **2.3 Narratives**

  Charts the narrative turn and the power of storylines in policy; reviews climate/net-zero narratives and *discourses of delay*; and introduces metanarrative dynamics (disruption vs continuity) evident in UK debates (Hermwille, 2016; Lamb et al., 2020; Dunlap & McCright, 2015; Winskel & Kattirtzi, 2020).

- **2.4 Wicked problems**

  Sets out wicked and super-wicked characteristics; considers limits of holism and the case for pragmatic, iterative problem-solving alongside democratic legitimacy (Rittel & Webber, 1973; Levin et al., 2012; Sarewitz, 2010; Head & Alford, 2015).

- **2.5 The gaps**

  Synthesises where the literatures may benefit from greater exploration; formalises the chapter's two contributions, transition artefacts and wicked

narratives, and links them to the thesis questions and subsequent methodology (Jasanoff, 2018; Sovacool et al., 2022; Geels et al., 2018).

2.1 Theories of Change

Here I explore theories of change, their key principles, their relevance to climate change, and their implications for the use of narratives in driving social and behavioural change. I also explore a range of theories of change drawn from behavioural science, social practices literature, economics, and sociology. These theories offer perspectives on how change occurs, who drives it, and how it can be managed or influenced, providing understanding of the dynamics of change in this context. Notably, not all the theories are directly or readily relatable to climate change and NZT. The theories of change I will explore are drawn from a variety of fields, to reflect climate change's perceived interdisciplinarity (Winskel, 2018.a).

2.1.a Behavioural Theories of Change

Theories of behavioural change share a focus on the individual and the psychological factors influencing behaviour (Ajzen, 1991; Bandura, 1997), and include a wide range of applications across the social and behavioural sciences (Davis et al., 2015). The 'theory of planned behaviour', which has been used to better understand energy conservation, recycling and other pro-environmental behaviour (Stern, 2008); and suggests people's behaviours are determined by their intentions, which are in turn influenced by their attitudes and beliefs (Ajzen, 1991). Attitudes are shaped by a person's understanding of the consequences of behaviour, and their normative beliefs about what other people think they should do. Behaviour is also determined by perceived behavioural control, reflecting a person's perception of their ability to carry out the behaviour. The theory

then posits a rational framework where individuals assess the implications of their actions based on available information. However, behavioural economics, by merging insights from psychology and economics, challenges this assumption of perfect rationality. Scholars highlight how individuals exhibit bounded rationality, where decision-making is influenced by cognitive biases (Thaler & Sunstein, 2008).

Two theories can help with understanding behavioural change - especially within NZT (Stern, 2008) - these being 'Rational Choice Theory' (RCT) and 'Social Learning Theory' (SLT) (Ajzen, 1991; Bandura, 1997). RCT sees individuals as "homo economicus", where decisions are cost-benefit analyses, for maximising personal utility (Becker, 1976); thus for NZT related actions, RCT sees individuals' responses through the lens of personal benefits and costs (Stern, 2008; Gifford, 2011). In contrast, SLT emphasises observational learning, where witnessing behaviours catalyses others to adopt similar practices (Bandura, 1997; Maki and Rothman, 2017). Amplified by the contemporary proliferation of social media, SLT encompasses individuals' capacity to observe anti- or pro-environmental behaviour (van der Linden, 2015).

Beyond SLT, Bandura (1997) developed Social Cognitive Theory (SCT), seeing people's behaviour as determined by their thoughts, emotions and other behaviours. Thus, to change people's behaviour, there needs to be changes to their thoughts and emotions first. For example, the theory suggests people are more likely to change their behaviour if they see others modelling the desired behaviour and experiencing positive outcomes as a result (Bandura, 1997). SCT also promotes self-efficacy, which refers to an individual's belief in their ability to perform a specific behaviour. Enhancing individuals' self-efficacy, for example by demonstrating how others have overcome barriers to adopt pro-environmental behaviours, could be effective in promoting behaviour change (Bandura, 1997).

Both RCT and SLT provide scaffolds for understanding behaviour change, but they are not without their limitations (Ockwell et al., 2009; Whitmarsh & O'Neill, 2010). While RCT posits decision-making as a cost-benefit analysis, behavioural economics introduces "nudges" to steer individuals towards desirable actions without necessarily restricting choice (Thaler & Sunstein, 2008). Similarly, while SLT emphasises observational learning, behavioural economics underscores the role of framing, anchoring, and other cognitive biases might influence individuals' perceptions and actions towards NZT (ibid.).

However, scholars in environmental and climate change studies, see NZT as not merely about individual behavioural shifts but involves systemic changes addressing issues of power, inequality, and justice (Adger et al., 2013). NZT is a 'wicked problem', characterised by complexity, uncertainty, and interdependence (Levin et al., 2012). Addressing such a challenge might then be seen to necessitate interdisciplinary approaches beyond behavioural science, integrating socio-political, economic, and technological perspectives (Winskel, 2018.a).

Counter-arguments by Shove and Walker (2007) and Sovacool et al. (2022) see limitations for behavioural economics in tackling systemic or structural challenges in NZT. Sovacool et al. (2022) highlight the trade-offs on different equity dimensions some behavioural interventions may entail, and the importance of incorporating justice and ethical considerations into energy decision-making, the necessity of addressing external costs and public costs associated with low-carbon technologies, and the need for conceptual debates and discussions beyond disciplinary confines like behavioural economics, to ensure a fuller understanding, and therefore approach towards the challenges of NZT.

2.1.b Social Theories of Change

Social practice theories of change offer a distinct perspective from behavioural theories of change. While behavioural theories, such as the theory of planned behaviour, focus on individual attitudes, intentions, and perceived behavioural control as determinants of behaviour (Ajzen, 1991), social practice theories emphasise the role of shared practices in shaping behaviour (Strengers, 2012; Kennedy, et al., 2015). This perspective shifts the focus from individual actors to the practices themselves, highlighting the importance of social and material contexts in shaping behaviour.

For instance, Strengers (2012) reframes peak electricity demand as a problem of changing social practices, suggesting demand managers could work with consumers to promote new practice 'needs' and expectations. Similarly, Kennedy et al., (2015) discuss how social practice theories can be used to understand sustainable consumption, highlighting the role of shared practices in shaping consumption patterns (Godfray et al., 2018). Williams et al. (2021) also demonstrate the applicability of social practice theories in understanding the inclusion and exclusion of disabled people in social practices, leading us on to explore the influence of power-dynamics in affecting change.

The coercive strategies of change theories, explain the role of power dynamics in effecting change (Hughes, 2016; Lewin, 1947). While not traditionally classified within the purview of behavioural or social practice theories, its emphasis on the interplay of power, whether legitimate or coercive, within structures aligns it more closely with social practice theories (Reckwitz, 2002; Shove et al., 2012). However, as scholars like Giddens (1984) and Bourdieu (1990) have posited, the demarcation between individual agency and social structures is fluid, with many theories of change capturing elements of both. Coercive theories see change as orchestrated through power dynamics, be it

from authoritative figures, influential groups, or natural systems (French & Raven, 1959; Lukes, 1974). Recognising change can manifest both voluntarily and through coercion, we find the nature of power dynamics in shaping outcomes. This thesis finds power needs not solely emanate from human actors, but also as a manifestation of natural systems, a view reflecting discourse on environmental determinism (Peet & Watts, 2004).

‘Wicked narratives' offers a potential framework, portraying the situation as a discord between humanity and a formidable adversary: nature. This depiction finds roots in the foundational concept of wicked problems articulated by Rittel & Webber (1973), yet ventures into a novel narrative domain. This exposition serves as the first mention of 'wicked narratives' within this thesis, as the literature review progresses and the discussion evolves in this thesis, this concept will be refined and elaborated. The narrative construct, positing nature as a common adversary, expands understanding the challenges and narratives within the climate dilemma (Nisbet, 2009; O'Brien & Wolf, 2010). This combines wicked problems with an extension to the dialogue into a narrative of adversarial relationships between humanity and nature. This extension is congruent with narratives shaping our understanding of climate issues (Bruner, 2002).

Drawing upon Rittel & Webber's (1973) 'wicked problems', 'wicked narratives' offers a new view of the climate crisis narrative. While Rittel & Webber (1973) did not say 'wicked narratives', their work serves as an academic anchor, offering a theoretical foundation for this concept. Wicked narratives, in turn, proposes a more detailed understanding of the climate crisis, challenging Flyvbjerg's (2006) argument: social science narratives oversimplify reality. Additionally, the adversarial portrayal of nature within 'wicked narratives' aligns with, yet extends beyond, Latour's (2018) nature-culture paradigm, opening a new narrative avenue to explore the climate crisis.

This extension is meticulously explored, highlighting the adversarial relationship between humanity and nature, and offering a fresh perspective complements yet expands upon established paradigms. The narrative of nature as an adversary to humanity has long historical roots (Cronon, 1992; Horvath, 2019). This age-old narrative has witnessed a revival in light of the mounting evidence of anthropogenic climate change (Oreskes, 2004; Steffen et al., 2015). Such narratives, casting humanity in opposition to nature, resonate with the dichotomous theme of 'Us vs. Them', a recurrent motif in human storytelling (Zerubavel, 1996).

Coercion narratives frame challenges, whether self-created or externally so, as powerful adversaries, potent catalysts for change (French & Raven, 1959; Lukes, 1974). Narratives of coercive power show narratives driving action through changing perspectives (Bourdieu, 1990; Giddens, 1984). Narratives of urgency and NZT co-benefits galvanise public sentiment towards proactivity (Hulme, 2009; Huntington in Moser & Dilling, 2007). Conversely, narratives of NZT unattainability or excessive burden deter collective action; emphasising the role of narrative framing in shaping public discourse and action (Nisbet, 2009; Corner & Clarke, 2016).

2.1.c Behavioural or Social?

Behaviour change theories and social practice theories of change offer different perspectives on how and why change occurs. Behaviour change theories, such as the Theory of Planned Behaviour (Ajzen, 1991), Rational Choice Theory (Scott, 2000), and Social Learning Theory (Bandura, 1997), focus on the individual and the psychological factors influence behaviour. These theories suggest people's behaviours are determined by their intentions, attitudes, beliefs, and perceived control over their actions (Ajzen, 1991; Scott, 2000; Bandura, 1997). On the other hand, social practice theories of

change, such as the coercive power theories (French & Raven, 1959), focus on the social and cultural contexts in which behaviours occur. These theories suggest change is driven by shifts in social practices, norms, and structures, rather than individual decisions or actions (Shove et al., 2012). For instance, the coercive power theories posits change can be achieved through the use of power and coercion, via social and political structures (French & Raven, 1959).

Selecting between behaviour change theories and social practice theories is contingent upon the specific research (Shove et al., 2012). For inquiries centred on individual decision-making mechanisms and crafting interventions to steer these processes, behaviour change theories might offer more pertinent insights (Ajzen, 1991; Prochaska & DiClemente, 1983). Conversely, when the emphasis shifts towards deciphering and influencing expansive societal and cultural metamorphoses, social practice theories emerge as more apt (Reckwitz, 2002).

Navigating the intricate terrain of Social Practice versus Behaviorist theories of change is far from straightforward (Giddens, 1984; Bourdieu, 1990). While behaviours influence change-dynamics, capturing the entire phenomenon within behaviour would be an oversimplification (Bandura, 1997; Cialdini, 2003). NZT mandates exploration into the root causes of inaction, coupled with efforts to recalibrate prevailing social norms and institutional barriers (see "nudges" in Thaler & Sunstein, 2008). For behavioural sciences, the intention-action gap testifies the sophistication of human behaviour. While intentions signify an individual's predisposition towards a specific action, a myriad of factors can deter the translation of these intentions into tangible actions. Cialdini (2003) emphasises the power of social norms in shaping behaviour, even when they conflict with personal intentions. As Ajzen (1991) posits, long-standing habits act as barriers to change, overshadowing intentions, while Bandura (1997)

presents the role of self-efficacy and awareness in determining behaviour; where a deficit in either can stymie action.

For NZT, the intention-action gap becomes even more pronounced. While awareness about environmental issues has increased (Gifford, 2011), tangible behavioural shifts remain elusive. This gap not only hinders individual sustainable practices but also impedes societal transitions towards sustainability. The web of power dynamics, which bolster or impede change, warrants inquiry (Lukes, 1974; Foucault, 1980). To cultivate understanding, the thesis evidences the role of narratives in NZT, and the potential for a more narrative focused theory of change (Geels et al., 2018; Fisher, 1985).

2.2 Transitions

Social transitions, as conceptualised in scholarly discourse, encapsulate shifts in the foundational pillars of societies, spanning economic paradigms, political institutions, and cultural mores (Polanyi, 2001; Giddens, 1984). Such transitions can manifest as abrupt seismic shifts, exemplified by governmental collapses or war onset, or they might unfold as protracted change, evident in technological diffusion or the gradual embrace of new norms (Rogers, 2003). Transitions represent a specific category of change, characterised by a system's progression from one state to another (Geels et al., 2018; Kates et al., 2001). Such transitions capture more than the regular flux inherent to all systems, instead marking lasting deviations from one status quo, to a new status quo (Meadows, 2008). Geels et al. (2018) see importance in understanding theoretical perspectives of climate change and a future NZT economy, arguing these theories explain how change occurs, who drives it, and how it can be managed or influenced. Geels et al. (2018) also discuss the distinction between transformative and incremental change. Transformative change refers to fundamental and structural shifts, while

incremental change involves small and gradual adjustments. Both types of change are important for addressing climate change, but Geels et al. (2018) note transformative change is seen as fundamental given the scale and urgency of the climate crisis.

Increasing awareness highlights the urgency for social, economic, and energy transitions from unsustainable to sustainable modes (Meadowcroft, 2009; Markard et al., 2015). Research has looked into these transitions, their "multi-level" nature and the stakeholders present in them (Geels et al., 2018). An objective of scholars in this area is often to equip policymakers and practitioners with methodologies to enable such transitions (Smith et al., 2005; Kemp et al., 2007), and help recognise the symbiosis of social, economic, and energy transitions (Bridge et al., 2013; Sovacool et al., 2022).

Giddens (1984) categorises transitions into *structural*, meaning economic changes like the shift from feudalism to capitalism; *cultural*, epitomised by value shifts such as the feminist movement in the 20th century; and *personal*, spotlighting identity evolutions, exemplified by identity politics around race, gender, and sexuality (Butler, 1990; Hall & du Gay 1996). Each transition typology embodies distinct modalities of change, and progressions from one state to another (Castells, 2015; Leiss, 1995).

Schot and Kanger (2018) explore "deep transitions", saying such transitions have four attributes: emergence, acceleration, stabilisation, and directionality. Emergence and acceleration are when novel technologies or societal practices materialise and permeate societal structures (Geels et al., 2018; Smith et al., 2005). Stabilisation, is the propensity of deep transitions to normalise in a society (Grin et al., 2010). While directionality is the belief that these transitions, positing post-transition, societies are seldom, if ever, inclined to regress to antecedent phases (Kemp et al., 2007; Loorbach, 2010).

In their exploration of the deep transitions paradigm, the authors present historical epochs, such as the Industrial Revolution, the democratisation waves in Europe, and the digital revolution (Castells, 2015). Schot and Kanger (2018) contend while instances of deep transitions are sporadic, their imprint on societal trajectories is indelible. However, detractors challenge the irreversibility of deep transitions, suggesting potential for regressions (Smith et al., 2005). The paradigm's perceived oversight of individual agency in precipitating societal change has also been a point of contention (Giddens, 1984). Individuals, while potentially instigating deep transitions, are concurrently moulded by them (Bourdieu, 1990).

2.2.a Socio-Technical Transitions

Socio-technical transitions, as conceptualised by Geels et al. (2018), combines societal and energy transition studies, to better understand the co-evolution of society and technology. Bijker et al. (2012), have looked into transitions at the level of technologies and sectors, for example, the shift from coal to oil during the early 20th century and the transition from incandescent bulbs to LED lighting. Another approach presents the socio-economic and political determinants enabling or stymieing transitions (Kemp et al., 2007), for example to explain the industrialisation of agrarian societies (ibid.).

Sovacool et al., (2022) promote the indispensability of a dynamic policy mix and the integration of politics in transition policymaking. However, as critiqued by Turnheim et al. (2015), their paper's exploration into individual behaviour and societal norms as key transition agents remains cursory. Additionally, while Sovacool (ibid.) and colleagues advocate for an expansive solution space for supply-side technology and economics, they fall short in providing actionable strategies or examples to realise this vision. The socio-technical transition describes both the technical and societal changes through

assimilation (Geels et al., 2018). New technologies emerge, but their integration into society hinges on the establishment of supportive norms and institutions (Kemp et al., 2007), often over extended periods of time (Smith et al., 2005; Markard et al., 2015).

The ‘stages of societal change’ capture changes in cultural, economic, or political paradigms, and have also been extensively academically researched (Pierson, 2004; Tilly, 2003):

- The Initial Stability Phase is emblematic of a societal stasis, where dominant structures, be they social, political, or economic, remain unchallenged. However, beneath this veneer of stability, incipient tensions or shifts might be gestating, potentially signalling forthcoming disruptions (Tilly, 2003). Such shifts could be spurred by technological breakthroughs (Bijker et al., 2012), demographic oscillations, or changing cultural paradigms (Lesthaeghe, 2014).
- The Period of Upheaval, or Transition Phase, is tumultuous, marked by overt challenges to the prevailing order. This phase, as is punctuated by social movements, economic upheavals, or political revolutions, laying the groundwork for an emergent societal order.
- The Consolidation, or Post-transition Phase, witnesses the solidification of the nascent societal order. The transformative shifts initiated earlier gradually gain institutional traction, culminating in a rejuvenated stability.

However, while the 'stages of societal change' offer a structured perspective, it's limited. As Pierson (2004) contends, societal transitions do not always conform to these phases, with the intensity and trajectory of each phase being context contingent.

Such transitions might signify a shift from fossil fuel-based systems to renewable energy paradigms or from centralised to decentralised energy infrastructures. Geels et al.

(2018), also postulate a multi-level perspective, suggesting transitions occur in stages: technological innovation, societal diffusion, and institutional adaptation. Here, new technologies permeate society, gain widespread acceptance, and subsequently, institutional frameworks change to structrualise, institutionalise and embed the emergent energy system. Prochaska and DiClemente (1983) offer a behaviour-centric model, with stages of precontemplation, contemplation, preparation, and action, emphasising individual and collective awareness and readiness for change (Gössling et al., 2019).

2.2.b Net Zero Transitions

For some, the transition to a low-carbon economy is not only about reducing emissions but also about seizing economic opportunities. According to a report by Vivid Economics (2020), the low-carbon economy could be worth up to £170 billion per year by 2030, creating jobs and stimulating economic growth. The Intergovernmental Panel on Climate Change (IPCC) has warned global emissions need to start falling immediately to limit global warming to 1.5 degrees celsius above pre-industrial levels, the target set by the Paris Agreement (IPCC, 2018). A Net Zero economy would thus require changes across all sectors. In the power sector, a continued shift towards low-carbon energy sources, including wind, solar, and nuclear power. Many of the technologies and practices required to achieve Net Zero are already available and in use to some extent; and include renewable energy technologies such as wind and solar power, as well as, but far from limited to: electric vehicles, energy-efficient appliances, and sustainable farming practices. However, the deployment of these technologies is often cited as needing to be scaled up to meet the Net Zero target (IPCC, 2018).

The UK has already made significant progress in this area, with renewables accounting for 47.1% of electricity generation in 2020 (BEIS, 2021). However, expansion of renewable energy capacity, along with improvements in grid infrastructure and energy storage, are for some, seen as necessary to meet the increased demand for electricity as other sectors decarbonise (National Infrastructure Commission, 2021). The UK has been reducing its greenhouse gas emissions over the past few decades, with a notable decrease in emissions from the power sector due to the shift from coal to renewable energy sources (BEIS, 2020.b).

However, the progress in other sectors has been less substantial. Emissions from residential buildings and transport, which together constitute approximately 60% of the UK's total emissions, have been on an upward trend since 2012 (CCC, 2020). The current trajectory suggests the UK is not on course to meet its legally binding carbon budgets for the 2020s, which aim to reduce emissions by 57% compared to 1990 levels (CCC, 2020). For some, the NZT economy means shifting approaches to resource stewardship, energy generation, and consumption patterns (Geels et al., 2018; Godfray et al., 2018; Gössling et al., 2019). So, moving from fossil fuels to renewable energy is seen as fundamental to this transition, but also presents significant challenges. These include technical challenges related to energy storage and grid reliability, economic challenges related to the cost of renewable technologies and the phase-out of fossil fuels, and social challenges related to job losses in fossil fuel industries and public acceptance of renewable technologies.

Transportation is recognised as a key sector to address in the UK's NZT. The UK Department for Transport substantiates this significance, given its contribution to the nation's greenhouse gas emissions (DfT, 2022.a). In 2020, the transportation sector accounted for 24% of the total greenhouse gas emissions in the UK (ibid.). The Centre

for Research into Energy Demand Solutions affirms Electric Vehicles (EVs) as supposedly key in reducing emissions from the transportation sector, yet also emphasises the insufficiency of this measure when pursued in isolation. Similarly, Sovacool et al., (2022) argue when paired with renewable energy sources, EVs could dent carbon emissions. The challenges associated with EVs, notably battery production, raw material procurement, and charging infrastructure are highlighted by Turnheim et al., (2015).

This interconnection-complexity is found in calls for a coordinated societal and industrial response, exemplified in the UK by the creation of the National Energy System Operator (NESO), newly responsible for 'whole system' energy planning. As Winskel and Kattirtzi (2019) observed from their study of NZT narratives, "most experts and stakeholders expected continuing key roles for established energy organisations and infrastructures – but adapted to the transition challenge", reinforcing the narrative for leveraging existing institutions, while aligning them towards a concerted net-zero agenda.

In the heating and transport sectors, a prominent strategy is electrification. This involves replacing gas boilers with electric heat pumps in homes and businesses, and replacing petrol and diesel vehicles with electric vehicles; or a reduction in any and all of these activities (Gössling et al., 2019). However, this transition will require significant upgrades to the electricity grid, as well as improvements in the energy efficiency of buildings and vehicles (CCC, 2020). Improving the energy efficiency of buildings is another crucial aspect of the transition. This can be achieved through measures such as insulation, double glazing, and energy-efficient appliances, which can reduce the energy demand of homes and businesses (BEIS, 2020.a).

In the agricultural sector, practices will likely be adapted to reduce emissions, for instance through precision farming, agroforestry, and dietary shifts (CCC, 2019). Discourse on NZTs in agriculture benefits from an exploration of socio-politics. For Newell & Mulvaney (2013) NZT demands an equitable transition, advocating for the safeguarding of livelihoods and rights of agricultural communities. This perspective links with a broader scholarly recognition of the socio-political dimensions to environmental transitions (Scoones et al., 2020). On the other hand, a technocratic lens presents the potential of harnessing technological and market-based solutions; advocated via centralised strategies to accelerate an agricultural NZT. The narrative shows a contrast between top-down versus bottom-up NZTs in agriculture, echoing debates in literature concerning centralised versus decentralised approaches to environmental governance (Bulkeley & Betsill, 2005).

While the integration and advancement of Carbon Capture and Storage (CCS) technologies are identified as significant steps (IPCC, 2018), they represent only part of the solution. CCS technologies capture carbon dioxide emissions, from significant sources like power plants and industrial facilities, or directly from the air, followed by transportation and sequestration underground. However, the nascent stage of CCS technology development faces substantial hurdles, marked by a paucity of large-scale projects and a requisite for escalated investment and policy endorsement. The emergence of Bioenergy with Carbon Capture and Storage (BECCS) adds capturing, and also removing GHGs from the atmosphere, to the carbon negative strategy (ibid.).

As mentioned, this transition is cross-vector, energy production and consumption, and cross-sector, transportation, agriculture, industry, housing, and more (Godfray et al., 2018). Involving stakeholders, from individuals and communities to businesses and governments. Each sector and stakeholder faces challenges and opportunities in NZT,

and their actions and interactions will inevitably shape the trajectory and outcomes of this transition. There are debates in the literature on NZT, with one major debate revolving around the role of technology versus behaviour change. Some argue technological innovations, such as renewable energy and electric vehicles, will be sufficient to achieve Net Zero; while others argue these technological solutions need to be complemented by significant behaviour changes, such as reduced consumption and shifts in dietary habits (Chaudhary & Krishna, 2019; Godfray et al., 2018; Whitmarsh & O'Neill, 2010; Sovacool et al., 2022).

2.2.c Just Transitions

Just Transition captures aspirations to both temper transitional turbulence, and sustain or augment levels of justice and equity during and an intentional outcome of transition; and has been accruing conceptual traction as part of the urgency to combat climate change (Heffron et al., 2018; Krawchenko & Gordon, 2021; Newell & Mulvaney, 2013; Wang & Lo, 2021). However, critics caution against potential idealism encapsulated in the concept, pointing to challenges in translating such idealistic principles into tangible policy and practice. As the relevance of Just Transitions grows amidst calls for climate action, critics such as Jenkins et al. (2018) spotlight a gap between conceptual acknowledgments of Just Transitions and its pragmatic implementation (Sarewitz, 2010). Embarking on a just-NZT, means adopting a policy approach where no one is left behind (Krawchenko & Gordon, 2021). The ethos of this approach gravitates towards assisting those affected by the change, for example meaning workers who face job losses and communities impacted by shifts away from traditional energy sources (Newell & Mulvaney, 2013).

Three concepts can expand our understanding of a just NZT: Transitional Justice, Injustice-Gaps, and Failed Transitions. Transitional Justice, is the redressal of historical human rights abuses, and seeks reconciliation and accountability (ICTJ, 2023). The term 'injustice-gap' can be conceptualised as the disparity between the ideals of justice and the realities of implementation during transitions, leaving marginalised groups marginalised (Roberts and Henwood, 2020). Complicating the landscape are *Failed Transitions*, where societal shifts neither meet their intended objectives nor address foundational issues (Newell & Mulvaney, 2013). Societal structures, histories, and power dynamics mean transitions are seldom linear or uniformly just (Arthur, 2009). One way of reframing, or better yet adding to Just Transitions, is to explore 'Transitional Justice'; the International Center for Transitional Justice (ICTJ, 2023), describes transitional justice as:

> *"[H]ow societies respond to the legacies of massive and serious human rights violations. [...] [S]ocieties and individual stakeholders the world over must find answers to the same difficult questions about whether, when, and how to embark on a path toward a peaceful, just, and inclusive future where past crimes have been acknowledged and redressed [...]."* (ICTJ, 2023)

This section highlights the difficulty in understanding and identifying *just* transitions, acknowledging transitional traits and the limitations of single theories in capturing all aspects of a transition. One approach is to examine the societal structures and practices, and their changes over time. For instance, the study by Ali Shah (2021) discusses the transition to a green economy, using the SWOT model and spatial interaction analysis to understand the potential for change in a specific region. This involves looking at the current situation and potential for development in the area, and how these can be employed to achieve the desired results for a sustainable future.

Recognising a societal transition involves observing changes in aspects of society, including social norms, values, beliefs, practices, consumer behaviour, and production and consumption patterns (Godfray et al., 2018). Changes identified through direct observation, analysis of data, and the use of theoretical frameworks. For Climate Change and Net Zero, the notion we are in a transition is based on recognising:

- The consensus among scientists is human activities, burning of fossil fuels and deforestation, are causing global temperatures to rise, leading to climate change. This has led to a call for a transition to a more sustainable way of living.
- Globally, governments are reducing greenhouse gas emissions and promoting sustainable practices. Including commitments to achieve net-zero emissions, the phasing out of fossil fuels, and the promotion of renewable energy.
- The development and increasing affordability of renewable energy technologies, such as solar and wind power, are making the transition to a sustainable energy system more feasible.
- There is a growing social movement demanding action on climate change. This is leading to changes in societal norms and values, and increasing pressure on governments and businesses to act.
- The economics of energy are changing, with renewable energy increasingly cost-competitive with fossil fuels. This is driving a shift in investment away from fossil fuels and towards renewable energy and other sustainable technologies.
- Many businesses are recognising the risks of climate change and the opportunities presented by the transition to a sustainable economy. They are

taking action by reducing their own emissions, investing in sustainable technologies, and developing new business models.

While these factors suggest a transition is underway, it's important to note the pace and scale of the transition are subjects of ongoing debate. The transition to a sustainable, net-zero emissions economy involves changes in technology, infrastructure, policy, and behaviour (Roberts and Henwood, 2020). Made yet more challenging via the question of whether a transition is just or not. Justice in transitions involves considerations of fairness in the distribution of costs and benefits, the inclusivity of decision-making processes, and the recognition of diverse values and rights (Jenkins et al., 2018). Assessing the justice of a transition requires careful analysis beyond what any single theory can provide (Heffron et al., 2018; Newell & Mulvaney, 2013; Jenkins et al., 2018; Loorbach, 2010).

Historically, transitions are marked by disparate impacts, relegating certain groups to unfavourable economic and social conditions (Roberts and Henwood, 2020). This historical narrative mirrors analyses of socio-technical transitions and their uneven socio-economic impacts (Stirling, 2014). Yet, focusing on historical failures may not adequately guide future transition strategies (Geels et al., 2018). The establishment of the Scottish Just Transition Commission, as a mechanism to bring-about a fair transition towards a net-zero economy, represents a contemporary practical step towards operationalising just transition principles.

While there is a wealth of literature on the technical and policy aspects of transitions, and the human stories, the lived experiences, and the cultural and societal nuances shaping and are shaped by these transitions; there is a relative paucity of research exploring the acceptability of scenarios intentionally rejecting a Just transition. The emotional, psychological, and cultural impacts of being 'left behind' also provide areas

for greater exploration. So, while academia has shed light on transitions, there may be value in exploring pathways that acknowledge a deliberate rejection of integrative, human-centric, holistic research.

Transitions, of a large-scale societal or economic nature, are accompanied by uneven impacts across segments of the population, a phenomenon well-documented in scholarly discourses (Geels et al., 2018). Historical narratives furnish a litany of instances wherein transitions have precipitated disparate outcomes for different groups:

- The move from agrarian economies to industrial landscapes relegated many small-scale farmers and artisans to the periphery as larger industrial entities emerged dominant.
- The digital revolution, creating economic and social boons for many, concurrently engendered a digital divide, leaving those devoid of access to technology or the requisite skills in its wake.
- The move from coal to cleaner energy sources, albeit environmentally imperative, spells job losses in coal-centric regions, even as it fosters job creation elsewhere.

Supposing transitions "*inherently*" maroon certain groups in a quagmire of disadvantage leans towards determinism, a viewpoint critiqued for its oversimplification of transition dynamics (Köhler et al., 2019). Contrarily, literature offers a more optimistic outlook, proposing with planning, policy interventions, and inclusive strategies, the ramifications of transitions on vulnerable demographics can be managed (Heffron et al., 2018; Sovacool et al., 2022). Challenge lies in orchestrating just, equal transitions, considering the needs and rights of all stakeholders, alongside the feasibility of addressing social concerns within a techno-environmental transition context. However, this aligns mostly

to academic dialogues advocating for approaches to holistically managing transitions, so NZTs are *Just* (Newell & Mulvaney, 2013).

The critique of deterministic interpretations of transitions, emphasising a shift towards proactive, inclusive management to mitigate disparities, reflects a shift in transition theories towards more inclusive, anticipatory approaches. However, Geels et al., (2018) argue about the feasibility and effectiveness of proactive measures given systemic constraints. The advocacies for anticipatory governance and early stakeholder engagement in transition planning are resonant with calls for anticipatory governance in transition management literature. Yet, Stirling (2014) recognises the critique of anticipatory approaches as overly technocratic or failing to address power dynamics.

An intermediate step then presents itself, centred on how transitions are perceived, in hindsight they look to be natural progressions, the periods when humanity moves from a more primitive state, to a more civilised one. This framing is problematic for many reasons:

- Firstly, this view sees humanity as monolithic; a collective whole, moving with guided intention towards a positive common future. In this way, we continually cast aside those left behind, and their views on aspects of the transition, and the transition as a whole. Advancing this argument, we can posit a linear and progressive view of transitions is not only overly simplistic but also problematic. It assumes a universally shared understanding of what constitutes 'progress' or 'civilization'. Cultures, social groups, and individuals have heterogeneous views, and this extends to views on what progress means.
- Secondly, this presents transitions as positive, good, and virtuous, it is a narrative whereby humanity existed in a state of varying depravity, and in overcoming its foe moves itself to a newer, better, state. Moreover, by viewing

transitions as inevitable and uniformly positive, we risk marginalising the voices and experiences of those who might not benefit from, or even be adversely affected by, these shifts. Such a perspective can lead to a form of historical amnesia, where the struggles, resistances, and alternative narratives of those 'left behind' are erased or overshadowed by the dominant narrative of progress. The very notion of 'leaving behind' presupposes a predetermined direction of movement, which again is a subjective construct. Who determines this direction? Based on what criteria? These are challenges to the conventional wisdom on transitions. Recognising experiences valuing a plurality of narratives, we highlight power dynamics; so engage just transition topics, reflective of diverse human experience.

- Third, this framing tells us transitions are monolithic: a collection of changes, grouped together, with a beginning and an end. We began by eating raw animal parts and plants, and cleanly transitioned to a state of fire making and cooked meals; we started with hunting and gathering, and ended with fields of wheat and rice, and enclosed pastures of domesticated farm animals.

Finally then, should we instead be asking ‘what are those things we are happy to leave behind?’ By striving for justice, we are explicitly or implicitly - but necessarily - saying there are demographics, or at least practices, we want altered. Growing attention is being given to the idea of a 'just transition' (Sovacool et al., 2022); a concept, ethically persuasive, challenged by practical realisation, with literature discussing the ideals of 'just transition', and the gaps in its implementation. How do we translate the theory of 'just transition' into actionable strategies for equity, inclusivity, and justice? History and empirical observations underscore the reality, transitions, by their very nature, manifest unevenly across societal segments. While the ideal of a just transition is to

bring about collective advancement, the practical unfolding can leave certain groups behind or even exacerbate inequalities. This thesis seeks to understand the challenges of attempting to proactively realise NZT.

2.2.d Transition Artefacts

To see whether a society is undergoing a just or unjust transition, it's useful to identify the markers of transition. These markers - informed by scholars such as Geels et al., (2018) and Turnheim et al. (2015) - are shifts in economic paradigms, cultural norms, political landscapes, and technological breakthroughs. However, transition theories are not one-size-fits-all solutions; they manifest differently across societies and histories. As such, a holistic approach including theories like 'Just transitions' may enrich our understanding of transitions and their justice implications (Heffron et al., 2018).

This thesis' author therefore introduces the novel term 'transition artefact' as a concept to address both tangible and intangible elements vital for facilitating, obstructing, or demarcating transitions. These artefacts are operationalised by identifying their influence in shaping transitions, either as catalysts or barriers, making them subject to empirical investigation.

Structural gaps contribute to what Polanyi (2001) saw as undiscoverable public knowledge, impeding methodological approaches to effectively tackle the transdisciplinary spaces defined as 'wicked' problems by Rittel and Webber (1973). Their insights on the strength of weak ties in social networks provide a contrasting view, suggesting these structural holes, while potentially problematic, can also foster the diffusion of innovative ideas across loosely connected networks. This concept aligns with the thesis's exploration of wicked problems as transition artefacts, positing the very challenges and nature of wicked problems, like those encountered in the pursuit

of Net Zero, can influence and shape the trajectory and dynamics of societal transitions. For NZT, these artefacts can include:

Policies

Policy transition artefacts are regulations, incentives, or guidelines; which create 'policy lock-ins' or 'carbon lock-ins,' impeding or promoting deviation from existing unsustainable systems. The UK's Clean Growth Strategy is one policy artefact facilitating NZT (BEIS, 2018). Policies synergize to expedite transitions or slow them, urging policy coherence (Jenkins et al., 2018). Effective implementation and stakeholder engagement additionally impact transitions, echoing the multi-modality of transition artefacts (Meadowcroft, 2009).

Technologies

Contentious technologies like wind turbines and solar panels serve as transition artefacts facilitating NZT (Bijker et al., 1987). While coal-fired power plants are ‘locked-in’ to economic and political structures, impeding NZT. Such artefacts with historical path dependencies, like the UK’s coal industry, have societal implications. Emerging technologies like Carbon Capture and Storage (CCS) are examples of issues simultaneously technological, ethical, and inseparable from justice. While CCS may decarbonise industrial sectors, debates on its ethical implications and potential for 'moral hazard' introduces detail into its role as a transition artefact (Newell & Mulvaney, 2013).

In examining sociotechnical systems where these technologies operate (Geels et al., 2018), one can better appreciate transition artefacts. For instance, electric vehicles (EVs), low operational emissions, draw criticism for unethical mining practices linked to their batteries, and the embodied-emissions in their construction. From the

perspective of innovation systems, technological transition artefacts' effectiveness is shaped by how well integrated they are into existing structures, whether supported by policy, or how they affect social practices (Geels et al., 2018).

Narratives

Media narratives shape public opinion towards renewable energy, in the UK, media portrayals stressing the economic benefits of renewable energy sources, such as job creation, facilitate public acceptance and policy momentum (Ansell & Gash, 2008). However, narratives can also function as instruments of exclusion and marginalisation. One example is the 'climate refugee', framing migrants as security threats, reinforcing xenophobic attitudes and policies (Arthur, 2009; Bhopal, 2018). This narrative impacts the justice remit of climate policies, raising ethical questions about who bears the burden for climate change, and any related policies or actions (Newell & Mulvaney, 2013).

More prominently, outside the UK cultural narratives of indigenous communities act as transition artefacts where land and ancestral heritage shape approaches to climate justice, providing an alternative paradigm to mainstream, 'Western' narratives (Bouzarovski, 2021; Lesthaeghe, 2014). To understand narratives as transition artefacts, it is useful to see how they account for the social, cultural, ethical, and political (Kennedy, et al., 2015); especially when exploring just transitions (Nisbet, 2009).

Institutions

Institutions act as transition artefacts, their structures and systems influencing transitional likelihood. The legacy of fossil fuel subsidies demonstrates how institutions can not only hinder transition but also perpetuate inequalities by disproportionately benefiting wealthy corporations over marginalised communities (Corner & Clarke,

2016). An interesting example in the UK, would be the Low Carbon Contracts Company (LCCC), who perform a dual role as transition artefacts. On one hand, they facilitate the transition by administering the Contracts for Difference (CfD) subsidy scheme, a mechanism incentivising renewable energy, accelerating decarbonisation (DESNZ, 2025). However, the financial structure behind CfDs warrants scrutiny. Typically financial costs of energy policies are paid for by energy suppliers, these costs are then transferred to consumers through higher energy tariffs (Gills, et al., 2022). This financial burden disproportionately affects marginalised communities, including lower-income households, posing questions about the equity of such a transition artefact (Healy & Barry, 2017). While the LCCC and similar organisations appear to be facilitators of net zero, their role can have implications for both accelerating and complicating a just NZT (Jenkins et al., 2018).

LCCC, CfDs and other market instruments sit within the Green Growth narrative. Critics see market-based approaches increasing inequality, via funding mechanisms transferring costs onto consumers, and profits to company shareholders (Healy & Barry, 2017). Similarly, the Low Carbon Hydrogen Agreement (LCHA) business model, also managed by the LCCC has recently provided assurance for billions of pounds of taxpayers money to go to a private partnership parented by British Petroleum (BP); which as the name suggests, has assets in other energy sources (DESNZ, 2025). Further, LCCC favours mediating large-scale power agreements; disadvantaging smaller generators and producers who consequently experience limited access to such funding, and often include already marginalised community or cooperative energy groups (Seyfang & Hexaltine, 2012). This creates cyclical tension between supposedly secure economic investments and longer-term equity where smaller market-players are sidelined (Jenkins et al., 2018).

However, some see CfDs and related incentive policies as building investor trust, lowering financing costs, and encouraging faster decarbonisation, via stabilising returns for larger renewables portfolios. CfDs ideally also shield households from wholesale price spikes, which can bolster public acceptance (Lorenzoni et al., 2007); although due to how the UK's energy pricing market works, through marginal pricing, reducing consumer costs via CfDs may be limited (Gills et al., 2022). LCCC's intermediary role is supposedly to assure accountability; providing oversight through standardised terms, dispute resolution, and transparent reporting. Within current political and economic frameworks, CfDs and similar incentive policies are both feasible and attractive as they align decarbonisation with existing economic incentives, thus reducing resistance from established market actors (Winskel, 2018.a). Framing policy interventions as continuity-based rather than purely disruptive enhances their acceptance within incumbent regulatory structures, improving their chances of successful implementation (Mäkitie et al., 2018).

Institutions function at multiple scales, from international organisations like the United Nations to local grassroots organisations. Each comes with its own set of rules, norms, and logics, complicating the landscape of transition artefacts (Pierson, 2004). It's important to consider institutions are neither monolithic nor static; they are shaped by internal and external factors and can change over time. Some institutions, like community land trusts, can serve as instruments for social justice, providing equitable access to land and resources. Thus, understanding the institutions and their potential to either facilitate or obstruct just transitions is useful (Newell & Mulvaney, 2013; Patterson et al., 2017).

Social Practices

Social practices, meaning established habits, norms, or routines, function as transition artefacts in environmental transitions. For example, community gardens in urban spaces represent a social practice aligned with sustainability goals and enhanced local resilience (Seyfang & Hexaltine, 2012). Conversely, single-use plastic consumption hinders Net Zero goals and disproportionately affects low-income communities with limited access to waste management. Eco-social practices can then reinforce unequal power relations and social structures. (Bourdieu, 1990; Giddens, 1984). As transition artefacts, these practices are subject to change over time, in response to public policy and technological innovation (Shove et al., 2012).

Understanding these dynamic practices and their alignment or dissonance with just transition goals requires an examination of cuts across disciplines and scales (Shove et al., 2012). This allows us to see how social practices perpetuate or challenge systemic inequalities, influencing the direction and justice of environmental transitions. It's useful to recognise transition artefacts are the dynamic and interconnected markers of a transition, influencing and being influenced by other elements within the transition (Geels et al., 2018).

2.3 Narratives

Narratives, as highlighted by scholars in the field of communication theory like Boje (2001), Bal and van Boheemen (2009), show how narrative framing and construction, mould public perception and engender actions geared towards environmental sustainability (Bernstein, 1991; Fisher, 1985). NZT is influenced by factors understood through three key dimensions: policy analysis, behavioural paradigms, and narrative construction; exploring these dimensions, this section provides understanding of the narrative forces driving NZT. Narratives, spanning stories, myths, and discourses, are

integral to human cognition, serving as interpretative tools for our environment (Bruner, 2002). These narratives, ingrained in human consciousness, wield influence on our attitudes, beliefs, and consequent actions (Geall & Ely, 2018). By presenting alternative perspectives to daily realities, narratives hold the potential to reshape individuals' beliefs and values, subsequently driving behavioural modifications (Fisher, 1985). For environmental challenges, narratives mould public perceptions on issues like climate change (O'Neill & Nicholson-Cole, 2009; Moser, 2010). Narratives shape societal norms, the implicit rules guiding our behaviour (Morgan & Stapleford, 2023), and values (O'Neill et al., 2017).

This thesis explores the narratives of the UK's NZT, to see what impacts they have on shaping policy directives and societal engagements en route to Net Zero. Central to the narrative arc of this transition, are the "stakeholders", each with distinct interests and perspectives, necessitating engagement grounded in stakeholder theory and deliberative democracy principles (Dryzek, 2009). The theoretical lens of Turnpenny et al. (2009) illuminates the wicked nature of environmental dilemmas, advocating for a participatory, transparent, and evidence-informed approach to policy-making, directly reflected in the participant selection and research methodology of the DNZ project.

Narratives are drivers of justice within the transition to Net Zero, a position resonating with Shanahan et al.'s (2011) assertion on the centrality of narratives in policy discourse. These narratives shape public and policy engagement, reflecting narratives as instrumental in bridging perceptual and systemic barriers in environmental policymaking (ibid.). Lorenzoni et al. (2007) examine perceptual barriers via conflicting stakeholder positions. Similarly, systemic barriers show how structural challenges in the transition can be examined (Whitmarsh & O'Neill, 2010). Combining these barriers for NZT, narratives serve as either enablers or barriers to justice. The interaction

between narratives, perception, and systemic barriers expands our understanding of NZT.

2.3.a The Narrative Turn in Social Sciences

The role of narratives in social change, recognised by thinkers from different disciplines, led to the so-called 'narrative turn' in social sciences (Bruner, 2002; Polkinghorne, 1988). Widely acknowledged in literature, stories function in human cognition and communication, helping us understand and navigate the world around us (Bruner, 2002). This turn, articulated in the field of psychology as a move away from traditional models of the self as a rational actor to a varied understanding of how individuals are shaped by the stories they tell about themselves and the world around them. Narrative psychology focuses on how people make sense of their lives through stories, and how these stories are shaped by culture, history and social relations (Bruner, 2002).

Michel Foucault's discussions on narrative examine the relationship between power, knowledge, and discourse (ibid.). Foucault argued that the ways in which societies construct truths are tied to specific socio-historically contextualised discursive power relations; narratives become instruments through which power is exercised, maintained, or contested (ibid.). In his analysis of discourse, Foucault highlighted how dominant narratives shape societal norms and individual identities, determining what can be thought, said, and perceived as truthful or legitimate. Where narratives operate as sites of power, embedding individuals within frameworks of acceptable and unacceptable behaviour, thus shaping subjectivities by delineating the boundaries of conceivable identities and actions. Foucault also explains how dominant societal narratives enforce conformity through subtle mechanisms of surveillance and

self-regulation, embedding discipline into individual self-perceptions and behaviours. Within narrative psychology, Foucault's approach highlights that stories are never neutral, they reflect and reproduce social hierarchies, legitimising specific forms of knowledge and marginalising alternative perspectives. Through his concepts of discursive formations and regimes of truth, Foucault posited that narratives structure social reality via acceptable forms of knowledge and behaviour, thus influencing individual and collective identities (Foucault, 1980).

Drawing from Bandura's Social Cognitive Theory (1997), we see narratives shaping behaviours through mechanisms of observational learning and social influence. Through presenting relatable scenarios and characters, narratives offer platforms for individuals to learn, not just from personal experiences, but also from the experiences of others. Key constructs of the Social Cognitive Theory, such as self-efficacy, outcome expectations, and perceived barriers, provide perspectives on the behavioural impact of narratives (Bandura, 1997). For instance, narratives depicting triumphs over adversities can bolster readers' or viewers' confidence in their capabilities, while also shaping their beliefs about the potential outcomes of their actions. Research in health behaviour change, for instance, has demonstrated the potential of SCT-based interventions in influencing positive lifestyle behaviours. Such interventions, when applied to environmental behaviours, lead to narratives emphasising positive actions towards Net Zero, these then add to individuals' self-efficacy and belief in the feasibility of change and the collective effort towards it.

The narrative turn has also influenced other disciplines, including anthropology (Bakhtin, 1981), sociology (Bourdieu, 1990; Giddens, 1984) and economics (Morgan & Stapleford, 2023; Polanyi, 2001). Literature and film studies moved away from traditional understandings of narratives as linear and static to a variegated

understanding of how they are created, circulated and interpreted. Part of the importance of narrative arcs in describing societal change is they provide a framework for understanding the progression and development of socio-technical transitions. Looking at historical, current, and future energy shifts we better understand both their successes as well as potential pitfalls, so we may prepare for when faced with similar challenges going forward. Additionally by recognising patterns within these stories we gain insight into which approaches are most likely to bring about desired outcomes while also being mindful of any unintended consequences could arise from such changes – something especially important given our current climate crisis where there's no room for error if we hope to mitigate its effects before it's too late. Dominant narratives painting Net Zero as an unattainable goal can erect perceived barriers, hindering the uptake of sustainable behaviours (Gifford, 2011). The perception of these barriers, coupled with potential risks, can influence individuals' willingness to adopt new practices. Sources of narratives are also important (Kahan et al., 2012). Trust in the information source can impact the acceptance and internalisation of the narrative (ibid.). NZT narratives need not only be positive but also emanate from trusted sources. So, while Social Cognitive Theory offers insights into narrative's ability to drive behaviour change, a multidisciplinary approach will provide a fuller understanding of NZT.

Narratives, by offering alternative viewpoints, hold the power to reshape and challenge entrenched social norms and values (Fisher, 1985; Polkinghorne, 1988). For instance, narratives centred on environmental issues, such as climate change, can contest prevailing norms condone environmental degradation and values prioritise non-renewable energy sources (Hulme, 2009; Moser, 2010). For NZT narratives influence individuals' perceptions, emotions, and behaviours, shifting societal norms and

values (Shanahan et al., 2011). These narratives, by presenting a compelling vision of a sustainable future, can mobilise collective action and inspire societal change (ibid.). For narratives to effectively drive change, they must resonate with a broad audience, being both accessible and inspiring (ibid.). However, balance is useful; narratives overly detached from reality or negative can hinder their impact. For some authors, the most influential narratives are those offering a realistic, yet optimistic vision of the future, motivating individuals towards collective action (O'Neill & Nicholson-Cole, 2009; Nisbet, 2009).

The study of narratives has grown across disciplines, including psychology (McAdams, 1992), sociology (Bruner, 2002; Polkinghorne, 1988), anthropology (Bakhtin, 1981), political science (Shanahan et al., 2011) and economics (Akerlof & Shiller, 2009). Narratives have been shown to shape perceptions of risk and opportunity, and so influence behaviour and decision-making (Lorenzoni et al., 2007). For example, stories about heroic individuals taking personal responsibility for tackling climate change can inspire others to do the same (O'Neill et al., 2017). Conversely, narratives emphasising the difficulty or impossibility of change can act as a barrier to action (Crossley, 2000).

It is important to note this narrative process is not static or linear; they are always in flux, being added to and changed as they are re-interpreted internally by an individual, and when they are passed from one person to another, and back again. In this way, they are open-ended and dynamic (Bruner, 2002). Narratives are also never completely true or false; they are always partial and selective, shaped by the perspectives and experiences of those who create them (Somers, 1994). The way we tell and retell the stories of our lives, individually and collectively, matters therefore not only for how we make sense of the world but also for how we change it. Narratives can help us to cope with change, by providing a sense of continuity and coherence in a time of flux (Bruner,

2002). They can also motivate us to take action. As such, narratives are powerful tools for shaping social reality. They can be used to legitimise power structures and relations or to challenge them. Narratives can reproduce dominant ideologies, or help to bring about social change. In other words, narratives can be used to support or resist change (Mora, 2014).

Narrative arcs describe the structure of stories, which typically follows an introduction, rising action and climax before reaching resolution. This same concept can be applied to energy transitions in order for researchers from both sociology and science & technology studies (STS) fields to understand how these changes occur over time. In this regard a narrative arc or pathway can be used to understand socio-technical transitions related to energy production over time – from historical beginnings up into current contexts and implications for the future. Narratives are non-linear, including contingencies for unanticipated events causing disruption or even acceleration along emergent societal paths (Lindblom, 1959). Examining energy transition narratives involves multiple perspectives - technology studies' offers insight on developmental aspects such as pressures driving innovation developments while sociologists focus more upon contextual features including political status quo arrangements which influence societal acceptance of certain technologies' diffusion across populations.

In this way historical energy transitions could be seen as having their own unique narrative arcs with each stage representing different points on the story's timeline - beginning at its initial conception through eventual adoption by society until finally being evaluated after completion. For example when looking at shifts such as coal replacing wood during England's industrial revolution one might see evidence of Latour's (2018) framework playing out across centuries while also noting other social factors like socioeconomic disparities between those who enjoyed access, versus those

without, influencing outcomes along the way. Similarly, current transformations occurring today may follow similar patterns but with new complexities due to advances in digital technologies making them more dynamic than ever before – something STS scholars have referred to when discussing networked societies where multiple actors interact across scales simultaneously, creating unpredictable results (Jasanoff, 2018). As we face future challenges like automation and climate change, we must consider if our narratives around technological solutions will meet current and future global needs. These narratives of change aid our understanding of how agents of change create cultural representations through language shape people's awareness about issues undergoing societal (re-)evaluation (ibid.).

2.3.b The Power of Narratives

In their study on the role of narratives in socio-technical transitions, Hermwille (2016) highlights another important distinction in theories of change: the focus on top-down versus bottom-up processes. Top-down theories of change emphasise the role of those in positions of power in driving change, while bottom-up theories highlight the role of ordinary people and grassroots movements. Boulton (2016) argues both perspectives are important for understanding the dynamics of change in NZT.

Theories of narratives and change offer a different perspective on how social reality is constructed and how society changes. These theories focus on the role of stories, myths and discourses in shaping our understanding of the world and our behaviour. This is also where concepts such as 'Invented Traditions' (Hobsbawm and Ranger, 2012), suggest some traditions, the classic example being Scottish tartan, are created or re-interpreted to serve the needs of the present; this can be useful in understanding how narratives are used and their value in creating change, or bolstering a wider

narrative, the previous example signifying a way to formalise and popularise Scottish national and cultural heritage. Benedict Anderson's theory of 'imagined communities' (2006) also emphasises the role of narratives in creating a sense of belonging and community. This theory suggests nation-states are 'imagined communities', with shared senses of belonging to a country even without having met all its citizens. This is because we share a common culture and history, conveyed through stories, narratives and discourses. Similarly, Edward Said's 'Orientalism' (1978) sees the West as having used narratives about the East to justify colonialism, exploitation and extractivism. These theories suggest narratives are powerful tools to be used to create, or reinforce, a sense of community, identity and belonging. They justify action or inaction, and legitimise power structures.

Narratives of change, show the manner in which individuals or collectives within a society perceive and articulate historical, current, and impending social transformations (Shanahan et al., 2011). Narratives of change place emphasis on historical temporality and linear developmental narrative framings, which house the socio-economic transitions within a society. These narratives legitimate or illegitimate specific actions or beliefs, shaping public opinion and societal perception of reality (Benford and Snow, 2000). Benford and Snow's discourse extends the understanding of narratives by introducing a structured approach to analysing social movements through three levels of framing: Diagnostic, Prognostic, and Motivational, which help in identifying problems, proposing solutions, and mobilising actions respectively within social contexts.

However, the term 'narratives' can extend yet further, with Bruner (2002) providing an interpretation of narratives as a constructive force, explaining how individuals' understanding of the world is actively shaped through the stories they tell and hear. Similarly, Entman's (1993) framing complements Benford and Snow's understanding of

how narratives influence societal perceptions. Entman's framing is a process of selecting and emphasising certain aspects of a perceived reality, promoting a problem definition, causal interpretation, moral evaluation, and/or treatment recommendation. This synthesis of Shanahan et al.'s, Benford and Snow's, Bruner's, and Entman's (ibid.) frameworks provide a lens through which the role of narratives in societal transformations can be analysed.

Social change narratives encapsulate tales of what is perceived as 'progress,' 'decline,' or 'crisis,' each mirrored in real-world scenarios and academic discourse. However, narratives reflect a range of social changes beyond categorisations. A narrative of 'progress' is exemplified by Singapore's evolution from a modest fishing village to a thriving global city within mere decades, a narrative grounded in factual representations of economic growth, urbanisation, and enhanced living standards (Berners-Lee, 2021). However, this narrative may not encapsulate the environmental or socio-cultural costs associated with rapid urbanisation. James and Morel (2020) provide an introduction to the field of 'ecocriticism' and the growing discourse around environmental narratives, incorporating environmental themes within narratives, illuminating the potential oversight of environmental concerns in 'progress' narratives (James and Morel, 2020). Additionally, the strategic use of narratives within social movements and environmental networks highlights the potential for narratives to either bridge or exacerbate community divisions, indicating a need for a more nuanced exploration of 'progress' narratives in academic and public discourse (ibid.).

Conversely, narratives of 'decline', epitomised by discourse on the United States' "Rust Belt," articulate economic stagnation or decline, and urban decay due to a loss of manufacturing jobs (Hermwille, 2016). A narrative resembling the downturn of the British coal industry during the 20th century, marked similarly by job loss and

economic frailty. However, the socio-political contexts of these declines reveal nuance. Transitions to post-industrial economies in both regions were influenced by political and industrial policies, with Thatcher era policies rapidly de-industrialising the UK post-1979 (Sarewitz, 2004).

Polanyi's (2001) socio-economic exploration of factors, applicable to the Rust Belt, suggest what is perceived as 'decline' may also include transformative opportunities. This perspective aligns with Schumpeter's (1994) theory of 'creative destruction,' where old, unprofitable industries give way to innovation, entrepreneurial growth, and economic prosperity. Piketty (2014) expands on this, addressing implications of income inequality and capital concentration in modern capitalist societies, offering contemporary insight into 'creative destruction' in post-industrial transitions.

The discussion on 'creative destruction' is nuanced by critiques of neoliberalism, which see limitations in market-oriented reforms' ability to foster genuine economic transformation and resilience (ibid.). In exploring how market-oriented reforms and economic deregulation catalyse the 'creative' side of 'creative destruction' in post-industrial economies, we see they contribute to a discourse around the economic resilience and transformative potential in declining industrial regions (ibid.). The environmental merits linked with diminished coal dependency expands the ambit of the 'decline' narrative beyond socio-economics (Jenkins et al., 2018). Challenging the conventional 'decline' narrative, a transformation discussion opens up, incorporating tenets of 'just transition' as a pathway to inclusive and sustainable change (Newell and Mulvaney, 2013). 'Decline' narratives present opportunism and the lived experiences of suffering within marginalised communities, territorial stigmatisation, all while embracing the call for transitional justice (Sovacool et al., 2022).

Expanding the discussion, the environmental ramifications of reducing coal dependency should not be isolated from conversations around energy transitions (Bridge et al., 2013; Sovacool, 2022). The 'decline' narrative straddles multiple disciplines: socio-economic shifts, environmental security, energy sovereignty, community resilience, and overarching goals of sustainability (Adger et al., 2013; Barnett, 2006; Kates et al., 2001). For these theorists all narratives of society and transition should be opened up as intersectional. Demanding attention to the co-construction of transition narratives (Somers, 1994).

While some narratives of change are grounded in factual representations, others traverse myth (Bruner, 2002; Polkinghorne, 1988). Irrespective of their basis in reality or fiction, such narratives wield substantial influence over individuals' cognitions and their interactions with their environment (Somers, 1994; McAdams, 1992). Nonetheless, the centrality of narratives could be contested by perspectives advocating for the paramountcy of structural determinants in shaping social realities, overshadowing the role of narratives (Giddens, 1984). Through this, the influence of narratives might be perceived as secondary or complementary to structural factors.

The power of narratives resides not just in their representational qualities, but also in their capacity to actively shape perceptions of reality, as discussed in the sociology of knowledge (Berger & Luckmann, 1966). Narratives emerge from and are reinforced by social institutions like the media, religious organisations, and educational systems (Foucault, 1980; Bourdieu, 1990). Take, for example, gendered narratives either perpetuate or subvert stereotypes. Such narrative phenomena are embedded within patriarchal systems and disseminated through media and culture (Butler, 1990). Similarly, the portrayal of immigrants oscillates between harmful characterisations and more humanising stories, influenced by political discourse and media framing (Entman,

1993). The dual potential of narratives extends this participatory notion into social identity, as they can reinforce 'us' vs. 'them' dichotomies, facilitating conflict as per theories of in-group and out-group behaviour (Stirling, 2007: Kahan, et al., 2012; Clayton, et al., 2015). Whereas narratives are tools for social cohesion, breaking down barriers to build a sense of shared humanity, note, therefore, the influence of narratives on social forces and the potential to sustain or dismantle social structures.

Narratives vindicate action and inaction, as discussed in narrative policy frameworks (Shanahan et al., 2011). For instance, the narrative of hard-work and self-reliance underpins austerity policies, legitimising actions disproportionately impacting vulnerable sections of society (Lopez-Gonzalez et al., 2019). Such narratives present dominant ideologies serving to maintain power hierarchies (Gramsci, 1971; Murphy et al., 2021). Likewise, tales of the purported dangers of immigration frequently incite 'moral panics,' providing fodder for policies restricting human mobility and access to services (Muller, 1980; Nikolaeva et al., 2019; Obeng-Odoom, 2021). The potency of these narratives gains traction from their capacity to be integrated into hegemonic belief systems, subsequently becoming self-reinforcing mechanisms of power (Gramsci, 1971).

Beyond legitimising isolated policies, narratives serve to validate systems of inequality and oppression. An intersectional lens reveals how these narratives are suffused with multiple axes of discrimination, gender, race, class, and more (Butler 1990; James & Morel, 2020; O'Brien & Wolf, 2010). Consequently, narratives wield significant influence over our social and political landscapes, shaping both public opinion and policy formulation (Zollmann, 2017).

Building upon the preceding discussions on transitions and the power of narratives, we see narratives shaping socio-technical transitions. Hermwille's (2016) conceptualisation of the 'structuration cycle' provides a framework for understanding this role. Within

this cycle, narratives function as "vehicles for signification," and are linked with elements of domination and legitimation, collectively shaping agency (see Figure 2.3.b.i below). For example, the energy policies emerged in Japan, Germany, and the United Kingdom following the Fukushima disaster, Hermwille (2016) sees how narratives both enable and constrain agency, depending on the socio-political context. The introduction of counter-narratives expands the discourse, revealing how narratives challenge dominant narratives (Mora, 2014; Hermwille, 2016). However, we should also consider the limitations of narratives as analytical tools that may oversimplify socio-technical issues (Bal & van Boheemen, 2009).

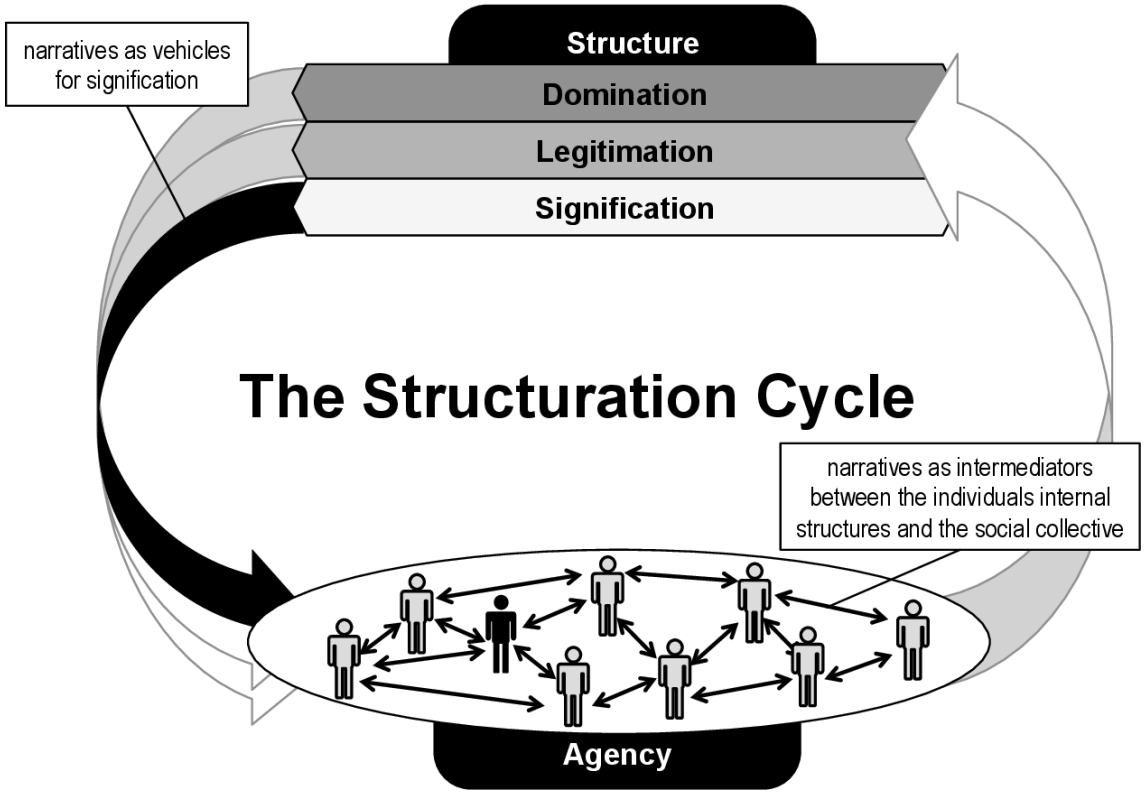


Figure 2.3.b.i, Illustration of the role of narratives in the structuration cycle. Hermwille's illustration (2016).

2.3.c Narratives of Climate Change, Net Zero, and Discourses of Delay

As a conceptual tool, narratives prove useful in describing the interface between society and the environment. Narratives can simplify scientific discourse to a language more accessible to the layperson, commented on in public understanding of science literature (Nisbet, 2009; Moser, 2010). "Econarratology", a field that scrutinises the interplay between narratives and the environment, suggests climate stories have ramifications for climate related decision-making and policy (James and Morel, 2020). For some, an effective way to address climate change is for stakeholders to first recognise and accept new narratives as potentially legitimate approaches for achieving NZT (Geall and Ely, 2018). This requires an understanding among all parties of the challenges, which may produce unintended consequences; nevertheless, they see action as required, adopting a consequentialist approach (Geall and Ely, 2018; Radoslav, 2016).

Climate narratives permeate multiple media forms, from journalistic interpretations to cinematic representations. These different mediums contribute to varied public engagement with the climate crisis (O'Neill & Nicholson-Cole, 2009; Wibeck, 2014). Cultural artefacts like 'An Inconvenient Truth' and 'The Day after Tomorrow' epitomise how these narratives percolate mainstream consciousness. While the former was lauded for its pedagogical rigour, it has also been criticised for its focus on individual-based solutions (Leiserowitz, 2004). The latter, while entertaining, blurs the lines between fiction and fact (Sheehan, 2017).

These narratives, each with their unique tonalities and resonances, serve different audience niches and attention spans, affecting their efficacy in instigating action or reflection (O'Neill et al., 2017). It is therefore useful to understand the impact of these climate narratives on public engagement and policy change (Hulme, 2009). Narratives

carry within them power structures and ethics deserving scrutiny (Foucault, 1980; Corner & Clarke, 2016).

Cultural artefacts, such as films and documentaries, are not just passive reflectors of societal views but active participants (Bennett, 2005). However, in this thesis, it's valuable to extend 'cultural artefacts' to the earlier introduced concept of 'transition artefacts.' While both define social perceptions and influences, transition artefacts specifically include policies, technologies, narratives, institutions, and social practices facilitate or hinder a transition, in this case, towards a new relationship between humanity and nature, or more specifically for this thesis, towards Net Zero (Geels et al., 2018; Grin et al., 2010; Loorbach, 2010). These narratives educate, shift norms (Corner & Clarke, 2016), and have the potential to engage audiences who might be sceptical or indifferent to climate change, a challenging task and contribute to the greater discourse on climate change (Burch et al., 2014; Carmichael, 2019; Hulme, 2009).

The term "discourses of delay" has gained traction in academic circles (Lamb et al., 2020; Dunlap & McCright, 2015). It refers to narratives and rhetoric that, either intentionally or unintentionally, serve to postpone immediate action on pressing issues, such as the global climate crisis. Hickman (2020) argues these discourses subtly manifest, such as emphasising the need for research, the economic costs of action, or the idea technological advancements will eventually solve the problem. Such arguments, while seemingly rational, can be used as tactics to delay policy changes, regulatory actions, or shifts in public opinion (Lamb et al., 2020).

Climate change discourses of delay can have consequences, as Oreskes (2004) notes certain interest groups have historically employed delay tactics to sow doubt about the scientific consensus on climate change, hindering meaningful policy responses.

However, it is useful to - attempt to - differentiate between genuine concerns and deliberate delay tactics. Some arguments for caution or research may stem from legitimate uncertainties in large-scale systemic changes (Pielke Jr. et al., 2007). Yet, as the urgency of the climate crisis intensifies, the line between caution and obstruction becomes increasingly thin.

In climate discourse, the 'Green Growth Narrative, advocates for the harmonisation of economic prosperity with environmental stewardship. This proposition, while alluring, is mired in academic debate. The allure of 'Green Growth' lies in its promise of a win-win scenario: economic expansion without the environmental cost. The Organisation for Economic Co-operation and Development (OECD, 2011) champions this perspective, suggesting the feasibility of decoupling economic growth from environmental harm. However, this perspective is not universally accepted. Hickel (2019) counters this optimism, contending the very foundations of our growth-driven economic models are at odds with the principles of sustainability. Complicating this debate is the intricate relationship between affluence and ecological impact. Jorgenson (2003) posits affluence, rather than being a solution, exacerbates environmental degradation, with richer nations leaving a disproportionately larger ecological footprint.

Steven Pinker (2018), in his work 'Enlightenment Now', argues progress, driven by reason and science, leads to solutions allowing for both economic growth and environmental conservation. However, he also acknowledges the challenges and emphasises the need for data-driven approaches to ascertain the right balance. The 'Green Growth Narrative', while compelling, remains a contested field in academic circles. Economic aspirations and environmental imperatives are conflicting, thus it is becoming increasingly important to assess, through empirical evidence and debate, whether this growth narrative should continue to shape our future.

Degrowth narrative stands out as a radical departure from conventional economic thinking. It challenges the long-held belief in the sanctity of growth as the ultimate panacea for societal progress. Jackson (2009) provides a foundational critique of the relentless pursuit of economic expansion, especially when juxtaposed against the undeniable constraints of our finite planet. This perspective is not merely a theoretical postulation but is rooted in the tangible realities of ecological degradation and resource depletion. "Planetary boundaries: Guiding human development on a changing planet" by Will Steffen et al. (2015), introduces planetary boundaries within which humanity can safely operate. It emphasises the need for sustainable development to prevent pushing the Earth system into a new state.

Kallis et al., (2020), a prominent voice in this discourse, posits the degrowth paradigm offers more than just ecological balance; it promises a reimagined societal well-being decoupled from wealth accumulation. However, the degrowth narrative, while intellectually stimulating, is not without its critics. Raworth (2017) articulates the concerns of many, especially from emerging economies. For nations on the cusp of economic take-off, the idea of abandoning growth seems antithetical to their aspirations of improving living standards and eradicating poverty.

Freeman and Pye's (2022) exploration of the UK's energy transition through the lens of Shared Socioeconomic Pathways (SSPs) illuminates the different possible trajectories for societal development, including energy demand and political dynamics. Capturing scenarios offering insights into how societal pushback, energy transition support, and technological advancements might occur. The Shared Socioeconomic Pathways (SSPs) serve as narrative inputs to the TEMPEST model, a framework used to simulate future energy transition scenarios by incorporating divergent societal preferences, levels of political commitment, and projections of economic and demographic change (Freeman

& Pye, 2022). These narratives are not neutral; they structure scenario development by embedding assumptions about what forms of mitigation are socially acceptable, politically viable, or economically plausible. In this respect, the SSPs operate as narrative infrastructures, artefacts that give shape to the possible futures of decarbonisation, particularly in the context of the UK's NZT (Rounsevell & Metzger, 2010; O'Neill et al., 2017).

Among the modelled pathways, SSP1 and SSP2 approach compliance with the UK's 2050 Net Zero target, whereas SSP5 delays full decarbonisation until after 2080. While SSP1 offers the most substantial reduction in emissions, it is associated with the highest aggregated socio-political and economic cost. In contrast, SSP2 achieves a more favourable balance between emissions reduction and overall cost, and is assessed as the most feasible scenario due to its proximity to historical development patterns and institutional capacities (Riahi et al., 2017; Freeman & Pye, 2022).

Despite these findings, current UK policy orientation aligns most closely with the narrative logic of SSP5. This pathway is characterised by continued growth in energy demand, reliance on technological innovation without structural behavioural change, and significant dependence on carbon-intensive sectors such as aviation. Consequently, under SSP5, the projected cumulative emissions exceed the estimated UK carbon budget by 32%, suggesting a serious divergence from Net Zero commitments and underscoring the narrative dissonance between policy discourse and empirical feasibility (Anderson et al., 2020; Freeman & Pye, 2022).

2.3.d Metanarratives

Expanding on societal narrative structures, Jean-François Lyotard introduced the concept of "metanarratives," grand, universalising stories that societies use to legitimise

knowledge, practices, and social institutions (Lyotard, 1984). Lyotard's critique of metanarratives sits within postmodern philosophy, asserting that grand narratives, such as: Enlightenment rationality and Marxist historical determinism, suppress alternative viewpoints and marginalise minority experiences (ibid.). These metanarratives function by offering a single, cohesive vision of history, purpose, or progress, effectively obscuring alternative or localised ways of understanding the world. Lyotard advocated for recognising the multiplicity and heterogeneity of "petit récits" or little narratives, arguing that no single, universal narrative can adequately represent the diversity of human experience. Lyotard's critique contends that contemporary society, characterised by fragmentation and pluralism, increasingly rejects such grand narratives, favouring instead smaller, localised, and context-specific narratives that acknowledge multiplicity and complexity (Lyotard, 1984). Lyotard's critique aligns with the narrative psychological approach mentioned above, that emphasizes the diversity within individuals' lived experiences, resisting reduction to monolithic explanations or universal truths. Instead, meaning and identity can derive from diverse, situated and conflicting narratives (Lyotard, 1984; Crossley, 2000). This insight has clear resonance for NZT scholarship, where analysts have begun to interrogate whether the familiar "green growth" or "technocratic innovation" narratives are being supplanted by more nuanced, issue-specific accounts of change (Crossley, 2000; Meadowcroft, 2009).

This point on the applicability of metanarratives has recently been explored for NZT narratives, with Winskel and Kattirtzi arguing: *"that rather than having fixed overarching orientations to energy system dynamics, most experts consider the likelihood and desirability of disruption and continuity-led change on an issue-by-issue basis, going beyond uniform transition narratives"* (Winskel & Kattirtzi, 2020). This is grounded by the empirical work by Winskel and Kattirtzi (2019) who provide a vivid illustration of this plurality in the UK's NZT. Drawing on a two-round Policy Delphi

survey of some 130 UK energy experts and stakeholders, they identify two contrasting "transition logics" (ibid.) that respondents deploy on an "issue-by-issue basis":

Disruption-based logic calls for a transition where:

- *"policies, technologies, business models and behaviours provoke a fundamental remaking of the UK energy system.*
- *Existing organisations and infrastructures cannot respond sufficiently and are largely displaced.*
- *Wide-ranging decentralisation of the system, both technically and organisationally.*
- *End users and the wider public become more actively involved."* - (ibid., p.2)

While the **continuity-based logic** calls for a transition where:

- *"system change is pursued mainly by adapting and repurposing existing organisations and infrastructures.*
- *New technologies, business models and behaviours are adopted as extensions and adaptations of existing ones, in order to meet policy objectives.*
- *Large scale technologies and organisations remain vital; national strategy and regulation dominate.*
- *End users and the wider public remain largely passive"* - (ibid., p.2)

Crucially, Winskel and Kattirtzi report that *"respondents were roughly evenly divided on whether the UK's energy system was likely to undergo a disruptive or continuity-based transition over the next two decades"* (ibid., p.4), a finding that runs counter to any single, overarching narrative of either wholesale system overhaul, or fragmented and incremental adaptation. Instead, experts appear to switch between

these metanarratives depending on sectoral context and the nature of the challenge at hand. For example, in the heat sector, a majority envisaged a "patchwork mix" of local low-carbon technologies overlaying the existing gas grid, with limited scope for community-led systems to dominate by 2040 (ibid., p.8–9). By contrast, the transport sector was almost unanimously seen through a continuity lens, *"electric vehicles making the dominant contribution to changes in personal transport"*, even as stakeholders warned that *"behavioural shifts could either amplify or counteract electrification"* (ibid., p.9).

The applicability of the disruption logic to system change was seen to require both *"an internal imperative for disruption and a policy willingness to enable it"* (ibid., p.12); where either condition is absent, the continuity narratives prevail. However, these logics were not consistently built upon with thoroughly evidenced arguments. Limited movement between the Policy Delphi's survey rounds was noted, despite exposure to peers' reasoning and requests for sourceable evidence to back up their reasoning, suggesting that respondents' strict adherence to either of these narratives is underpinned more by *"durable values and worldviews"* (ibid.) rather than by presentations of evidence alone.

This sector-sensitive, values-inflected pattern of story-making exemplifies Lyotard's (1984) petit récits in action: rather than experts describing a single consistent NZT metanarrative, the case in the UK reveals a constellation of narratives that experts call upon, in relation to *"specific recent niche developments or trends"* (Winskel and Kattirtzi, ibid.). This aligns with insights from the multi-level perspective (Geels et al., 2018), which sees regime actors oscillating between protecting existing structures and embracing novelty; and with work on policy narratives (Hajer, 1995; Meadowcroft, 2009), which emphasises how differing storylines mobilise coalitions around particular

policy instruments. Moreover, by demonstrating that the *"disruption vs continuity"* dichotomy itself becomes a narrative resource to explain variations in power, heat, transport and whole-system transitions, Winskel and Kattirtzi (ibid.) present the reflexivity in NZT discourse. Their findings strengthen the discourse being contributed to, for example by other scholars investigating how energy transitions are narrated in media, politics and stakeholder fora (Sovacool et al., 2022; Bridge et al., 2013), building scope for both first and second-order (also known as 'meta') narratives assisting in the understanding of the theory and practice of NZT.

Pluralised and reflexive metanarratives - where actors shift between logics of disruption and continuity depending on sectoral context and underlying values - presents an instability across NZT narratives (Kattirtzi & Winskel, 2020). It reveals how such narratives do not simply reflect empirical realities but actively shape and are shaped by political, institutional, and epistemic commitments. This instability echoes the diagnostic features of wicked problems, where problem definitions, proposed interventions, and evaluative criteria are inseparable from normative and contextual frames. As such, these metanarrative dynamics do not merely coexist with wickedness, they exemplify it (Kattirtzi & Winskel, 2020). Pointing to a condition in which the multiplicity of views, lack of consensus, and contested epistemologies render both the formulation of transition pathways and their implementation structurally irresolvable within conventional planning frameworks. It is to this characterisation of wicked problems that the next section now turns.

2.4 Wicked Problems

Rittel and Webber's (1973) 'wicked problems' became foundational in understanding challenges, specifically those of social policy, defying normal scientific solutionising.

Climate change, particularly in the context of NZT, exemplifies this, where the ten or tenets of wicked problems, are:

1. There is no definitive formulation of a wicked problem. The nature and boundaries of wicked problems are difficult to define clearly.
2. Wicked problems have no stopping rule. There is no point at which a solution can be said to be complete or final.
3. Solutions to wicked problems are not true-or-false, but better or worse. Judgements are subjective and often value-laden rather than objective.
4. There is no immediate and no ultimate test of a solution to a wicked problem. Outcomes may unfold over time, and their success is difficult to evaluate conclusively.
5. Every solution is a 'one-shot operation'; there is no opportunity to learn by trial and error. Each intervention has consequences that are irreversible.
6. Wicked problems do not have an enumerable set of potential solutions. The solution space is not finite, and no exhaustive list can be generated.
7. Every wicked problem is essentially unique. Although similarities may exist, each wicked problem has distinctive features.
8. Every wicked problem can be considered a symptom of another problem. They are interconnected with other issues, often forming complex systems.
9. The way a wicked problem is explained determines its resolution. Framing and problem definition are intrinsically linked to proposed solutions.
10. The planner has no right to be wrong. Unlike scientific experiments, social planning carries ethical and political responsibilities; errors can have significant consequences (ibid.).

Similarly, in the field of complexity, we encounter the 'hyperobject' as posited by the philosopher Timothy Morton (2013; 2010: p.135). Hyperobjects, transcending traditional knowledge boundaries, represent phenomena so vast they challenge conventional understanding and action; with examples like global warming or overpopulation requiring new approaches to understand them (Morton, 2013). Boulton (2016: p.772) finds hyperobjects shape contemporary climate change narratives, suggesting a paradigm shift in how we perceive and address global challenges.

In this context, the framework of 'post-normal science' also becomes useful (see Figure 2.4.i below). Funtowicz and Ravetz (1993) introduced this concept to address the limitations of conventional scientific methods in dealing with uncertain but value-laden environmental problems. In the face of climate change, a quintessential post-normal issue, traditional approaches separate facts from values prove inadequate. Instead, post-normal science advocates for a more inclusive, participatory, and iterative approach to knowledge production, one acknowledges the role of uncertainty, the plurality of legitimate perspectives, and the need for extended peer communities in environmental governance (Funtowicz & Ravetz, 1993). This view of climate change as a wicked problem, provides reasoning for a reevaluation of our scientific methods and decision-making processes.

However, Sarewitz (2004; 2010) argues "*we have always been post-normal"* (2016.b). He critiques the notion that science is in crisis due to declining quality, suggesting instead that the crisis stems from a false image of science shaped by the *"wrong"* disciplinary archetypes: physics, rather than sociology, ecology, or economics. In settings characterised by deep uncertainty and normative contestation, Sarewitz contends that it is *"misleading"* to expect science to be predictive, universal, or

value-neutral. As he notes, the failure lies not in science itself but in our misplaced expectations: *"If the latter [ecology, sociology, economics] had been our canonical sciences, then no one would have expected science to be replicable, general, accurate, predictive, and redemptive"* (2016.b). His view reframes post-normal science not as an emergent condition, but as a perennial feature of science in public life, particularly when applied to wicked problems such as climate change and NZT (Sarewitz, 2016.a).

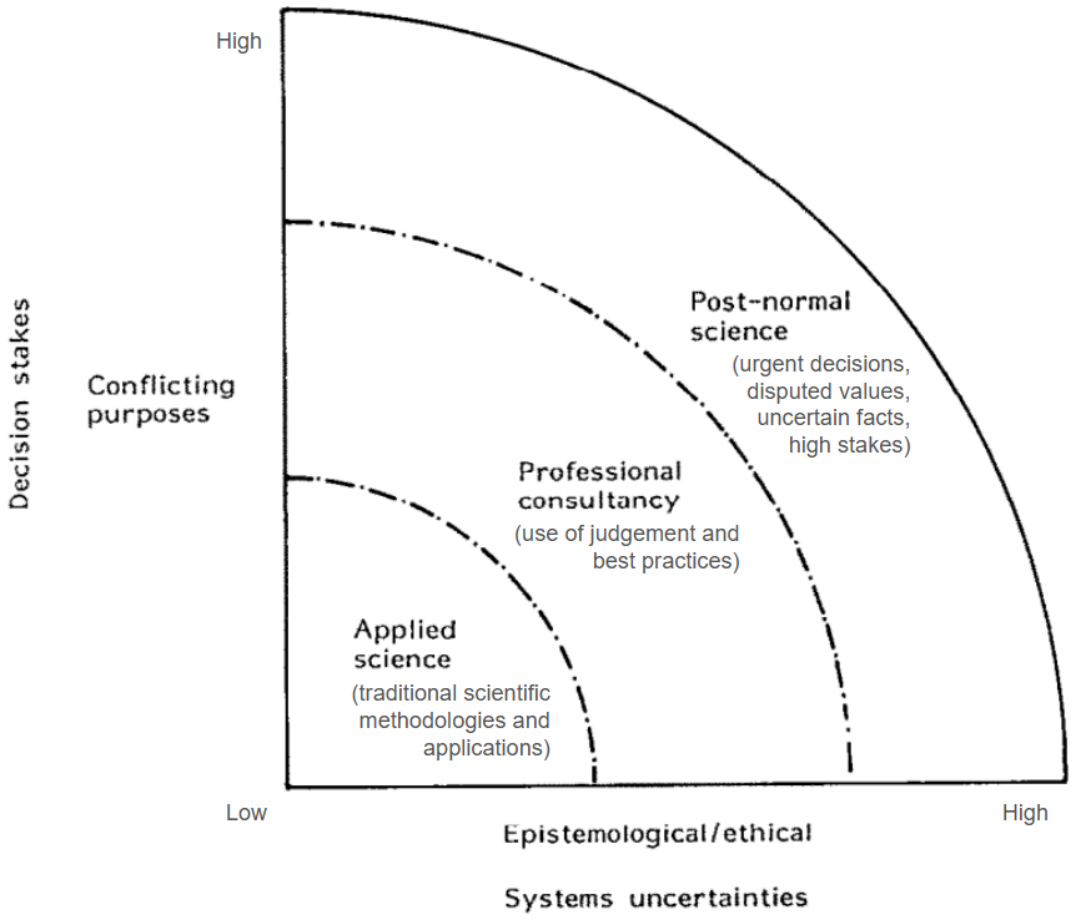


Figure 2.4.i: Adapted from Funtowicz and Ravetz (1993, p.750) diagram of "Post-normal science".

Post-normal climate change science encourages involving stakeholders, including non-scientists, in problem-solving, seeing environmental issues like climate change

spanning traditional scientific disciplines. Where problems and solutions appear to require both technical expertise and value-based societal input (Stirling, 2006; Turnpenny et al., 2009). Post-normal scientific discourse on climate change and wicked problems desires a more holistic view, to define effective solutions; where dialogue between knowledge systems and societal actors facilitates understanding the problem, promoting co-creation of sustainable and socially acceptable solutions. This is then a methodological, but also philosophical, rethinking of science in society, for addressing global challenges like climate change (Kasperson, 2011). Wicked problems are also a product of the conflicting perspectives and interests of the actors involved. This wickedness is amplified by the ambiguity of these problems, their temporal exactness, their repercussive nature, and the double hermeneutic involved in their understanding (Duckett et al., 2020).

By evaluating the effectiveness of policy appraisal mechanisms, Turnpenny et al.'s (ibid.) work calls for the balancing of environmental governance, marred by competing interests and priorities. Similarly, Lorenzoni's research offers in-depth insights into public engagement with climate change (2007). Her studies, including surveys and interviews, reveal how public perceptions are shaped by variables like knowledge, perceived risk, and trust in policymakers. This research assists in understanding the barriers to behavioural change, highlighting effective communication strategies in fostering a more environmentally conscious society.

Turnpenny et al.'s work on policy integration complements Lorenzoni's findings on the societal barriers to environmental action, offering a holistic view of environmental governance (Turnpenny et al., 2009; Lorenzoni et al., 2007). Their work collectively informs a holistic approach to environmental policy-making. Similarly, Lorenzoni's research on public engagement informs the development of communication strategies

addressing public misconceptions and apathy towards climate change (Lorenzoni & Pidgeon, 2006). While both Turnpenny and Lorenzonis' (ibid.) contributions offer an understanding of environmental policy and public engagement within a wicked problem context, providing a foundation for future research and policy development; they are also attempting to steer the discourse towards holism.

2.4.a Are All Problems Wicked?

However, the wicked framing of problems has constraints and presents challenges, notably for the UK's NZT. While wicked problems have found resonance across disciplines, from urban planning (Kossoff and Irwin, 2022) to healthcare, public policy, and environmental stewardship, it begets the following question 'does not every problem warrant the 'wicked' label?' Further, while many challenges, termed "tame" or "benign", can be shown to have achievable solutions, do these solutions not beget potentially problematic consequences? It is argued that tame problems might be delicate in their own right, but that they seldom grapple with the hallmarks of wicked problems: pervasive uncertainty, ambiguity, and conflicting stakeholder values (Rittel & Webber, 1973). So, can every problem be seen as wicked? Here, this question is initially juxtaposed with Eriksson and Grief's (2023) political-philosophy exploration of a potential wicked problem hitherto evading such a wicked classification; as an initial response to Head's (2019) challenge that:

> *"The literature on 'wicked problems' [...] often [...] disconnect[s] discussion from the insights available in the fields of policy studies and public management, not to mention the broader social sciences. For example, there has been a tendency to [...] perceive social policy issues as inherently wicked, owing to widespread evidence of stakeholder disagreements. A preferable approach would be, first, to see 'wicked' features as part of a complex continuum or*

> *typology of problem types [...] and second, to tackle empirically these substantial challenges [by] applying concepts from the emerging literatures on policy design, policy capacity, policy deliberation and political legitimacy. In other words, some of the concepts and frameworks necessary to extend and deepen the 'wicked problems' literature are already available in related literatures."* - (ibid., p.183).

Drawing from Eriksson and Grief's (2023) work on nation-states' legitimacy and the lack thereof's generation of ensuing crises can be portrayed as similarly emblematic of wicked problems. State legitimacy, at its core, is the populace's endorsement of governance authority. A state's faltering in this regard may stem from its inability to provide both 'input' and 'output' legitimacy. The former pertains to aspects of 'authorisation, representation, and participation' (Turnhout et al., 2020), while the latter is the 'efficacy and quality of policy outcomes' (Piattoni, 2010). Eriksson and Grief (2023) postulate the nuances of input and output legitimacy as contingent upon a state's populace and their anticipations. National services resonate with people's expectations, bolstering output legitimacy; conversely, deviation erodes it (Schmelze & Stollenwerk, 2018). Legitimacy, for Eriksson and Grief (2023) is the 'means to achieve collective aspirations' (Barnett, 2006: p.90), contingent on the collective acceptance of authority.

The nature of these issues, the interdependencies, the paradoxical "Catch-22" scenarios (Eriksson & Grief, 2023: p.364) where solutions spawn new challenges, and the desire for context-centric resolutions, all show the wickedness of state legitimacy and its crises. They present an inclination for adaptive and inclusive approaches to governance and policy making, when addressing large-scale (wicked) problems. Wicked problem framings inherently call for a holistic view of complexity, seeing policy issues as interconnected. Rittel and Webber's (1973) classic formulation sees, for instance, that

"every wicked problem is a symptom of another problem" (Kennedy, 2015) – an endless chain of linked issues that defy neat compartmentalization. This holistic ambition highlights interdependencies, but if overextended risks analytical paralysis. Some theorists naturally see the labelling of every problem as "wicked" stretching the concept, diluting its meaning and leading to a spiral of ever-expanding problem definitions (Turnbull & Hoppe, 2019).

Peters (2017) cautions that the wicked-problem lens has become so fashionable that it is applied indiscriminately, with *"any number of problems being labeled as 'wicked'"* (ibid., p.385). Such overuse may create a rhetorical excuse for inaction – a feeling that problems are insurmountable – rather than a spur to thoughtful action. Indeed, as Head (2008) observes, wickedness stems from high complexity and interdependency; pushing holism to the extreme can mean *every* problem's causes bleed into another's, leaving no bounds to analysis (also see Alford & Head, 2017; Head & Alford, 2013). Reiterating the unhelpful infinity of problem-scoping without resolution (Turnbull & Hoppe, 2019). Thus, while a broad systems view is what many scholars argue for, others see value in taking care in its use: balancing between seeing the "big picture" and setting workable limits on problem-framing (ibid.). In sum, not all policy challenges may warrant the full 'wicked' epithet, while trying to force holistic complexity onto every issue may only muddle priorities and obscure feasible ways forward (ibid.).

Policies and regulations are increasingly appended to decision-making processes, often under the banner of achieving a more holistic or integrative governance paradigm (Köhler et al., 2019). However, such procedural expansions can also be interpreted not as equivalent and necessary adaptations, but as reactive accommodations to a broader socio-economic imperative: the pursuit of continuous economic growth. In this view, regulatory layering does not inherently signal progress towards justice or sustainability;

instead, it may reflect the tensions and contradictions inherent in governing under conditions shaped by the imperative to grow. A striking example is found in the planning of HS2, the high-speed rail project in the UK, where a mandated bat tunnel - introduced under environmental protection legislation - sits uneasily within a national level infrastructure scheme explicitly justified in terms of economic growth. Such cases suggest that holistic framings are not always indicative of a fundamental transformation in priorities; they may instead operate as moralistic accommodations to growth oriented logics.

This disjuncture between holistic regulation and underlying systemic commitments is directly relevant to the NZT. In this context, the wickedness of the problem is not only a matter of technical or political complexity but of ideologies in contestation. While some narratives embed the NZT within a vision of systemic transformation, emphasising equity, intergenerational justice, and planetary limits; others recast it as a mostly technocratic exercise, to be resolved through efficiency, innovation, and minimal disruption to existing institutional and economic structures (Stirling, 2014; Markard et al., 2015). This cleavage may not then be best collapsed into a simple dichotomy between holism and technocracy. Rather, this instead may reflect two contending orientations toward governing systemic change under capitalism: one that seeks to temper the growth imperative through justice- and ecology-centred approaches, and another that instrumentalises environmental goals to reinforce continuity within capitalist systems (Scoones et al., 2020).

Thus, while the wicked problem framing draws attention to complexity, interdependence, and contestation, its indiscriminate application risks masking ideology. Not every challenge warrants classification as wicked, and doing so uncritically may obscure the underlying drivers of governance dilemmas - particularly

those rooted in power asymmetries, institutional inertia, and systemic commitments to growth (Köhler et al., 2019). The NZT, while certainly wicked in many respects, is also deeply structured by normative struggles over what constitutes legitimate action, acceptable risk, and desirable futures. It is these underlying dimensions - not just epistemic uncertainty or technical complexity - that demand critique. Recognising wickedness must therefore not simply provoke more expansive framings, but also sharpen our attention to the political economy of NZT (Meadowcroft, 2009; Stirling, 2007; Turnheim et al., 2015).

2.4.b 'Against Holism'

In *The Oxford Handbook of Interdisciplinarity* (2010), Daniel Sarewitz presents a provocative chapter titled "Against Holism." Challenging the notion that holistic, integrative approaches to knowledge and problem-solving are superior in science and policy-making. He acknowledges that modern academic disciplines – the epitome of specialization – have achieved progress, yet also have limitations: disciplines can be *"arbitrary and reductive"* and may *"distort as much as they reveal"* (ibid. p.65). This disciplinary fragmentation has led to desires for more unified, "holistic" understandings of problems. Sarewitz's core contention, however, is that holism may be worse than specialization. Sarewitz (ibid.) contrasts holistic and reductionist science; observing "reductive monodisciplinary research" as the primary engine of discovery and social progress (Winskel, 2018.b, p.79); where reductionist science's predictive power generates "context-independent", broadly applied, and generalisable knowledge, "embodied in engineered artifacts" which behave predictably anywhere (Luzadis, et al., 2018, p.7). Holistic or integrated science, by contrast, has far less certainty of impact. According to Sarewitz, *"holistic scientific inquiry, in stark contrast, strives for insight that embraces and explains context and complexity"* (Sarewitz, 2010, p.68). In other

words, holistic approaches seek to understand whole systems (e.g. the coupled human–natural world) in all their complexity and context-dependence, rather than isolating a few variables as in reductionism (Luzadis, et al., 2018).

The epistemological problem, Sarewitz argues, is that holism does not yield the universal, predictive truths reductionist science does. Human and natural systems are highly dynamic, interwoven, and often non-deterministic (Winskel, 2018.b). As a result, holistic inquiry attempting to capture *the whole picture* inevitably faces a moving target. Further, the success of reductionist science and technology continually makes those systems *"more complex and incomprehensible"* (Sarewitz, 2010, p.68) (by introducing new unintended consequences). For example, technological advances have created global-scale challenges like climate change. For Sarewitz, holism seeks to *"enhance comprehension of human and natural systems"* (ibid.) that are made less comprehensible due to the very progress of science. Thus, a fully unified understanding of such systems forever eludes us (Luzadis, et al., 2018). Holism comes up against the indeterminacy of its subject matter, echoing the same point made against wicked problems above, calling into question holism's epistemic promise of "consilience" or unified knowledge (ibid.).

Holism's demand for interdisciplinary integration has similarly been challenged (Winskel, 2018.b). Advocates of interdisciplinary holism argue that wicked problems (like sustainability, public health, or energy transitions) cut across traditional boundaries and therefore require integrated approaches spanning multiple disciplines, perspectives, and stakeholders (Stehr & Storch, 2023). Sarewitz (2010) acknowledges the motivation: disciplinary silos create gaps in understanding; but forcing integrative, holistic research design can backfire. Integrating natural sciences, social sciences, etc., is not only logistically difficult but can lead to conceptual tension and loss of focus

(Winskel, 2018.b). What counts as a valid question or result in one field may be meaningless or contested in another (Stehr & Storch, 2023). Interdisciplinary projects often struggle: participants may revert to disciplinary comfort zones, or allow one paradigm to dominate and marginalise others (Winskel, 2018.b). Radical integration is *"widely seen as virtuous"* but rarely achieved in practice, as disciplinary boundaries tend to reassert themselves when researchers confront differences (ibid., p.78).

Further, pursuing holistic knowledge is unavoidably selective and subjective. Research projects can not study everything – choices are made about what aspects of the whole to include, and where to draw system boundaries. Sarewitz calls holistic knowledge claims *"arbitrary acts of boundary drawing [...] encoding some concerns above others"* (see Sarewitz 2010 in Winskel, 2018.b). In other words, an interdisciplinary team investigating NZT might choose to emphasize technical and economic factors, or social and ecological factors; integration is a matter of judgment, reflecting the values of the researchers or sponsors (see Winskel 2018.b). Thus, outputs of holistic research are not neutral, comprehensive truths, but perspectives shaped by boundary choices; undercutting the notion of holism providing a superior or more complete understanding.

Sarewitz suggests only "modest and pragmatic form[s] of knowledge synthesis [are] tenable" (in Winskel, 2018.b, p.79). Rather than merging disciplines or creating grand unified theories of complex systems, targeted, problem-focused collaborations may be more fruitful. In this view, interdisciplinary work can succeed by addressing specific questions with clearly defined scope (where a limited set of insights can be combined usefully) – not by attempting an all-encompassing holistic analysis. This pragmatic stance favors partial integration over the ambition of holism. Sarewitz does not reject

interdisciplinarity, but challenges the *holistic mode* of seeking full intellectual integration.

One of Sarewitz's most pointed criticisms is against holistic approaches' inevitable entanglement with politics and normative agendas. Sarewitz (2010) argues that efforts to produce "the whole picture" are *"infused with self-interest and conflict"* (Winskel, 2018.b, p.79). Stakeholders push to include the knowledge that supports their preferred outcomes. As a result, holistic studies are used (or criticised) as political instruments, rather than objective analyses. Sarewitz says trying to explain complex socio-environmental systems in a holistic manner is *"an ultimately political pursuit"* (in Winskel, 2018.b, p.79). Science attempting holistic account for social, ethical, and ecological contexts, starts to resemble policy argumentation more than objective discovery. Decisions about what to study, what relationships matter, and how to balance competing aspects of a system are inherently value-laden.

This critique has implications for the science-policy interface. Holistic, integrated assessments are often promoted as providing a sound basis for policy – for example, comprehensive climate models or ecosystem services assessments are meant to guide decision-makers (Daily & Matson, 2008). Sarewitz (ibid.) believes such holistic scientific assessments cannot escape the politics of their construction. Rather than delivering unequivocal guidance, they mirror political conflicts. For instance, a "holistic" social-climate-energy-economic model might encode certain assumptions (about technology or behavior) that are contested, leading interest groups to dispute the model's legitimacy. On contentious issues like environmental policy, more integrative science often leads to more contention, not consensus (Winskel, 2018.b). Competing groups produce their own holistic analyses, each highlighting different elements of the problem, all claiming comprehensiveness. Instead of resolving debates, holistic science

may amplify them by providing multiple narratives for stakeholders to selectively endorse, echoing the findings of Winskel and Kattirtzi (2020).

Sarewitz also observes practical shortcomings in policy outcomes. One might hope that holistic interdisciplinary research on grand challenges (climate change, NZT, etc.) would yield actionable solutions or at least clarity for decision-makers. However, Sarewitz argues that this hope has largely *not* been realized, contrasting reductionism and holism in solving societal problems. For example, airplanes and automobiles exist (according to Sarewitz, thanks to reductionist engineering), but a "holistic" solution to global warming (an unintended consequence) remains elusive. Despite decades of interdisciplinary research on climate, we still struggle to "meaningfully address" the climate crisis (Luzadis, et al., 2018, p.7). Sarewitz suggests this is not merely a lag in effort but a structural limitation: the complexity that holistic science must embrace "mitigates against its effectiveness" in actually changing outcomes (Luzadis, et al., 2018, p.7). In policy domains, broad integrative studies produce reports and recommendations, but tangible progress comes slowly, if at all (Winskel, 2018.b). It is seen as easier to invent a new technology or discover a scientific principle than to engineer sweeping social changes via holistic understanding (Luzadis, et al., 2018).

Sarewitz does not deny the importance of what holism attempts to tackle. Rather, the reliance on holism to drive policy solutions. Policy involves competing interests and trade-offs; and by overburdening science with the expectation of holism, we set ourselves up for disappointment. Sarewitz's critique thus has a normative edge: scientists and policymakers should be wary of holism as a guiding principle. Grand integrated efforts may promise a synoptic vision, but often politicise debates and yield ambiguous advice. For Sarewitz, a better approach to policy is to integrate knowledge in a more limited, case-by-case way, combining specialized inputs pragmatically rather

than seeking an all-encompassing analysis. An example of such findings is echoed in the findings of Winskel & Kattirtzi (2020) mentioned above, where experts looking for solutions to the wicked problem of NZT consistently switch between narratives on an "issue-by-issue" basis (ibid., p.10).

2.4.c Wicked Solutions

Metamodernism (Vermeulen & van den Akker, 2017) does not reject either the modernist's totalising theories of ideological solutions and utopian grand narratives, nor the postmodernist's meta-totalising theories of wicked problems and petit récits. Instead, metamodernism sees the zeitgeist for the end of the beginning of the 21st century as a 'structure of feeling' (see Raymond Williams, in Middleton, 2019) that oscillates between these two positions. Another parallel can be drawn from consequentialist and some utilitarian approaches to policy; particularly those focused narrowly on outcomes, seeking the greatest good or most efficient result (Rawls, 1971; Sen, 2009). Such approaches are often critiqued for marginalising normative values like fairness, inclusion and deliberation (Dryzek, 2009). In the context of wicked problems, a pure pursuit of optimal outcomes can override the plural viewpoints and procedural justice that such a framing of the problem consequently demands (Fischer, 1993; Stirling, 2007; Head & Alford, 2015).

Rittel and Webber (1973) themselves say that social problems are not amenable to purely technical fixes: these problems are "ultimately subjective" and involve multiple stakeholders with competing values (Kennedy, 2015). Defining success only in terms of ends (e.g. cost-benefit or a utilitarian felicific calculus) risks dismissing who gets to participate in defining those ends. Fischer (1993) argues that, contrary to technocratic expectations, truly intractable issues demand *more* public engagement, not less (Balint et al., 2011). In other words, procedural justice, or, *the process matters*: decisions

reached without inclusive dialogue may achieve a technical target yet still be deemed illegitimate or ineffective if stakeholders feel alienated (ibid.). Forester (1999) similarly contends that planners must act as "deliberative practitioners", facilitating participatory processes rather than acting as detached problem-solvers.

A strict consequentialist mindset is thus problematic for the wicked problem framing – technocratic decisions may streamline decision-making, but they "short-circuit" the democratic debate and fairness that give policies their social licence (cf. Forester 1999; Fischer 1993). By prioritising outcomes to the exclusion of process, more technocratic, utilitarian approaches are seen to neglect the *justice* considerations explored above of equity (who specifically benefits or loses) and inclusion (who has a voice) through "broad-based" public deliberation (Head, 2019, p.182). This critique reflects a particular approach to policy thought, where wicked problems should not be treated as optimisation puzzles. Instead, they call for forums, negotiations and iterative learning – approaches which see the "best solution" outcome as fragile, unless arrived at through fair, inclusive practices (ibid., p.183). Rittel and Webber's (1973) vision of an "argumentative process" for wicked issues – where understanding *emerges* through debate among stakeholders (ibid., p.162) – embodies this ethos. In essence, focusing solely on ends (no matter how well-intended) can erode the legitimacy and sustainability of solutions, whereas attending to means (inclusive, deliberative policy making) is crucial for wicked problems that have no single agreed-upon solution in the first place.

That said, it is important to again temper the above critique with a measured appreciation for technocratic and outcome-oriented approaches in certain contexts. Not every policy challenge may afford the luxury of prolonged deliberation or consensual process; while urgent, high-stakes problems – climate change is a

paradigmatic example – often demand quick, decisive, outcome-focused action (Head, 2019). In such cases, technocratic interventions and expert-driven strategies can deliver tangible progress where dithering would be disastrous. Pielke (2007), for example, notes that scientists and policy advisers may at times justifiably act as *issue advocates*, pressing for specific solutions when the evidence is strong and time is short. NZT has spurred calls for rapid, focused responses: cutting emissions, deploying renewable technology, building flood defences, etc., even if consensus on every value conflict is elusive (Carr-Whitworth et al., 2023).

Hulme (2009) acknowledges that while climate change involves deep ethical and cultural disagreements, pragmatic steps forward (from technological fixes to adaptive measures) cannot wait for complete social consensus. Indeed, *outcome-oriented pragmatism* can achieve partial successes that save lives or prevent harm – an ethical imperative in itself. Sarewitz and Pielke (2008) likewise argue that insisting on resolving all value disputes may be impractical; sometimes progress emerges from "*muddling through"* (Lindblom, 1959) with imperfect but effective measures. They warn that over-reliance on endless scientific debate can actually worsen controversies, whereas directed action (informed by science but not paralysed by uncertainty) can break stalemates. In short, there may be a role for technocratic expediency: proactively led, expert informed, and swiftly implemented policies producing real benefits. This does not mean ignoring fairness or public input, but rather finding ways to act even as deliberations continue. For instance, the global push to "lift the taboo on adaptation" in climate policy (Pielke et al., 2007) recognised that waiting for a perfect global treaty (a protracted wicked-problem negotiation) was inefficient – societies had to start adapting now, using the best available expertise to protect communities (Stein et al., 2013).

Thus, a balanced perspective would see technocratic and more participatory holistic approaches as complementary: outcome-driven action can buy time or achieve interim goals, while broader inclusion and debate catch up (Head, 2019; Peters, 2017). Especially in emergencies, the *optimal* process may be one that initially emphasises outcomes (to address immediate risks) and later integrates more voices as solutions are refined (Pielke 2007; Hulme 2009). A degree of technocratic urgency, in sum, can coexist with democratic values.

Furthermore, while wicked problems by definition defy any final or definitive solution, it does not follow that they are entirely unmanageable. Scholars increasingly stress that we should aim for progress, not perfection. Wickedness implies ongoing challenge, but also ongoing opportunities for improvement. As Peters (2017) and Head (2008) observe, public policy issues might be "wicked" in that they change and resist complete resolution, yet we can still mitigate their harms and move towards better outcomes (Alford & Head, 2017). Indeed, Rittel and Webber (1973) themselves noted that societal problems cannot be solved once-and-for-all; instead, they are resolved "over and over again" through adaptive judgment (ibid., p.160). The practical task for policymakers is not to solve a wicked problem, but to manage it over time (Alford & Head, 2017). This might mean breaking a huge problem into sub-problems, experimenting with partial fixes, and learning from what does or doesn't work.

Progress can be incremental – for example, reducing homelessness through successive policy tweaks, community initiatives, and feedback loops, even if the root causes (inequality, poverty, housing markets, mental health) remain complicated. Head (2008) emphasizes that no single strategy will eliminate a wicked issue, but a combination of efforts can alleviate it and prevent regression. Peters (2017) likewise suggests that treating wicked problems as a special ontological class to be "solved" is less useful than

adopting practical judgment and long-run engagement, accepting that success will be provisional and measured in degrees (Turnbull & Hoppe, 2019). In this view, we "muddle through" (Lindblom, 1959) wicked problems not in a defeatist sense, but in a realistic, optimistic one – acknowledging complexity while pursuing improvements. Importantly, framing wicked issues in this pragmatic way guards against fatalism.

Finally, it is worth noting that the philosophical challenges discussed here will reappear in later chapters when considering "wicked narratives" as interacting systems. Just as policy problems can be tangled and hard to pin down, narratives and stories in the social realm can themselves exhibit a wicked complexity. In Chapter 5, for example, we will encounter the idea of "wicked narratives", where multiple narratives hybridise. Much like wicked problems, these narrative systems resist closure, one story begets another, perspectives proliferate, and simple resolutions remain elusive. The echoes of wicked-problem logic in that discussion are not coincidental: framing narratives as wicked acknowledges their open-ended, systemic character.

The cautionary lessons from wicked problem theory, about holistic understanding, the need for deliberation, the value of pragmatic progress, will inform the approach to narrative identification as well. By foreshadowing the notion of "wicked narratives" here, I hint at a unifying thread in this thesis: whether dealing with tangible policy dilemmas or the stories we construct around them, the same ethos applies. This represents one of the thesis's core contentions: understanding and addressing wicked problems benefits from an appreciation of the wicked narratives they cohabit.

2.4.d Super Wicked Climate Change

In grappling with climate change, one confronts 'super wicked problems,' a classification which reinforces the dynamism and intractability of the issue(s) faced (Levin et al.,

2012). Super wicked problems ratchet up the complexity of *normal* wicked problems. Levin et al. (2012) introduced the term to describe problems like climate change, which includes features of wicked problems but are also further complicated by time constraints, a lack of centralised authority, and a paradox where those seeking to solve the problem are also contributing to its perpetuation. In essence, super wicked problems are a yet more pernicious subset of wicked problems, distinguished by their urgency, governance challenges, and the feedback loops involved (Levin et al., 2012).

Within the context of climate change and NZT, characteristics qualify this problem as 'super wicked.' Firstly, these issues manifest in the interrelatedness of environmental, social, and economic systems, a perspective in systems thinking and complexity theory (Meadows, 2008). Actions or interventions in one domain impact others, leading to cascading, unpredictable effects. Secondly, the temporal specificity of these problems is not merely a function of time but an attribute demands urgent intervention (Adam, 1998). The repercussions of our present-day actions, or inactions, extend far into the future, influencing the well-being of generations yet unborn. Thirdly, the repercussive and unintended consequences of climate policies need to be carefully evaluated. For instance, certain climate policies can have a regressive impact on vulnerable populations, an issue closely scrutinised within environmental justice frameworks (Newell & Mulvaney, 2013). Lastly, navigating these wicked problems involves a double hermeneutic: our evolving understanding of climate change informs societal responses, and vice versa. This co-evolutionary process aligns well with hermeneutic theory, emphasising the act of understanding is dynamic and shaped by the interpreter's context (Duckett et al., 2020).

The wickedness of these issues presents challenges for policy-making and societal action. However, it also offers opportunities for innovative, systemic, and participatory

approaches to problem-solving. Recognising the wickedness of these problems is seen to help us develop sustainable strategies for achieving a net-zero society. However, research by Levin et al. (2012) suggests super wicked problems require more than economic solutions; they argue these problems require multi-disciplinary approaches including economic but also political, social, and technological solutions. While Gibson et al. (2013) see importance in policy facilitating Just transitions and addressing super wicked problems; where policy supports the transition to a low-carbon economy via regulatory frameworks, financial incentives, and promoting sustainable practices.

Climate change and NZT present a quintessential example of a super wicked problem, transboundary interdependence, and the conflicting objectives, perspectives, and interests of actors involved (Levin et al., 2012). According to Plummer and Baird (2013), dealing with the super wicked problem of climate change requires flexibility, shared decision-making, learning and adaptation; meaning a politically engaged approach bringing together stakeholders, including governments, businesses, civil society, and communities. However, as Termeer et al. (2019: p.167) caution, super wicked problems *"tend to provoke either paralysis or an overestimation of what policy can do"*. This again suggests a need to be more realistic in our expectations when managing super wicked problems, as with *normal* wicked problems. As noted above, the wicked problem framing may not always be valuable, as it inherently demands a holistic framing, which can lead to endless problem identification, over solution deployment. Thus, a super wicked problem framing may be even less useful. This is all given the fact that social science - and more recently natural science applied to the social sphere - has been attempting to universalize problem solving (Head, 2019). Notably the quandary persists, with the desire to solve problems totally on one side, and the desire to solve problems discretely and incrementally, on the other. This is why it may be more useful

to see Climate Change, or more specifically, the UK's NZT, not as a super wicked or even wicked problem with wicked solutions, but instead, as "*part of a complex continuum or typology of problem types"* (ibid. p.183), in other words: a *wicked narrative*.

2.4.e Wicked Narratives

Wicked Problems are monolithic, while they may be changeable, any solutions we deploy will causally create a proportionate problem elsewhere, within the Wicked Problem monolith (Rittel & Webber, 1973). Understanding these problems can be helped by recognising the narratives shaping them. While some narratives challenge established understandings, termed "counter-narratives" (Hermwille, 2016; Mora, 2014), others provide "metanarratives" (Lyotard, 1984) or "grand narratives" (Bernstein, 1991); still others posit 'antenarratives', these being the stories before stories (Boje, 2001). Where a metanarrative, is defined as a *"global or totalizing cultural narrative schema which orders and explains knowledge and experience"* (Stephens & McCallum, 2013, p.6).

The to-be explored wicked narratives (see Chapter 5), however, are distinct, specifically capturing the nature of persistent societal problems' variety of contradictions. As wicked transitional problems change, some elements remain consistent, while other aspects fall away, explained within the wicked narrative framework (Fisher, 1985). Wicked narratives are embedded in societal thought, hold the potential to shape perceptions, attitudes, and consequently, actions. Wicked narratives, like NZT are "socially constructed and contestable" (Winskel & Kattirtzi's, 2020), they present a framework for conceptualising NZT that goes "beyond uniform transition narratives" (ibid.). Here then, wicked narratives are not tales of wrongdoing,

but are metanarratives of mass contradiction (Bernstein, 1991; Bruner, 2002). Such narratives, while challenging to alter, impact transitions; a concept developed in Chapter 4 and 5 using Winskel & Kattirtzi's (2020) work to help describe contrasting contradictory, but ultimately simultaneously deployed and relevant, NZT narratives.

2.5 The Gaps

The identification of research gaps in the literature serves as an academic exercise for advancing understanding of wicked problems, and narratives in shaping the NZT; while the concepts and narratives introduced to explore these gaps are theoretical constructs to assist in understanding NZT. Scientific theories are conjectural and must undergo empirical testing to ascertain their validity. Therefore, the concepts proposed in this thesis are subject to empirical scrutiny, emphasised in the methodological debates on transitions (Geels et al., 2018; Markard et al., 2015). Narratives shaping transitions are increasingly acknowledged, but calls exist for them to be more thoroughly explored (Hermwille, 2016; Jasanoff, 2018). The concepts explore narratives and the practical aspects of transitions, a relationship noted as neglected in the literature (Shove & Walker, 2007); and aim to serve as an initial framework for addressing the identified gaps in the literature. These concepts and their testing are elaborated in subsequent sections of this thesis, contributing to the academic discourse NZT and wicked problems (Patterson et al., 2017). Exploring these gaps situates this thesis at the intersection of social, environmental, and policy dimensions, to better examine the UK's NZT (Sovacool et al., 2022).

While technological and economic aspects of transitions have been extensively studied, certain justice dimensions remain underexplored (Smith et al., 2005). The "Just transition" emerges as one narrative to address these gaps, emphasising a call for

sustainable, equitable and inclusive transitions (Heffron et al., 2018). The DNZ project foregrounds this narrative, potentially offering insights into how transitions manage justice and inclusivity (Carr-Whitworth et al., 2022). Certain academic discourse demands a rigorous exploration of the mechanisms through which the Justice narrative can be operationalized, to ensure the benefits and cost of transitions are equitably distributed (Jenkins et al., 2018). While the DNZ project presented the contention of a Just transition, a deeper engagement with the primary data and academic literature will be useful for better understanding the UK's NZT.

There also potentially exists a gap between the UK's wicked NZT problem, and the narratives of NZT: in understanding how narratives can help (re)frame wicked problems. This gap is both explored through the lens of 'Wicked Narratives', and through the systematic identification of NZT narratives coming from the academic literature, the DNZ Project's Final Synthesis Report (Carr-Whitworth et al., 2022), and further narratives identified from the DNZ primary workshop data. This gap is additionally explored using 'Transition Artefacts', building on work noting how research aimed at studying Wicked Problems are themselves tools for navigating Wicked Problems (Rittel & Webber, 1973; Buchanan, 1992; Head & Alford, 2013). The literature also suggests a need for more understanding of how change occurs, who drives it, and how it can be managed or influenced in the context of both wicked problems, and the NZT.

As we transition from the literature review to the methodology chapter, the focus shifts from theory to direct investigation. The methodology first details the DNZ project's methodology, as this formed the primary data collection for this thesis, and secondly lays out the analytic approach for exploring the proposed concepts, employing a multi-method approach, sensitive to the research questions (Creswell &

Poth, 2017). This empirical phase helps validate and refine the proposed narratives, concepts, and scientific aspects of subjecting theoretical propositions to scrutiny (Bhaskar, 1976). The following chapter will detail the methodological design, data collection, and analytical strategies employed to explore the gaps in the literature.

3.0 Methodology

The study explores the UK's NZT narratives, drawing from Fisher's (1985) perspective on narratives, human communication and decision-making. This recognises the relationship between narratives and policy outcomes, as outlined by Shanahan et al., (2011). In line with Tracy's (2019) qualitative concepts, this research uses self-reflexivity, context, and thick-description, while also addressing Tracy's emphasis on power dynamics and ethical considerations. The application of thick description, inspired by Geertz's (1973) work, provides understanding of the participants' perspectives and the socio-environmental context of the UK's NZT.

The DNZ project used multi-methods, incorporating literature reviews, workshops, and expert evaluations; aligned with recommendations for researching socio-environmental phenomena (Creswell & Poth, 2017). The literature review was conducted using peer-reviewed academic journal articles, adhering to established guidelines for ensuring the credibility and relevance of the sources (Booth et al., 2012). The criteria for article selection included relevant research questions, methodology choice, and contribution to knowledge on NZT. The three sets of workshops served as a participatory method, employing semi-structured questioning techniques to engage a range of stakeholders. This approach is rooted in the participatory research paradigm, which underscores the importance of incorporating multiple perspectives; for example, in studies on issues such as NZT (Reason & Bradbury, 2008). Expert evaluations complemented the data collection, providing specialised insights into potential actions for a rapid NZT. While expert opinions are fascinating, it is useful to acknowledge their limitations, including potential biases and the risk of

underrepresenting marginalised perspectives (Jasanoff, 2018); a point expanded on further in subsequent sections.

The data collected through these methods was analysed to identify key themes and recommendations, through triangulation and member-checking, to strengthen research findings (Lincoln & Guba, 1985). In addition to this, an ethical review was conducted to ensure all participants were treated fairly and with respect. This chapter provides an overview of the methodological approach, serving as a record of the actions taken. It also outlines some potentially notable limitations. Overall, the methodological approach for this research project is based on scientific principles, where it is hoped the findings serve as a resource for others to better interpret the UK's NZT.

3.1 Delivering Net Zero Project Methodology

> *"Obviously it would be so much easier if we could all meet up but, you know, that's the reality of the situation."* - DNZ Research Team Member, Workshop Facilitator

The DNZ Project aimed to deliver impact, in part, through well-organised and continuous interactions with a variety of stakeholder- participants. The project set out to have an interactive engagement process, based on an iterative approach of gaining initial thoughts and levels of consensus, in the first round of workshops, then gaining clarity and wider stakeholder opinions in the latter rounds of workshops. The aim of the workshops was not simply to elicit opinions on what should be done to achieve Net Zero, but rather to identify specific actions for different groups to make progress towards this goal. This required participants to move beyond their usual way of thinking and explore different possible futures, in the short and long term.

3.1.a Deliberative Method and Expert Stakeholder Engagement

DNZ employed a consensus conference method, which leverages expert and stakeholder deliberation techniques to build consensus on actions; in this context, for a rapid NZT in the UK. This methodological choice was grounded in the deliberative democracy model, which values informed dialogue in policy decision-making (Dryzek, 2009). To facilitate this approach, a stakeholder mapping process was conducted, categorising stakeholders into primary, secondary, and tertiary groups. This hierarchical categorization aligns with Freeman's stakeholder theory, prioritising stakeholders based on their level of influence and interest in the project (Freeman, 1984).

A communication strategy was developed to support stakeholder engagement, including a professionally designed website and media campaigns. This strategy was informed by principles of effective science communication, where messages are tailored to resonate with intended audiences (Nisbet, 2009). From an ethical standpoint, the recruitment of workshop participants underwent full ethical approval, adhering to established guidelines for conducting social research (BPSEC, 2021). Participants were recruited from a range of stakeholder groups: the research community, public sector, private sector, third sector, and funding and investment communities. This approach is grounded in the stakeholder salience model, emphasising power, legitimacy, and urgency in stakeholder identification. Additionally, the project adheres to principles of Equality, Diversity, and Inclusion (EDI), aligning with justice-oriented frameworks (Newell & Mulvaney, 2013). Four distinct channels were utilised for stakeholder identification:

1. The research team's direct contacts,
2. Consultation with UKRI Energy Programme staff,
3. Fellowships funded by NERC, EPSRC, and ESRC, and

4. Recommendations from the DNZ Advisory Board.

This multi-channel strategy is consistent with snowball sampling techniques, commonly used in qualitative research to identify hard-to-reach populations. The project engaged directly with 7 members of our Advisory Group, 9 document reviewers, 35 pilot workshop participants, and 85 actual workshop attendees.

3.1.b Participant Recruitment

The selection of workshop participants was initiated through a 'long-listing' process, a method aligned with stakeholder analysis frameworks emphasising the identification of affected or affecting parties (Reed et al., 2018). This long-list was systematically narrowed down through a desk-based exercise generated an 'expertise matrix'. The criteria for inclusion in the workshops were defined to align with the research objectives. Participants were required to: 1) engage in work related to climate change or energy policy; 2) possess experience in policy-making or influencing policy; 3) be based in the United Kingdom; and 4) have a record of academic publications relevant to the research topic. These criteria were consistent with the principles of purposive sampling, which advocates for the selection of participants based on specific, relevant criteria (Tongco, 2007). This approach to participant selection, however, invites critical reflection on the very notion of "expertise" in the context of NZTs. The criteria privileging academic publications, policy influence, and institutional affiliations risk reinforcing epistemic hierarchies that marginalize non-Western, Indigenous, or community-based knowledge systems vital to just transitions (Turnhout et al., 2020). By equating expertise with formal credentials and proximity to power structures, the workshops may inadvertently exclude actors whose lived experiences or grassroots innovations challenge dominant paradigms, a tension well-documented in transition

literature (Scoones et al., 2020). The final list of participants was largely assembled through a combination of purposive and convenience sampling techniques. While the use of purposive sampling was justified by its ability to yield rich, relevant data, the application of convenience sampling was acknowledged as a limitation due to its potential for introducing bias.

In selecting participants, attention was given to career stage, gender diversity, and ethnicity, aligning with the EDI principles outlined in academic literature (Bhopal, 2018). A total of 31 invites were sent for Round 1 Workshop A, and 27 for Round 1 Workshop B. Of these, 16 invitees either could not attend or did not respond, a response rate potentially worth considering when interpreting the findings (Baruch & Holtom, 2008), for the reasons below. For the Round 3 workshops, the original Round 1 participants were re-invited, a strategy supported by Reed et al. (2018) for ensuring longitudinal stakeholder engagement. A total of 31 participants attended, distributed between Workshop G and Workshop H.

In Round 2, the recruitment process was similar to Round 1 but incorporated - on the advice of the Advisory Board - enhanced Equality, Diversity, and Inclusion (EDI) criteria for long-listing potential participants. To identify key actors within each sector and Net Zero domain (supply, demand, and GGR), grey literature, including policy documents and organisational materials, was consulted. Stakeholders were categorised as 'incumbent' or 'disruptor', aligning with Winskel (2018.a) who sees continuity and disruptive innovations in system transitions. This categorisation served as an additional layer for participant diversification.

To balance stakeholder representation, a shortlist of 137 stakeholders was generated, comprising individuals from the private sector, public sector, boundary organisations, and research funders. Consistent with Reed et al. (2018), who advocate for

stakeholder diversity to enrich research outcomes, invitations were sent in a priority-based method. The workshops aimed for a size of 12-14 participants, a number Krueger & Casey (2014) suggest is manageable for focus group discussions. The research faced common challenges in stakeholder engagement, such as non-responses and late dropouts. In total, 41 non-academic stakeholders attended the Round 2 workshops, with 8 no-shows. The research funders' workshop had lower attendance due to late dropouts, leading to the omission of breakout rooms.

3.1.c Primary Data Collection: The Workshops

We did not just want expert opinions on how to deliver Net Zero - which could have been gained through the use of questionnaires (Oplatka, 2021: p.1886) - instead we wanted depth and discussion, we aimed for consensus building and a collection of solutions and their strategies for deployment, for the UK to deliver Net Zero. The DNZ methodology used workshops split across four rounds, initially defined in the project proposal as:

- Round 1: "Framing the Vision" - *"will focus on gathering and structuring knowledge and consensus building within the academic community."*
- Round 2: "Building the Vision" - *"will seek to understand stakeholder perspectives of the Net Zero challenge, future visions, and the constraints and opportunities with stakeholders from the public sector, private sector, boundary organisations and UKRI."*
- Round 3: "Comparing the Vision" - *"will reflect upon the vision and consensus thinking derived from the stakeholder groups participating in Round 2 and share for debate with the original academic participants in Round 1."*
- Round 4: "Sharing the Vision" - *"the final workshop will bring together academics and representatives from the stakeholder groups to agree the*

outputs of the project which will inform the production of a narrative on what is required to deliver a Net Zero future in the short-term (the next 10 years) and the longer-term (from 2030) guided and underpinned by the best academic evidence."

The definitions were slightly altered after the first round of workshops, seen in *Figure 3.1.c.i*; and as we will see later on, the intention for these rounds changed further, and the fourth round was eventually dropped as a workshop.

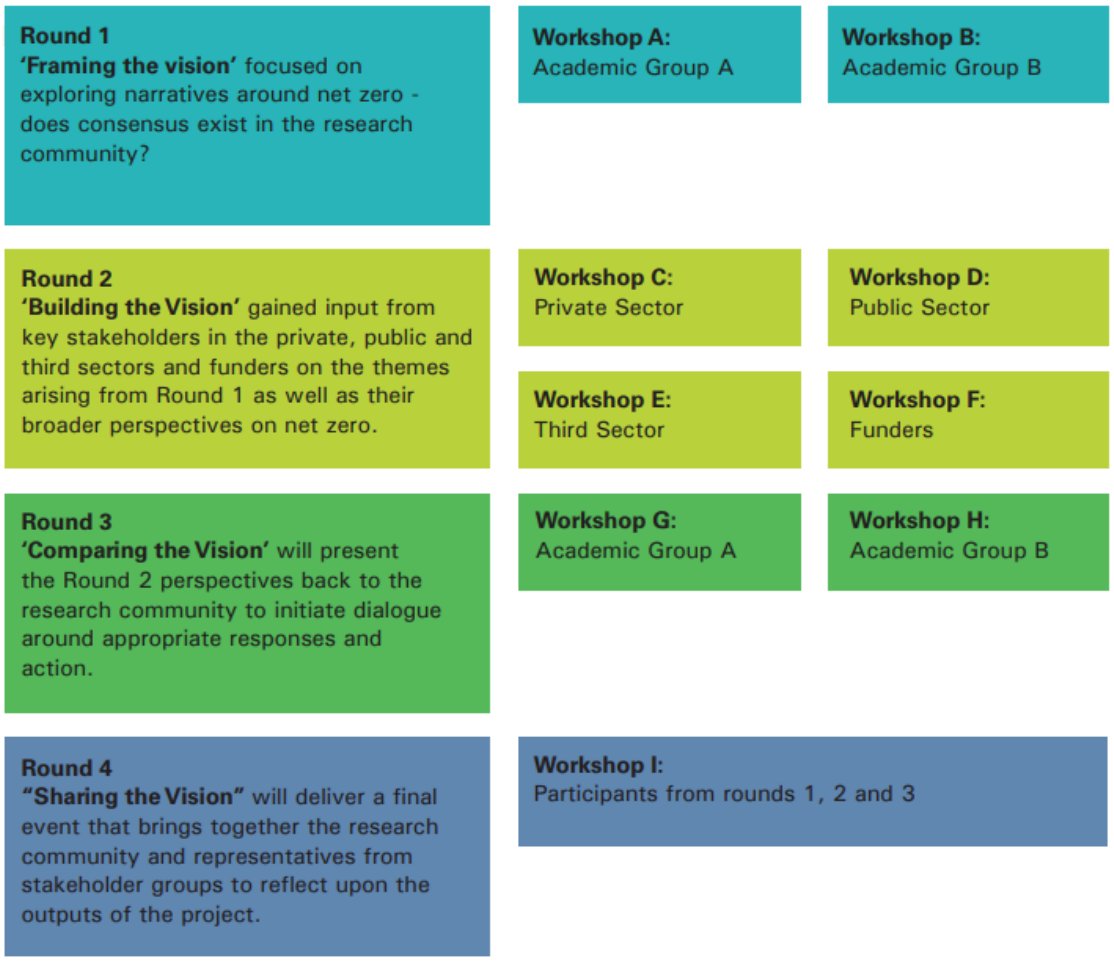


Figure 3.1.c.i taken from the Delivering Net Zero Project's "Analysis of Round 1 Workshop Results" (2021)

Workshops were chosen as the primary data collection method, for providing a breadth and depth of interactive dialogue beyond the capabilities of other methods such as document analysis, interviews, or surveys. Compared to document analysis, workshops actively engage participants in real-time discussions, enabling immediate clarification of ideas (Morgan, 2019). Interviews, while offering deep individual qualitative data, lack the collaborative consensus building potential of workshops, called for in the project proposal (Kamberelis & Dimitriadis, 2013). Similarly, surveys were discounted, being seen to inhibit collaborative consensus building, and while efficient for large-scale data collection, they were believed to too often constrain responses through predefined categories, reducing opportunities for the collective reflection through incremental, emergent knowledge building called for in the initial design of the second and third rounds of workshops (Bryman, 2016).

Although, as will be highlighted repeatedly below, this potentially sells-short surveys, especially approaches such as the Delphi method and yet more noticeably the Policy Delphi method explicitly designed for these kinds of research goals (Linstone & Turoff., 1975). Unlike a conventional survey or workshop setting, the policy Delphi method involves iterative, structured rounds of inquiry and feedback, often in a partially anonymised format, aimed at eliciting and refining divergent perspectives before converging on potential areas of agreement (Linstone & Turoff, 1975). Through managed questionnaires or other exchanges, participants are encouraged to critique and reflect on the range of viewpoints assembled, thus allowing for deeper exploration of contested assumptions while mitigating the risk that less dominant stances are overshadowed by vocal majorities. Usefully then, the DNZ research team were aware of the Policy Delphi method, and did attempt to employ some of it's common attributes, defined by Linstone & Turoff, (1975) as including:

- A panel of people knowledgeable about an issue is assembled and engaged in an anonymous, multi-round, structured dialogue on a question or problem.
- The process takes place over two or more rounds, beginning with an initial questionnaire that can be open-ended or more narrowly scoped.
- Responses from the initial round are synthesized and returned to panelists for their evaluation. Rating systems are commonly used to evaluate ideas, and more detailed written evaluations often are sought.
- Third and subsequent rounds refine the group's evaluation, and can open new lines of inquiry.

So, while this method was valued, and borrowed from, for example in the "panel of knowledgeable people", and "multi-round, structured dialogue on a [vague and transient] question or problem", as well as the synthesis and return of the initial round's outputs, along with rating systems; the DNZ workshops lacked some - potentially valuable, or even key - aspects. Notably, the workshops were:

- Not anonymous;
- There were arguably no simultaneously succinct and core questions or problems that were both consistently framed and reiterated to the "multi-round" participants.
- Slightly under half of the participants (the non-academic cohort), were not re-engaged within the workshop process. These participants did not experience "two or more rounds" of the method;
- While there were questionnaires sent to participants prior to the workshops, these data were secondary in importance, intentionally deployed to encourage engagement with the workshop topics so discussions would be more focused, informed, and aligned with the core research objectives;

- Only the academic participants benefited from having their initial contributions returned to them for re-evaluation; and,
- Finally, no participant was engaged in three or more rounds of the method.

With the project contextualised, workshops then have distinct advantages: capacity for immediate clarification, negotiation, and iterative consensus-building among diverse stakeholder groups (Morgan, 2019). This allowed the research team to explore perspectives simultaneously, with the intention being that it would also facilitate real-time convergence and divergence of viewpoints, ultimately combinable into actionable strategies for delivering Net Zero in the UK. The goal being that workshops would encourage participants to build upon each other's contributions, promoting qualitative insight not readily achievable through surveys or one-on-one interviews (Bryman, 2016). However, as will be discussed again when reflecting on the workshop rounds, the previously primary goal for consensus-building was ultimately reduced to simply being an area of interest; which - while providing the space for this thesis, and the reason why the 3rd Round of workshops did not follow the project's original aim - calls into question the reasons given for why workshops were chosen, over other methods.

Such workshops also have limitations, especially in the context of the DNZ project, being dependent heavily on participants' expertise, willingness to engage openly, and interpersonal dynamics potentially introducing biases linked to groupthink or dominant personalities (Janis, 1972; Morgan, 2019). More broadly, the quality of workshop outcomes relies on effective facilitation, raising concerns about facilitators' abilities to manage interactions objectively and inclusively (Krueger & Casey, 2014). Another limitation is the challenge in verifying the expertise desired from, and reliability of, participants' comments. Unlike document analysis, where data are typically sourced

from verified documents or literature, and ideally adequately referenced, workshop insights reflect participants' subjective experiences or perceptions, which may or may not be substantiated by empirical evidence (Kamberelis & Dimitriadis, 2013).

Additionally, participant recall can be subject to misremembering or reconstruction biases, resulting in inadvertently inaccurate or distorted contributions. Research highlights how memory can be unreliable, particularly in group settings where peer influence can shape recall (Janis, 1972). The accuracy and credibility of contributions were thus more challenging to validate, requiring careful interpretation and cross-verification with cited scholarship, another reason for the large Literature Review chapter. Ultimately, workshops were chosen for generating qualitative data through dialogue, seen as best enabling the consensus-building aspect of the project proposal. Though the method requires care across methodological planning, facilitation, and data analysis interpretations, to mitigate limitations related to variable participant expertise and evidence validation (Morgan, 2019; Bryman, 2016).

To help the team plan out our time and what resources would be needed to deliver the four workshops, I created a long-term, high-level quarterly plan (see *Figure 3.1.c.ii* below). However, it is worth noting here there were in fact only three rounds of workshops. The project's leadership team decided the fourth round was not workable within the time and budgetary constraints, and as a contingency the academics' comparison during round 3 would hold enough value. This was not decided until part way through the project, and as I was the designer of the round 3 workshops, this meant I needed to incorporate desired outcomes from both the initial round 3 and 4 project proposal. I will go into more detail on this below.



Figure 3.1.c.ii: High-level timeline for project delivery.

The workshops were conducted virtually via Zoom, utilising Mural software for collaborative note-taking. This methodological choice is in line with the increasing adoption of virtual platforms in academic research, especially in interdisciplinary settings (Salmons, 2020), note the timing and impact of the Covid epidemic on the choice to adopt a virtual approach. The workshop design involved team members from engineering, psychology, social sciences, communications, and management, a concept

supported by Repko & Szostak (2019), who argue that these socio-environmental challenges require interdisciplinary solutions. However, this view is not universally supported, with investigations into the value of interdisciplinarity showing lack-lustre results (Winskel, 2018.a). Prior to the main workshops, extensive piloting was conducted using contacts of the research team and students. This step helped to refine the research instruments and is strongly advocated in the literature (van Teijlingen & Hundley, 2001).

Prior to each workshop, participants were supplied with concise reports, ranging from 4-5 pages, on key topics slated for discussion. I contributed to the authorship of these reports, specifically penning the one on energy supply. Pre-work is supported by Rowe and Frewer (2005), who argue pre-circulating materials can enhance the quality of stakeholder discussions by establishing a common ground. These background documents were collaboratively written by the research team and underwent a rigorous peer-review process by external experts. The background documents were made publicly accessible, adhering to the principles of open science, which advocates for the transparent dissemination of research materials. These documents can be accessed via the project's official website Delivering Net Zero.

To address the challenges with workshops mentioned above, extensive pre-workshop preparations were conducted, including concise background reports and pre-work to establish a foundational understanding among participants (Rowe & Frewer, 2005). Participants were required to complete pre-work forms, a methodological choice supported by the utility of pre-survey questionnaires in qualitative research. These forms were designed to solicit responses to questions prior to the workshop, serving dual purposes: enriching the dataset and scene setting the workshop discussions (Creswell & Poth, 2017). This pre-work attempted to mitigate the risks in workshop

style data collection, by ensuring participants' contributions were informed by current evidence and contextually grounded.

3.2 Round 1 Academic Workshops

The initial round of workshops engaged UK academics, a selection process underpinned by stakeholder mapping techniques (Reed et al., 2018). Two workshops were conducted in this phase, each with 23 and 19 participants respectively, and both adhered to identical research methods and protocols to ensure methodological consistency (Creswell & Poth, 2017). The academic participants were subsequently categorised into three groups: energy supply, energy demand, and Greenhouse Gas Removal (GGR). This categorisation was designed to capture a range of academic perspectives, to achieve interdisciplinary approaches in addressing socio-environmental challenges. However, note that disciplinary silos (energy supply, demand, GGR) are seen to compartmentalise expertise in ways that contradict NZT's perceived interdependent and interdisciplinary challenges (Winskel, 2018.a). Some participants, identified as outliers, possessed 'whole-system knowledge.' These individuals were either integrated into the larger disciplinary groups or designated as 'spokes' council members. While the inclusion of 'whole-system' experts attempted to mitigate compartmentalizing expertise, their identification through conventional academic networks rightly raises questions on whose systemic knowledge is deemed legitimate (ibid.). A critique echoing concerns mentioned in the Literature Review on participatory processes in sustainability research, where technical expertise often overshadows situated, contextual knowledge (Jasanoff, 2018), narrowing the scope of feasible solutions to those aligned to incumbents.

In Zoom, participants were pre-assigned to breakout groups focused on the energy supply, energy demand, and Greenhouse Gas Removal (GGR) groupings. The smaller size of the GGR group was indicative of its narrower field of study, this is a categorisation strategy supported by the Delphi methods mentioned above.

Nine members of the research team, including myself, facilitated the workshops. Each breakout room was managed by two facilitators, a practice consistent with focus group methodologies (Krueger & Casey, 2014). One facilitator led the discussion, while the other utilised Mural software for note-taking, integrating digital tools into the qualitative research process. The primary objective of the first round of academic workshops was to find actions, priorities, and processes for achieving Net Zero emissions. This approach was rooted in the principles of participatory action research, which advocates for stakeholder engagement in shaping research and policy directions (Reason & Bradbury, 2008).

3.2.a Round 1 Sessions

The first round of workshops engaged participants in discussions about the UK's transition to Net Zero. The workshops commenced with a brief introduction by the lead facilitator, on the study's aims and the workshop format (Krueger & Casey, 2014). This initial presentation was intentionally devoid of slides to foster an interactive, less didactic, environment (Flick, 2018).

Participants were then divided into three breakout groups focusing on energy supply, demand, and Greenhouse Gas Removal (GGR), aligning with the tripartite framework commonly used in energy transition studies (Sovacool et al., 2022). The first session in these groups involved a frame-setting exercise, where participants engaged with curved graphs designed to represent the non-linear trajectory of emissions reductions and

removals. This approach was informed by systems dynamics literature, which emphasises the importance of understanding feedback loops and non-linear relationships in systems (Sterman, 2000). The graphs were designed to encapsulate key variables affecting the rate of decarbonisation, such as technological innovation and behavioural change (Geels et al., 2018).

The subsequent session 'opened out' the discussion, encouraging participants to identify and discuss options, policies, and barriers to NZT. Informed by Stirling's (2007) work on 'opening up' and 'closing down' appraisal methods. The session was intentionally designed to be 'messy', allowing for a diversity of opinions and fostering innovative thinking. The Spokes Council was a more irregular methodological feature, aimed at identifying cross-cutting issues and ensuring the breakout groups were not operating in silos (Ansell & Gash, 2008). The Spokes Council comprised individuals with expertise in whole-systems thinking, and their role was to reflect on the discussions from the breakout groups and identify overarching challenges and opportunities.

Periods of 'lone reflection' were integrated into the workshop design to counteract potential 'groupthink' (Janis, 1972). During these periods, participants were encouraged to consider the Social, Technological, Economic, Environmental, Political, Legal, and Ethical (STEEPLE) implications of the discussed options, drawing from business and management literature (Aguilera et al., 2004). Post-lunch sessions were dedicated to 'closing in' on a coherent narrative for achieving Net Zero. The consensus-building process was adapted from the third sector, to identify areas of agreement and disagreement without resorting to majority rule (Mansbridge et al., 2010). This approach was effective in pilot studies, especially in an online setting where non-verbal cues are limited. While the final plenary session synthesised the discussions into

overarching narratives, drawing on 'narrative policy frameworks' (Shanahan et al., 2011). Participants were invited to reflect on questions, linking the workshop's micro-level discussions to macro-level policy considerations, supported by multi-level perspective literature (Geels et al., 2018).

Round 1 workshops used a methodological and theoretically informed approach to primary data collection, drawing from academic literature spanning energy transitions, participatory modelling, governance, and social innovation. For reference the Figure 3.2.a.i below shows the timetable used for the Round 1 sessions.

Figure 3.2.a.i: Round 1 workshop timetable

Time	Length	Activity	Location
09:00	15mins	**Workshop opens; tech check of Zoom and Mural**	Plenary
09:15	15mins	**Welcome and workshop overview** Facilitator presentation (no slides)	Plenary
09:30	10mins	**Group introductions** Each person introduces themselves and area of expertise	Breakouts
09:40	10mins	**Opening exercise: Deployment and complexity curves** ● Facilitator introduces opening activity ● Presentation demonstrating the need to consider magnitude, deployment rate and complexity of Net Zero solutions	enary; presentation using shared screen
09:50	20mins	**Exploring the curve** Participants discuss and move the curve **Spokes Council meeting** Runs simultaneously	Breakouts, Spokes Council group
10:10	10mins	**Curve feedback** ● All the curves put together on screen ● An understanding is developed in relation to what all groups hope to achieve and if this is ambitious enough	Plenary; shared screen
10:20	10mins	**Coffee break**	
10:30	50 mins	**Opening out: Group exploration** ● Participants get set up on Mural ● Participants share answers from pre-work, followed by discussion	Breakout groups

		• Spokes Council leaves after 20 minutes	
11:20	15mins	**Feedback to plenary** • Feedback from Spokes and breakout room facilitator • Spokes present their challenges to the different groups in relation to overarching considerations	Plenary
11:35	15mins	**Lone reflection time** • Participants reflect on the 'opening out' items and STEEPLE considerations	Individually
11:50	30mins	**Finalising the opening out (Facilitators)** • Discuss outcomes of lone reflection, add STEEPLE considerations and any last reflections or items	Breakout groups
12:20	50 mins	**Lunch**	
13:10	5mins	**Consensus process explanation** • Facilitator explains consensus process • Participants get their four cards ready	Plenary; presentation using shared screen
13:15	50 mins	**Closing in: Group consensus building** • Participants prioritise ten items • Five short-term (next 10 years), five long-term (after 2030) • Consensus process run after each five	Breakout groups
14:05	10 mins	**Coffee break**	
14:15	30mins	**Closing in: continued** • Participants to place items on the 2x2 Matrix: 10 priorities as long/short-term, high/low-impact • Discussion begins when items have mostly stopped moving **Spokes Council meeting** Runs simultaneously	Breakout groups plus Spokes Council group
14:45	20mins	**Plenary feedback** Groups summarise and spokes identify any remaining challenges	Plenary
15:05	10mins	**Coffee break**	
15:15	10mins	**Lone reflection time** Reflect on the plenary feedback and the placement of the items on the Matrix	Individually
15:25	30mins	**Finalising and refining the Matrix: Group consensus building** • Session begins with Spokes feedback to breakout groups • Discussion of Matrix • Consensus process run	Breakout groups

15:55	35mins	**Plenary consensus building: Can we converge around one narrative?** • Facilitator brings together the three 'narratives' on one 2x2 Matrix • Plenary discussion	Plenary, shared screen
16:30	5 mins	**Closing remarks**	Plenary
16:35		**Workshop close**	

3.2.b Round 1 Reflections

The Round 1 workshops were designed with four aims, each of which was informed by a distinct body of academic literature. The first was to employ a bottom-up approach for identifying actions, priorities, and processes for achieving Net Zero, drawn from the expert perspectives across fields (Funtowicz & Ravetz, 1993). This aim was largely met, as evidenced by the range of experts who participated in the workshops. However, it is important to acknowledge the results were influenced by the selection of participants, a limitation inherent in any expert elicitation study (Morgan, 2019). The methodological approach also achieved a level of interdisciplinarity, involving all eleven members of the research team in the process. However, no assessment was made into the value gained or lost through the interdisciplinarity of the attendees' discussions. The bottom-up approach allowed for the exploration of less conventional pathways to Net Zero, contributing to the literature by introducing new perspectives and narratives (Stirling, 2006). However, the attempt to identify 'branching points' was less successful, as the discussions did not lend itself to such clear bifurcations, a challenge noted above in studies dealing with systems (Sterman, 2000).

The second aim, to integrate discussions on energy supply, demand, and Greenhouse Gas Removal (GGR), proved to be more challenging. Academic and policy discussions in these domains are siloed, each containing multiple sub-topics and 'sub-siloes'

(Sovacool et al., 2022). As noted previously, some researchers view NZT as heavily interlinked, so efforts to categorise discussions solely on supply, demand, and GGR are difficult (Sovacool et al., 2022; Turnheim et al., 2015). This categorisation can reduce visibility of cross-cutting themes such as policy, governance, and societal practices, elements that often lie at the intersection of what might otherwise appear to be distinct fields. Scholars also note that categorising expertise in narrow ways constrains the breadth of potential findings, especially when transitions rely on dialogue across disciplines, sectors, and communities (Stirling, 2014).

As a direct learning from the above, and grounded fully in inductively analysing the Round 1 workshop data, I first helped to design the second round of workshops, and then led on designing the third round of workshops to accommodate a wider scope of participant perspectives. Rounds two and three did not have the previous supply-demand-GGR structure, so participants were encouraged to engage with topics beyond and more deeply within their backgrounds. This approach is aligned with consistent calls from DNZ participants to acknowledge the role of justice in climate governance and to explore how various research, policy, and industry actors address shared challenges (Jasanoff, 2018; Sovacool et al., 2022). Such broader engagement did not presuppose holism's superiority; instead offering additional opportunities to compare how experts conceptualise, agree on, and disagree on, NZT within and across their respective domains (Turnheim et al., 2015; Winskel, 2018.a). However, the richness of the subject matter and the constraints of an online format potentially limited the extent to which this aim could be fully realised. Despite efforts to mitigate *"Zoom Fatigue"*, such as shorter workshop durations and more frequent breaks, participant fatigue was observed, potentially affecting the quality of discussions (Salmons, 2020)).

The third aim was to clarify points of consensus and dissensus, an objective which in principle would have been advanced through the many consensus-building sessions illustrated in Figure 3.2.a.i (Mansbridge et al., 2010). These sessions were intended to table not only broad areas of agreement, but also precisely extract all opposing views among participants, thereby generating insights into why divergent perspectives exist (Ansell & Gash, 2008); therefore subsequently allowing participants to rigorously engage in thoughtful discussions which would lead to disagreements being collaboratively overcome, and dissent adequately and fairly managed.

However, throughout the workshop (and across the proceeding workshops) this consensus-oriented approach quickly came into tension with an equally important, often participant-led, commitment to fostering a space for discussion and idea generation, on a multiplicity of visions, experiences and perspectives on NZT. This tension, which permeates many participatory research and co-creation methodologies (Smith et al., 2005), highlights the risk that a drive towards unifying narratives can not only overshadow less dominant viewpoints or alternative ways of framing the debate, but when implemented without systematic care, can also be immensely difficult to achieve (Crano, 2000). While consensus-building can be valuable for establishing shared points of reference, it can also constrain the scope for truly inclusive engagement in which minority or marginalised positions are not only acknowledged but thoroughly integrated into the deliberation process (Dryzek, 2009).

By employing aspects of the Policy Delphi methodological design, the project reacted to and partially addressed tensions identified within the workshops, particularly the challenge of balancing consensus-building with the inclusion of alternative framings, by continuously preserving space for both initial disagreements and the consideration of minority opinions, both prior to and during the workshop sessions via pre-work and

reflection time, respectively; this then influenced the design of the next workshops. Since responses in a Policy Delphi process are subjected to iterative, anonymous, feedback loops, it aims to give greater clarification of the reasons behind participants' dissent, leading to more transparent and systematic management of disagreements (Linstone & Turoff, 1975). However, due to the DNZ project only involving three rounds of workshops, and only half of the participants being involved in more than one workshop round, the full benefits of the method were likely unrealised.

In practical terms, this tension manifested in almost every session of all the three workshop rounds, even during the plenary sessions and Spokes Councils, where consensus-building was not systematically sought. The original methodology had envisaged a clear process of iterative discussion to identify agreements and disagreements on how to NZT, with a view to collaboratively and systematically documenting and addressing the reasons behind any divergences; however, this systematic activity did not remain the primary goal of the project. As a result, the workshops at times focused on cultivating a common storyline for energy futures, fostering group cohesion, yet did not always provide sufficient avenues for exploring deeper disagreements or inviting the full breadth of possible perspectives (Scoones, et al., 2020). Further, while some participants were enthusiastic about forging a coherent, unified set of NZT recommendations, others sought space for more diverse, even conflicting, interpretations of how multiple NZT pathways could unfold. Thus, although building consensus around specific insights was, especially initially, important, efforts gradually moved to upholding an inclusive approach, recognising that multiple narratives and socio-technical imaginaries of energy transitions could justifiably coexist (Jasanoff, 2018).

The workshops used facilitation techniques that incorporated collective decision-making sessions, ensuring that disagreements were explicitly surfaced and documented, not subsumed under a drive to reach convergence. Methods such as breakout groups, rotating dialogue sessions or positional mapping exposed and preserved the newly favoured divergent viewpoints (Kattirtzi & Winskel, 2020; Reed et al., 2018); these could then be brought back to plenary discussions to enrich collective reflections. Likewise, while I eventually decided to discontinue the Spokes Councils in round 3, to engage all participants more directly, I did consider using the Spokes to systematically track and revisit underrepresented perspectives, balancing the dual objectives of building consensus and cultivating multiple NZT understandings (Smith et al., 2005). Such an approach could have strengthened the pluralistic ethos of the workshops, making the tension between consensus-building and inclusivity more transparent. This methodological refinement would not eliminate the tension, nor is that necessarily desirable, given the value of both unity and diversity, but it would create a structured space in which the creative frictions between competing visions can be productively harnessed rather than inadvertently suppressed.

The fourth aim was to identify key gaps in knowledge. The workshop process facilitated the sharing of literature and evidence among participants from diverse backgrounds, contributing to greater understanding of NZT. However, similar to aim three, it is worth noting the identification of knowledge gaps was not a primary focus of the Spokes Council, another aspect worth incorporating in future workshops to enhance the comprehensiveness of the findings. Round 1 workshops achieved most of their aims, albeit with some limitations, and a lot of learnings. The methodology was informed by a range of academic, private and public literature. The subsequent sections

present modifications made for the Round 2 workshops, informed by the reflections and learnings from Round 1.

3.3 Round 2 Stakeholder Workshops

Informed by an iterative methodology, adjustments were made to the design of the Round 2 workshops based on reflections from Round 1. This iterative approach aligns with the principles of action research, which emphasises learning through doing (Lewin, 1947). Specifically, the methodology for Round 2 was simplified to mitigate the effects of Zoom fatigue (Salmons, 2020). Unlike Round 1, participants were not categorised into groups based on energy supply, demand, or GGR. This decision was made to foster 'whole-systems' thinking (Winskel, 2018.b). The design process remained collaborative, involving the entire research team, and the funders of the research.

The second round of workshops engaged non-academic stakeholders, identified through a stakeholder mapping process, a technique supported by Reed et al. (2018). Four workshops were conducted, each employing identical methods and protocols. Participants were pre-allocated to one of two breakout groups, not based on thematic focus but rather to manage discussion size. The groups were also balanced in terms of Equality, Diversity, and Inclusion (EDI) characteristics and organisational types. Unlike Round 1, a 'spokes council' was not utilised, and plenary sessions were minimised, focusing only on facilitator feedback. Each breakout group was managed by two team members, one facilitating the discussion and the other taking notes.

The primary objectives of Round 2 were twofold: firstly, to understand the key priorities for achieving Net Zero from the perspective of non-academic stakeholders, both individually and organisationally; and secondly, to gather responses to the academic priorities identified in Round 1. These aims are consistent with the literature

on transdisciplinary research, which emphasises the potential value in integrating knowledge from both academic and non-academic stakeholders (Winskel, 2018.b). Similar to Round 1, the workshops sought to identify areas of consensus and dissensus concerning the short-term and long-term aspects of achieving Net Zero, continuing to resonate with the Policy Delphi method (Linstone & Turoff, 1975). However, as noted above, I firstly provided academic reasoning for why consensus-building should no longer be the primary focus for this round, subsequently designing the 3rd round of workshops to explore beyond this. Instead, in this round the agreements and disagreements between experts would be highlighted as - while unlikely to be resolved - still a valuable research avenue for NZT, when "develop[ing] methods which acknowledge the diversity of expert perspectives and reasoning on the key uncertainties and choices involved" (Kattirtzi & Winskel, 2020).

3.3.a Round 2 Sessions

The Round 2 workshops commenced with an introductory session led by the principal investigators, providing an overview of the project's objectives. This aligns with the best practices in workshop facilitation, which emphasise the importance of clearly stating the goals and agenda at the outset (Linstone & Turoff, 1975). Participants were then allocated to breakout rooms, where they introduced themselves and their respective organisations. This initial discussion focused on participants' understanding of 'Net Zero', and was participant-led, with facilitators ensuring inclusive participation (Mansbridge et al., 2010).

The subsequent session utilised the Mural platform to explore the opportunities and barriers to achieving Net Zero. Participants first shared thoughts on their pre-work, a method aligned with 'flipped classrooms' in educational theory (Bergmann & Sams, 2012). This was followed by an in-depth discussion, facilitated by prompt questions to

understand the urgency and commonalities in participants' experiences. The session also probed into the decision-making processes within stakeholders' organisations, echoing the stakeholder theory's emphasis on understanding the influence dynamics among different groups (Freeman, 1984). The mid-morning session identified commonalities and areas of dissensus concerning the opportunities and barriers to Net Zero. This session focused on the temporal aspects of these issues, categorising them into short-term (up to 2030) and long-term (post-2030) challenges.

Before lunch, participants were introduced to the academic themes identified during the Round 1 workshops. This was followed by a 'lone reflection' period, a technique supported by research on the benefits of solitary reflection in group settings (Winskel & Kattirtzi, 2019). Participants were asked to rank these themes, both in terms of agreement and priority, using the Mural platform set to 'incognito mode', a feature to minimise groupthink by allowing anonymous input (Janis, 1972). Post-lunch, the 'incognito mode' was deactivated, and participants discussed their rankings.

With the final session having been designed to gather feedback for the academic community, focusing on identifying additional knowledge gaps and understanding the stakeholders' needs from the research community. The session concluded with a plenary feedback round, adhering to best practices in workshop facilitation. For reference the timetable for rounds 2 is shown in figure 3.3.a.i below.

Figure 3.3.a.i: Round 2 workshop timetable

Time	Length	Activity	Location
09:00	10 mins	**Workshop opens; tech check of Zoom and Mural**	Plenary
09:10	10 mins	**Welcome and workshop overview** Facilitator presentation (no slides)	Plenary

09:20	10 mins	**Group introductions** Each person introduces themselves and area of expertise	reakout groups
09:30	20 mins	**Why are you interested in Net Zero?** Open discussion	reakout groups
09:50	65 mins	**Opportunities and barriers to Net Zero** • Participants get set up on the Mural • Participants share opportunities and barriers, from the pre-work • Group discussion	reakout groups
10:55	20 mins	**Coffee break**	
11:15	10 mins	**Feedback to plenary** • Feedback from discussion facilitators	Plenary
11:25	40 mins	**Commonalities, temporalities** • Identifying common opportunities and barriers from the previous session • Short and long-term aspects	reakout groups
12:05	10 mins	**Feedback to plenary** Feedback from discussion facilitators	Plenary
12:15	10 mins	**Introducing key research community themes** acilitator presents and explains the eight key themes identified from the Round 1 workshop analysis (no slides)	Plenary
11:25	15 mins	**Lone reflection time** • Participants reflect on the eight themes • Themes placed on the Mural, according to participants' priorities and level of agreement • Mural in 'incognito mode'	Individually
12:40	45 mins	**Lunch**	

13:25	45 mins	**Discussion of Research Community themes** • Discussion of the themes • Discussion of areas of consensus or dissensus • Identification of anything missing	reakout groups
14:10	15 mins	**Key messages for the research community** • What do participants need from the research community? • How should they engage?	reakout groups
14:25	5 mins	**Plenary feedback** Groups summarise and spokes identify any remaining challenges	Plenary
14:30	5 mins	**Closing remarks**	Plenary
14:35		**Workshop close**	

3.3.b Round 2 Reflections

The Round 2 workshops were designed with multiple objectives in mind: to stimulate dialogue among a set of stakeholders from non-academic sectors; to ascertain the alignment between academic and non-academic perspectives on opportunities, barriers, and key issues; and to identify knowledge gaps and avenues for enhancing collaboration between the research community and other organisations.

Recruitment proved to be more challenging than for academic participants, a phenomenon observed in stakeholder engagement literature, which cites time constraints and differing priorities as barriers to participation (Reed et al., 2018). Despite these challenges and last-minute changes to the attendee list, the sample ultimately included a wide array of organisations and sectors, featuring both 'incumbents' and 'disruptors'; useful for capturing the variety within socio-environmental systems thinking. However, promoting 'whole-systems' thinking remained a challenge, corroborating the literature on the difficulties of transcending

disciplinary and sectoral silos (Winskel, 2018.b). These observations informed the planning for the subsequent Round 3 workshops.

The methodology elicited discussions around the eight themes identified from the academic workshops. Stakeholders presented a high degree of reflexivity, a valuable quality in the literature on participatory research. However, the discussions extended beyond the framing of the themes, illustrating the challenge of distilling qualitative focus-group data into simplified statements; acknowledged in the science communication literature (Nisbet, 2009). Intriguingly, but not surprisingly, despite the richness of the discussions, consensus on a unified narrative on the meaning or implementation of Net Zero remained elusive, reflecting the 'wicked' nature of NZT (Rittel & Webber, 1973).

The Round 2 workshops generated data on knowledge gaps and potential improvements in cross-sector collaboration. Aligning with the literature emphasising the importance of iterative learning and adaptation in such work (Pahl-Wostl, 2009). Insights gathered were used in shaping the Round 3 workshops, where the dialogue was re-presented to the academic community. Overall, the Round 2 workshops achieved their objectives to varying degrees, offering both successes and lessons for future engagement.

3.4 Round 3 Return of the Academics Workshops

For the third round of workshops, I assumed the role of primary designer, allowing me to blend my academic backgrounds in sociology and environmental studies with the practical application of designing our research methodology and facilitating the actual workshops. The third and final round of workshops revisited the academic participants from Round 1 and engaged them in discussions informed by the outcomes of both

preceding rounds. In line with the previously noted principles of iterative methodology (Pahl-Wostl, 2009), the design of Round 3 was influenced by reflections on the successes and limitations of Rounds 1 and 2. Similarly, this continued the collaborative ethos of the DNZ research team and maintained the emphasis on the importance of interdisciplinarity in addressing socio-environmental challenges. At this stage of the research process there was still little desire to question the validity that interdisciplinarity was a valuable aim (Winskel, 2018.a). To guide my design, I decided to revisit the initial research questions from the proposal to UKRI, as I felt this would be the best way to ground my workshop design while also rounding out both the workshops and the project as a whole.

Drawing on the initial research questions helped ensure the workshops remained aligned with the overarching goals of the project. It was crucial the discussions in this final round not only reflected upon the learnings from the previous rounds but also pushed our understanding. In doing so, I sought to create a platform for engaging with the themes of NZT and encourage participants to evaluate the progress made so far. The second set of knowledge I wanted to draw from were the previous workshop rounds, as these sessions had accumulated a wealth of data and insights. This retrospective approach was vital for maintaining continuity and ensuring the learnings from earlier discussions were not lost but rather built upon.

Analysing the content and dynamics of the previous rounds allowed me to identify key themes, recurring challenges, and areas where exploration was needed. It was imperative Round 3 not only served as a culmination of the discussions but also as a platform for synthesising these insights into actionable knowledge. By adopting a flexible goal alignment and exploration of emergent theories and variables, the DNZ project created a conducive environment for examining the concepts of Net Zero,

'Wicked Problems', and 'Just transitions'. Drawing from Rittel and Webber's (1973) 'Wicked Problems', participants explored the challenges inherent in the UK's low carbon transition. Building upon discourse on 'Just transitions', the DNZ project documented narratives for crafting a just NZT.

The high-level thinking on this culmination is documented in Figure 3.4.i below:



Figure 3.4.i Research Objectives, to Workshop Rounds

In designing the third round, I paid attention to the methodological approach, seeing it was reflective of the perspectives gathered in the previous sessions. This involved structuring the workshops to encourage open, yet focused, discussions, enabling participants to explore NZT. The methodology was designed to be flexible, allowing for adaptation based on participant feedback and emergent themes during the discussions. Facilitation of these workshops was geared towards nurturing

collaboration. Achieved via a sense of shared purpose among participants and encouraging a multidisciplinary exchange of ideas. My role as a facilitator was to gently guide the discussions to remain on track with the aims of the research, and to actively listen, observe, and capture the depth and breadth of the conversations.

The transcripts helped in answering the initial research questions, and in writing reports hoped to guide future directions for subsequent research and policy-making in the area of NZT. I designed and facilitated the workshops to make sure the project's goals were met and discussions were productive, as well as to provide myself with the primary data required for my doctoral research.

3.4.a Round 3 Sessions

Two workshops were conducted in this round, with 12 and 16 participants respectively, along with an observer from UKRI in each session. The workshops were held online, a decision influenced by the ongoing COVID-19 pandemic and its associated uncertainties. The number of participants in each workshop was partly determined by the availability of the experts, a common logistical challenge in expert elicitation studies (Morgan, 2019). Consistent with Rounds 1 and 2, the methodology and protocols for both workshops were identical. Participants were pre-allocated to breakout groups, with the aim of facilitating manageable discussions. Spokes councils were not employed, and plenary sessions were limited to briefings and debriefings by the facilitators. Each breakout group was facilitated by three team members, one leading the discussion and two taking notes using the shared Mural boards. The dual facilitation on Mural was intended to streamline the data collection process, allowing for more, and more nuanced, capture of participant contributions (Saldaña, 2016).

The primary objectives of Round 3 were: firstly to provide a platform for academics to reflect on the findings from their initial workshops, fostering a sense of continuity and iterative learning (Pahl-Wostl, 2009). Secondly, to expose academics to the priorities articulated by non-academic stakeholders in Round 2, aligning with the literature underscores the importance of multi-stakeholder engagement in sustainability transitions (Reed et al., 2018). Thirdly, to concentrate discussions on specific solutions for achieving Net Zero, addressing a perceived shortcoming of Round 1. This focus on solutions is consistent with the literature on 'solution-oriented science' (Kates et al., 2001). Lastly, to identify key research areas and messages for UK research funders, and providing the key deliverables UKRI funded the research with the aim of obtaining. Thus, Round 3 was designed as an integrative and reflective phase, to synthesise insights gathered from the previous rounds while also identifying actionable steps for future research and policy. The following Figure 3.4.a.i elaborates on the weekly progress needed to deliver these final workshops.

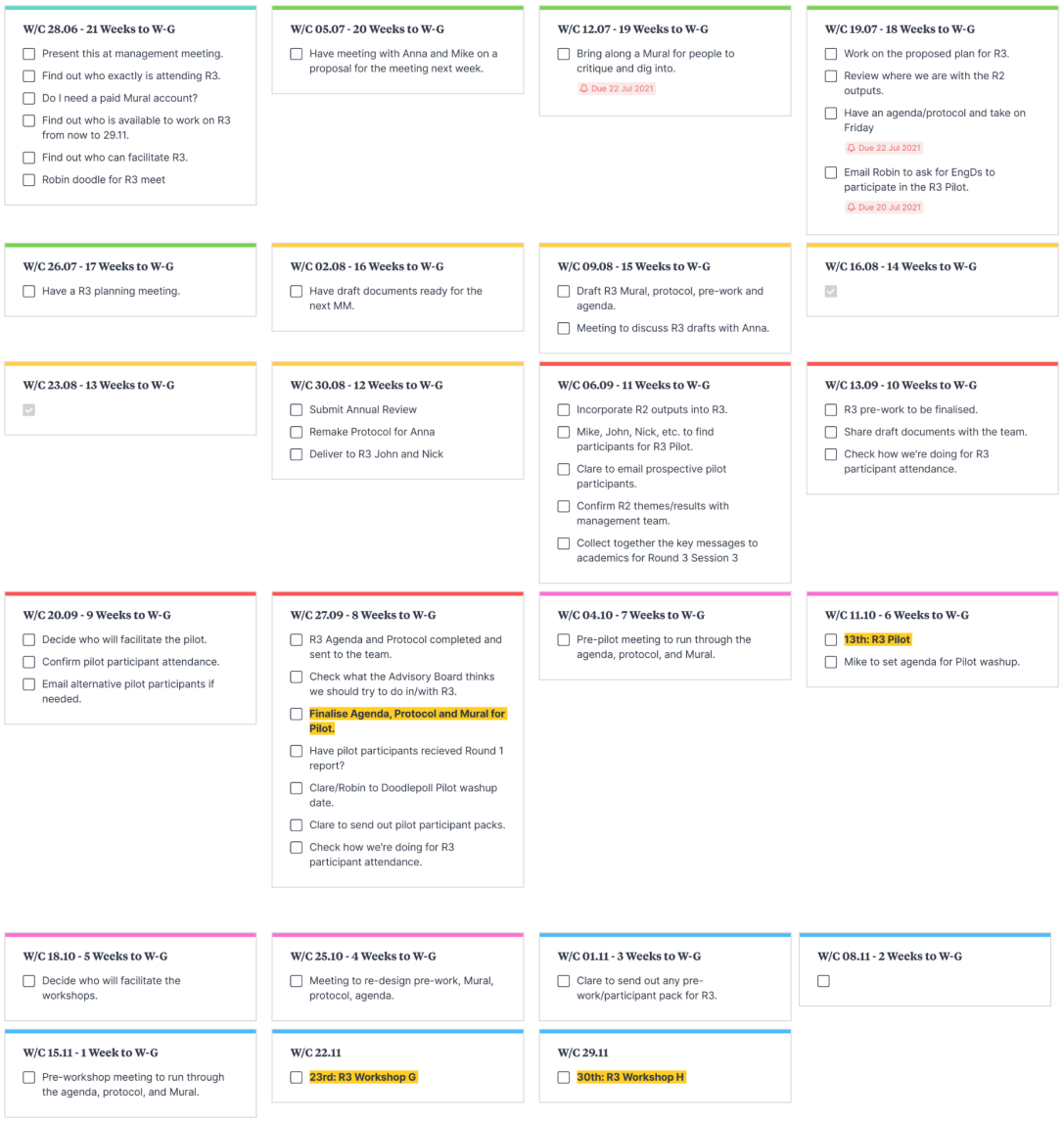


Figure 3.4.a.i Weekly breakdown of Round 3 preparation

I designed the workshops to begin with an introductory session, which I structured to provide a clear, concise overview of the project's objectives, setting the stage for informed and focused discussions. Following the introduction, participants were guided into their respective breakout rooms. Here, my design of the session influenced how I prompted participants to explore discussions about their institutional affiliations and

their engagement with NZT. This part of the session was structured to elicit perspectives of stakeholders' views on Net Zero.

Subsequently, the session transitioned into a facilitated open discussion. Drawing from the outputs of Round 1, which participants were expected to have reviewed beforehand, I introduced questions designed to probe NZT. Questions such as *"Are these the most important themes relating to Net Zero?"* and *"Where is there consensus (or lack thereof) in the group and in the UK as a whole?"* were strategically posed. These questions were conversation starters to stimulate critical thinking and encourage participants to reflect on, and challenge Net Zero narratives.

This stage of the workshop contributed directly to gathering perspectives. As the lead designer, my responsibilities included both guiding discussions and participating in exchanges with stakeholders, where I documented variations in their positions. Engaging in this way supported the DNZ project's goals and provided my research with perspectives shaped by direct engagement. These exchanges clarified connections between individual experiences and the social dynamics shaping environmental policy design.

Subsequently, participants reconvened in a plenary session where they were introduced to eight additional themes identified by stakeholders in Round 2. I designed this session to foster a dialogue between academic and non-academic perspectives, which allowed for 15 minutes of individual reflection on these themes. The use of Mural software for this exercise was inspired by the literature on digital tools in participatory research (Salmons, 2020). The reflection period was followed by a coffee break, after which the aggregated rankings were used to facilitate a discussion on stakeholder priorities. This methodological choice was influenced by the literature on multi-criteria decision

analysis, which highlights the utility of ranking exercises in decision-making contexts (Belton & Stewart, 2002).

In the subsequent session, I focused on specific topics such as 'Just transitions,' and encouraged participants to discuss the practicalities of transformative change. The choice of topics was directly influenced by the previous rounds, themes and emerging narratives. Participants were given the option to join one of three breakout groups, each focusing on a different aspect of the transition to Net Zero. The session began with three guiding questions, designed to align with the wicked problem framework, which emphasises the need for systemic thinking (Rittel & Webber, 1973).

The final session was devoted to developing a research agenda and key messages for UKRI. Participants were invited to reflect on stakeholder messages identified during the Round 2 analysis, which included the value of collaborative research and the need for more accessible research findings. Participants were then prompted to consider their own messages for UKRI, focusing on research funding priorities and systemic changes within the academic community. This session was designed to align with the literature on research impact and the role of funding bodies in shaping research agendas (Bornmann, 2013).

The third round of workshops was planned to address specific research questions; and while not the intention, this ultimately allowed me to generate data directly relevant to my thesis. The design choices were rooted in academic literature, ranging from climate urgency to just transitions, ensuring a sound methodological approach. The Round 3 workshop timeplan is shown in Figure 3.4.a.ii.

Figure 3.4.a.ii: Round 3 workshop timeplan

Time	Length	Activity	Location

09:00	10 mins	**Workshop opens; tech check of Zoom and Mural**	Plenary
09:10	10 mins	**Welcome and workshop overview** Facilitator presentation (no slides)	Plenary
09:20	15 mins	**Group introductions** Each person introduces themselves and area of expertise	reakout groups
09:35	45 mins	**Exploring the Round 1 themes** Open discussion	reakout groups
10:20	5 mins	**Introducing the Round 2 themes** Lead analyst explains the themes from the Round 2 analysis	Plenary
10:25	15 mins	**Lone reflection time** Ranking of round 2 priorities on individual Murals	Individually
10:40	10 mins	**Coffee break**	
10:50	45 mins	**Discussing Round 2 priorities** • Discussion of ranking exercise • Discussion of stakeholder priorities	reakout groups
11:35	5 mins	**Choosing the topic** Participants choose one of three breakout groups: • Actors, roles and responsibilities • Just transition and co-benefits • Urgency and rapid change	Plenary
11:40	15 mins	**Introductions and session intro** Participants introduce themselves to their new group; facilitator introduces the topic of discussion for the next session	reakout groups
11:55	15 mins	**Lone reflection time**	Individually
12:10	45 mins	**Lunch**	

12:55	60 mins	**Exploring the topic** • What needs to happen to deliver transformative change? • What are the systemic considerations and risks? • Does the group have a diversity of views, and how could consensus be achieved?	reakout groups
13:55	10 mins	**Coffee break**	
14:05	10 mins	**'resent key messages from the stakeholders for researchers**	Plenary
14:15	20 mins	**Lone reflection time**	Individually
14:35	60 mins	**Messages to UKRI** • Discussion of the stakeholder messages for researchers • Discussion of how the research community and UKRI can facilitate best Net Zero pathways	reakout groups
15:35	20 mins	**Plenary feedback** iscussion facilitators summarise their group's key messages for UKRI	Plenary
15:55	5 mins	**Closing remarks**	Plenary
16:00		**Workshop close**	

3.4.b Round 3 Reflections

The third round of workshops provided data for the analysis in my thesis. Reflecting on the first aim of the workshops, which was to facilitate an informed discussion among academics, the design proved effective. The introductory session, I designed to set the stage for dialogue by providing a succinct overview of the project's objectives and the themes identified in previous rounds. The second aim was to introduce academics to the additional themes identified by stakeholders in Round 2.

The third aim was to focus on specific topics: *"actors, roles and responsibilities"*, *"creating a just transition and co-benefits"* or *"urgency, potential for rapid change"*.

The guiding questions for these sessions were framed to align with the wicked problem framework, which emphasises the need for systemic thinking (Rittel & Webber, 1973).

The final aim was to develop a research agenda and key messages for UKRI. I designed this to be the capstone of the workshop series, and to work on research impact and the role of funding bodies in shaping research agendas. The session successfully elicited key messages from the academic community. Overall the third round of workshops yielded rich data and ensured the workshops were aligned with the overarching research questions of this study. The findings from this round of analysis directly informed subsequent DNZ publications and the discussions within my thesis.

3.5 DNZ Project Methodology

The workshops were systematically recorded using Zoom's embedded recording function, a digital tool whose significance in qualitative research is highlighted by Salmons (2020), who argues for the researcher's proficiency with digital methodologies. In my role as both a facilitator and a transcriber, I ensured the essence and authenticity of the discussions were preserved and participant's quotes anonymised, in line with Lincoln and Guba's (1985) principles on trustworthiness and ethical integrity in qualitative research.

The initial stage of our analysis was conducted with a time-sensitive approach, necessitated by the iterative nature of the workshops. This rapid analysis, grounded in Braun and Clarke's (2006) thematic analysis framework, allowed for prompt yet thorough exploration of the data. While awaiting transcription, we engaged in 'listening to data', enhancing our preliminary understanding of the recordings from Round 1 workshops. Two researchers, including myself, independently reviewed the recordings.

This process, aligned with Lincoln and Guba's (1985) principles of trustworthiness, involved answering a set of predefined questions.

In this research, the analytical framework was structured using an Excel matrix. This matrix systematically categorised each question from the workshop sessions, ensuring a thorough and organised approach to data management. My role in this phase was to organise and manage the data, and explain the practical applications of software tools. Following the initial data organisation, I thematically analysed the data to identify prevalent themes among the workshop participants' prioritised items and group discussions. This step was conducted in line with the rigorous guidelines of Braun and Clarke (2006), focusing on a systematic and unbiased approach to theme identification. My involvement here was centred around careful coding, consistent theme identification, and objective interpretation of the data.

A total of eight cross-cutting themes were identified, each of which was emphasised by participants across all workshops and breakout groups as being key to achieve Net Zero. These themes resonate with the literature on societal transitions to sustainability, including the need for social legitimacy (Sovacool et al., 2022), the urgency of implementing ready-to-go solutions (Geels et al., 2018), and the necessity for systemic social and political change (Grin et al., 2010). From these analyses, a total of three publically available DNZ reports were published, including a final synthesis report provided to UKRI as a summary of the project's outputs and showcase of delivery on initial project aims. Additionally an academic journal article was published in Environmental Research Letters, see Carr-Whitworth et al. (2023).

A salient comment from one of the Round 1 Workshops - reflecting participant discomfort with the outputs of one of the sessions - finds the methodological framing limiting the transformative ideation potential of the discussions. As one participant

reflected, "I'm astounded at how un-transformational and unradical anything that we've come up with is... we're talking about, like, Net Zero by 2050… the stuff that we've come up with is not what's needed... [it] seems like a bit of a warning sign to me." This is a critique of how the workshop format may have embedded a *"conservative"* framing by default, inadvertently reinforcing presentist assumptions, constraining the scope of imagined futures. The participant continues by suggesting that a more explicitly future-oriented, *"back-casting"* approach might have elicited *"very different ways"* of thinking. Their observation offers an internally generated critique of the workshop structure and points to the epistemic consequences of the chosen methodology, as noted in Section 3.1.

Such comments were not isolated, and so coded as data points during analysis, as they offer reflexive insight into the process itself. As noted below (Section 3.6.e), participant-led data is not limited to thematic content, but includes meta-commentary on process and context. This also supports the methodological position taken in this thesis, whereby analysis attends not only to the content of deliberation, but also to its absence and wider situation. Thus, such reflections informed both the critical engagement with dominant narratives (see Chapter 4) and considerations on the limitations of co-productive research design within the UK's NZT.

3.6 Thesis Results and Analysis

Briefly, before laying out how the data was managed and the results were analysed, some insightful preamble on shortcomings due to the nature of the relationship between the DNZ project, and this thesis. I had initially attempted to sit with the transcript - having plugged the data into the Nvivo software - and through re-reading, and where necessary rewatching the workshop recordings, had hoped to entirely

inductively identify *new* codes and themes. This somewhat naive approach did not last very long, as I quickly realised that I was falling into two traps, which when combined were severely limiting my ability to gain any insights at all. The first trap was attempting to find only new insights, denying the DNZ analysis work completely, by either only coding quotes that had not been so coded during the DNZ Project analysis, or only allowing myself to code quotes with *new* codes. For example, in the following quote:

> *"There's an immediate issue with nature-based solutions, around skills and training, and a belief that this is available; but we don't have a supply chain, we don't have a skill base, and we need a lot more training…"* - Academic, specialised in Energy Policy and Sustainability

Where I had originally coded this with the following words: "Urgency", "NBS" (nature-based solutions), and "Skills and Training" during the DNZ project analysis; I was now coding the following: "Availability", "Supply Chains", and "Resource Allocation". Crucially, while the new codes are not bad, or incorrect codes, I was rejecting the old codes, in place of the new, solely as a means to differentiate my thesis from the DNZ project.

The second trap was slightly more subtle, but even more pernicious, where I would accept the DNZ analysis, but attempt to improve upon it, using synonyms, or 'reading between the lines', when I knew very well there was little of anything there to read. For example, swapping the code "Urgency", for "Rapidity"; or when between-the-line-reading adding a code such as "Skeptical of NBS". A key issue with the latter part of this trap here being that I was effectively trying to deny my role as a DNZ researcher, and facilitator in the workshops, and worse than that, setting myself up to intentionally misrepresent the data. Having attended the workshops, I knew first-hand the intention behind the statements being given by the participants, the

emotions with which they were conveyed, and their contexts within the discussions being had; not only sabotaging the intrinsic value gained via the researcher-participant relationship made possible via primary research (Beck, 2019; Turnhout et al. 2020), but also calling into question my scholarly rigour. For the example above, the participant was not skeptical of NBS, in favour of engineering-based solutions (EBS); it was just that the sentence's structure could be construed in such a way as to make it sound as such.

3.6.a Empirical Data Analysis

Thankfully, these traps were identified and resolved. Rather than rejecting prior knowledge or pretending to approach the data as an external analyst, I embraced a more integrative and reflexive strategy that allowed this thesis to build upon, but also go beyond, the DNZ Project. Three methodological steps guided this:

1. I used the thesis' **research questions and hypotheses** as orienting devices, to shape the identification and organisation of new codes and themes.
2. I drew on the concepts and **literature reviewed in Chapter 2** on *holism*, *narratives*, *justice*, *transitions*, and *wicked problems* to provide an interpretive framework. Moving then to literature on transition pathways and systemic inertia (Winskel & Kattirtzi, 2019; ibid. 2020; Stirling, 2014; Geels et al., 2018), which informed the development of codes related to, for example, *disruption* and *continuity*.
3. Additionally, I critically engaged with the **existing DNZ codes and themes**, rather than seeing them as analytical limits. Where necessary, these were reinterpreted, but only when there was clear added value in terms of explanatory power or closer alignment with the thesis' guiding questions.

These steps provided a structured basis for data analysis, grounding the thesis with the empirical workshop data, while still contributing new theoretical insight. They also allowed the analytical process to remain responsive to the core claims of this research. To reiterate, the analysis that follows is framed by three central hypotheses and their associated research questions:

Hypothesis 1: Narratives (e.g. technocratic vs. holistic) shape transitions.

- **RQ1**: How are experts conceptualising the role of NZT narratives in the UK?

Hypothesis 2: Justice framings are in tension with the UK's emission reduction objectives.

- **RQ2**: How do justice framings challenge or complement the UK's emissions-focused NZT policies?

Hypothesis 3: Framing the NZT as a *wicked problem* complicates consensus-building.

- **RQ3**: How can broad conceptual framings (e.g. *wicked problem*) be applied to the UK's NZT to yield valuable insight?

The thesis analysis then involved organising the pre-existing narratives, themes and codes derived from the DNZ Project, allowing me to reflect on the pre-established frameworks created by myself and the research team. While it is worth noting here the inherent bias posed by this inclusion, as a member of the DNZ Project, involved throughout the process, I would not be able to simply forget the work that I had done for the project; similarly I had been key in shaping parts of the DNZ project to provide data for my thesis, so rejecting these efforts would have made little sense.

However, the analytical process intentionally extended beyond the DNZ analysis; engaging in an iterative and reflexive examination of both the (now intelligent, see Section 3.6.c below) transcriptions, as well as the analysis already performed by myself when within the DNZ Project team. This aligns with the perspectives of Braun and Clarke (2006), who advocate for a thematic analysis that is both flexible and responsive, allowing for the emergence of new themes through deep engagement with the data. While also drawing on Fereday and Muir-Cochrane's (2006) hybrid approach to thematic analysis, which combines abductive, inductive and deductive coding, and Saldaña's (2016) guidance on axial coding, using a constant comparative method to refine and collapse codes through successive rounds of coding.

Attention was thus also paid to issues of data sufficiency, code saturation and meaning saturation, which informed my decision to continue coding until conceptual depth, not only thematic breadth, had been achieved. The recursive dialogue between extant and emergent codes mirrors Williams and Moser's (2019) argument that analytic insight grows through systematic movement between data segments and higher-level abstractions. Such a method contrasts with Morse's (2018) emphasis on developing theory without reliance on pre-existing codes, suggesting that a balance can be struck between utilising established frameworks and remaining open to novel insights (Nowell et al., 2017; Terry et al., 2017).

Regarding the data utilised, it occupies a unique position as both primary and secondary. As a member of the DNZ Project research team, I was directly involved in the data collection process, establishing a primary relationship with the data. However, when engaging with the data through the lens of published DNZ reports, the data assumes a secondary character, having been previously interpreted and presented. This

duality necessitated a critical approach to analysis, acknowledging the original context of data collection while also considering the influence of prior interpretations.

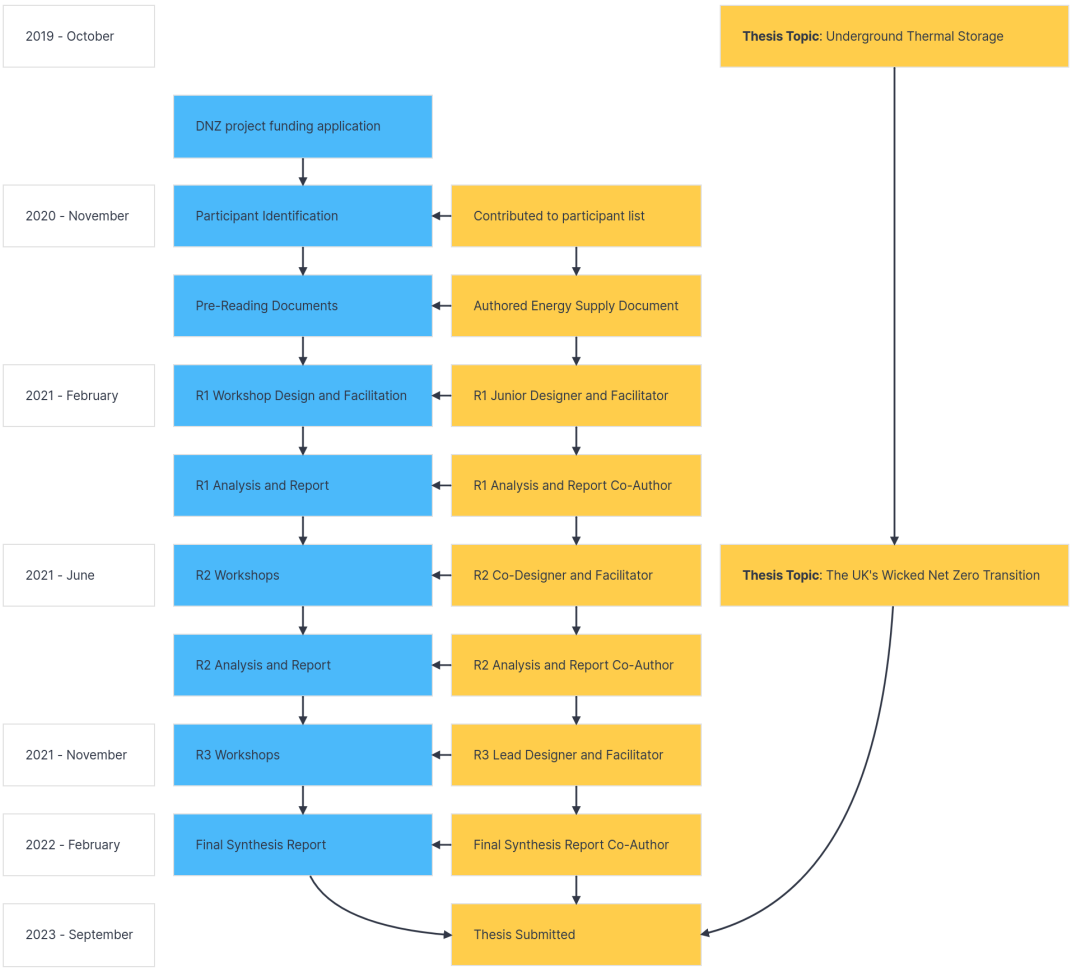


Figure 3.6.a.i: Timeline of thesis and DNZ related events. The DNZ project is in blue (the left side column), and my contributions and thesis topics are in yellow (the centre and right columns).

3.6.b Research Literature

Recognizing my dyslexia, I employed tools to help manage the assembly and synthesis of referenced sources. The main tool was *Milanote*, an online visual organization platform facilitating a structured literature review process. While literature reviews traditionally involve note-taking in word processors or reference managers, my dyslexia

presented specific challenges in retaining large volumes of text-based information and in mentally mapping relationships among theoretical frameworks. Milanote's visual 'board' format allowed me to drag, drop, and group relevant citations, notes, and excerpts into clusters with arrows linking them, such as "narrative theory," "transitions," and "wicked problems." This process was useful for addressing typical dyslexia-related issues like cross-referencing sources and cognitive load, so rather than scrolling through linear text, I could drag and drop links and images, or quickly write notes, and then in that moment, or whenever I felt more able, arrange and rearrange references spatially, using color-coded cards, arrows and columns to represent thematic groupings.

Being able to *drag-and-drop* ideas, links, quotes, and pictures was useful, especially when storing quotations from key authors (e.g., Fisher, 1985; Geels et al., 2018) alongside my reflections. By pinning these quotes as discrete *cards* of text I could quickly see which themes they related to. Milanote also includes a linking feature. I created short narrative arcs, "storyboards" for major concepts, while maintaining a logical flow within each subsection of the literature review. If I noticed overlap between, for instance, Social Practice Theory and Theories of Planned Behavior, I could visually connect those boards to highlight differences and avoid repetitive text. This approach helped me streamline the review by merging or removing redundancies more efficiently. My visual cognition is a relative strength; so Milanote enabled me by offering the ability to zoom in/out, letting me see a top-level map of the review, then drill down into detailed notes. I was also free to move between boards without losing my place, something easily done in long Word documents.

3.6.c Intelligent Transcription

The three workshop rounds produced a single compiled corpus of roughly 1,000 pages (≈690,000 words). The raw verbatim transcripts contained some inaccuracies, irrelevant verbalisations, and process chatter (set-up, platform issues, scheduling). To render the corpus more analysable, as it was very large, I applied "intelligent verbatim transcription" (McMullin, 2023: p.144-145). This meant removing less relevant parts of the text, and lightly editing what remains, via the following process:

1. Correcting potential transcription errors (misheard terms, names, acronyms). The majority of the original transcription work was not performed by myself, but by other members of the project team, specifically members less embedded in the topics being discussed; which occasionally resulted in some niche terms and acronyms that participants used being mistyped when transcribed. I also expanded some less common acronyms used by participants, for example "*DAC*", was expanded out to *"[direct air capture]"*, to help with excerpt readability.
2. Replacing identifiers such as names and names of organisations specific participants' worked at, with roles and specialisations (e.g. "Academic (GGR)"), retaining data for analytic context, but adhering to anonymisation.
3. Removing filled pauses, false starts, repeated words, and other non-essential verbalisations, unless they altered emphasis or meaning (Herbig et al., 2022: p.4).
4. Removing administrative exchanges such as scheduling, or fixing issues with the variety of digital platforms used, e.g. *"This is crap. Can we just get on with it?"* - Academic, specialised in Greenhouse Gas Removal.

5. When excerpting, elisions are shown with an ellipsis (…) and clarifications in square brackets [...].

As noted in section 3.6.e (Discourse Analysis), some of the comments removed could inform separate work on accessibility in the online workshop format, or power-dynamics between participants; however, this thesis does not pursue those lines of analysis for the sake of focus and brevity, preserving what is needed for thematic-oriented interpretation (Braun & Clarke, 2006; Saldaña, 2016).

3.6.d Codes and Themes

Qualitative coding was used to systematically identify and label the data set (Basit, 2003). This can be done manually, but there are a variety of software programmes to help with the process (Zamawe, 2015). There are two main types of qualitative coding: open and closed (Hsieh & Shannon, 2005). Open coding involves creating codes specific to the data set, allowing concepts to emerge directly from the data (Vollstedt & Rezat, 2019), while closed coding involves applying pre-existing codes developed by others (Hsieh & Shannon, 2005). Once created, codes can be organised into categories, which serve as the foundation for generating themes (MacQueen et al., 1998). Themes help to identify patterns within the data and offer a 'bigger picture' of the phenomena under study (Braun & Clarke, 2006; Ryan & Bernard, 2003). Themes may be generated inductively (from the data itself) or deductively (guided by a pre-existing theoretical framework) (Fereday & Muir-Cochrane, 2006). Here, the process of thematising was both inductive and deductive, meaning that while some themes arose directly from the data, others were informed by the DNZ project's existing thematic structure. Even deductively imposed themes were re-examined and reinterpreted as new, unexpected themes emerged. A useful practical step in this

process is to create a table of themes, detailing each code and the data segments it represents; this facilitates comparison across cases and supports the generation of narrative accounts (Fereday & Muir-Cochrane, 2006).

To analyse key narratives such as 'Just transitions' and 'Societal engagement', NVivo's in-built coding and query functionalities were employed to identify patterns and connections within the transcripts (Zamawe, 2015). For example, the 'Just transitions' narrative was coded for phrases such as "fair distribution of costs and benefits", "protecting vulnerable communities" and "worker retraining", and connections to codes relating to "policy", "economic development" and "environmental justice" (Allsop et al., 2022). Similarly, 'Societal engagement' was examined through codes for "community consultation", "citizen engagement", "public awareness" and "public education", enabling the interrogation of relationships between participation and related themes (ibid.). After thematic coding, I conducted a light second-pass narrative coding of key excerpts, tagging diagnosis–prognosis–motivation and implied agents/instruments to assemble narrative types.

3.6.e Discourse Analysis

Discourse analysis can serve as a versatile methodology for scrutinising written, spoken, or sign language discourse, with applications across linguistics, sociology, psychology, and anthropology (Fairclough, 1992). Extending to multimodal discourse, such as video and social media. Discourse analysis reveals workshop stakeholder engagement, access, and power dynamics (Foucault, 1980). For instance:

> *"I should have just mentioned, sorry, before that, I did tell the organisers I've got to go about 2/2:30 this afternoon because of children,"* - Academic, specialised in Greenhouse Gas Removal

A poignant illustration of the barriers to full participation. This quote reveals disparities based on socio-economic status, traditional gender roles, age, and job seniority levels (Bourdieu, 1990). Such disparities can influence the ability of stakeholders to engage in discussions, affecting the inclusivity and representativeness of the research. Discourse analysis also offers a lens through which to examine power relations within the group, as it scrutinises the interplay between language, power, and authority (Fairclough, 1992; Foucault, 1980). For example, this quote by one of the facilitators:

> *"We'll be pulled back in a couple of minutes just to explain the first exercise. Do you have any other questions at this point at all?"* - DNZ Research Team Member, Workshop Facilitator

Can be analysed to understand the dynamics of authority and participation within the workshop setting. Such an analysis can reveal whether contributions from participants are marginalised or dominated by certain voices, affecting the quality and inclusivity of the discourse. I decided it would be useful to keep and analyse some of the facilitators' voices, opinions and narratives, as they framed and reframed the discussions each group had. They were also all members of the expert witness class of people we were trying to sample, and occasionally let their opinions on technologies, politics, society and more surface and drive conversation. However, as noted they were all topic experts and thus their opinions are as valuable as the participants; i.e. other facilitators fit into my thesis' participant list, even if they weren't intended participants of DNZ.

It is important to note while many quotes offer rich sociological insights, some were deliberately excluded from the primary analysis technique. The reason for this exclusion was to maintain a focused analytic scope on narratives related to the UK's NZT. Although the quotes are sociologically compelling, incorporating them would have increased the scope of the research to an extent would compromise the depth of

inquiry into Net Zero narratives (Bryman, 2016). Therefore, while a deep discourse analysis will not play a major role in falsifying or answering the research hypotheses or questions respectively, of this project; I recognise that the results and discussion chapters will benefit from simple analysis of quotes' contexts, the immediate conversational context, but also the social, temporal, and spatial context (Fairclough, 1992).

3.6.f Comparative Narrative Analysis

Narrative analysis treats the story or narrative as the primary unit of qualitative inquiry, enabling researchers to explore how individuals construct and communicate meaning through their own accounts (Riessman, 2008; Polkinghorne, 1988; Bruner, 2002). Originally developed in psychology to illuminate cognitive and emotional processes (McAdams, 1992), it soon found application in sociology for examining identity construction, family relations, and social interactions (Somers, 1994), and has more recently been extended to organisational and institutional studies, shedding light on operational dynamics and employee experiences (Boje, 2001).

A key advantage of narrative analysis is its "emic" perspective - an insider's view of participants' lived experiences - achieved by examining how people interpret and make sense of their lives (Geertz, 1973). Its methodological flexibility allows it to be tailored to diverse research objectives and time-frames, capturing change over time and surfacing latent patterns and tensions within data (Crossley, 2000; Newell & Mulvaney, 2013; Polkinghorne, 1988).

In this thesis, narrative analysis of the DNZ project data explores how cross-disciplinary challenges - technical, economic, social, political and environmental - intersect in the UK's net-zero transition (Sovacool et al., 2022; Shove et al., 2012;

Reckwitz, 2002). Qualitative methods were chosen over quantitative modelling to capture the depth of reasoning and contextual dynamics that drive societal change (Flyvbjerg, 2006; Creswell & Poth, 2017), and because narratives house both the thinking behind actions and the actions themselves (Heffron et al., 2018; Polkinghorne, 1988; Patterson et al., 2017).

A multi-stage analytical framework integrated thematic analysis with narrative-specific coding (Braun & Clarke, 2006; Creswell & Poth, 2017), ensuring that emerging narratives, such as the Justice narrative, remained aligned with research objectives. In so doing, narratives functioned as both interpretive lenses and generative tools, fostering empathy and mutual understanding, revealing stakeholder agency (Bruner, 2002; Somers, 1994), and suggesting avenues for collective action. They act as vehicles for discovery, surfacing discursive contradictions (Riessman, 2008) and facilitating the inclusion of stakeholder perspectives, a key element in researching transitions (Dryzek, 2009; Jasanoff, 2018). Ultimately, narrative analysis here is justified by its capacity to yield rich, contextualised insights into the dynamics of the UK's NZT.

3.6.g Challenges and Goals of using Comparative Narrative Analysis

However, the use of narratives is not without debate in the academic literature. A 'narrative' has become a ubiquitous term, and its precise definition can vary (Bruner, 2002; Riessman, 2008). Some scholars argue human cognition is fundamentally narrative in nature, meaning each quote is part of a larger narrative (Bruner, 2002; Fisher, 1985), although this perspective is not universally accepted (Polkinghorne, 1988). For example, the following quote can be seen as part of a wider narrative on all actions having environmental consequences:

> *"We haven't talked much about the environmental side effects, but all of the techniques discussed would have environmental side effects, and these should be taken into account. Even technologies like [direct air capture (DAC)], do you know how many DAC plants we would need? If you wanted to scale DAC, you'd probably need a container sized unit every square kilometre of the entire country. It's not unthinkable, but it would have significant environmental impacts. While for ocean based solutions, the environmental side effects would certainly be the fatal flaw. People care about environmental impacts in the ocean, even though most people never get anywhere close to it."* - Academic, specialised in Greenhouse Gas Removal

While the quote sits within a narrative concerned with the environmental consequences of human actions - a theme widely discussed in environmental sociology and policy studies (Hajer, 1995; Dryzek, 2009) - it also presents potential sub- and counter narratives. The quote captures a narrative that is neither entirely hopeful nor entirely pessimistic. The participant reflects upon a public opinion not necessarily grounded with empirical evidence, that nevertheless appears to wield significant influence (Jasanoff, 2018); calling into question the public's ability to fully understand the sustainability of human actions and their environmental consequences (Hulme, 2009).

The application of narratives and comparative narratology in this research is a methodological choice grounded in the academic literature. Comparative narratology allows for the examination of multiple narratives, offering understanding into groups' constructions of meaning (Bal & van Boheemen, 2009); relevant for examining phenomena like NZT (O'Neill & Nicholson-Cole, 2009; Hulme, 2009).

1. Firstly the narrative analysis will focus on identifying and analysing the Net Zero narratives present within the data. By comparing and contrasting these

narratives, the research illuminates the ways in which NZT is being narratively formed, in line with ***RQ1*** *How are experts conceptualising the role of NZT narratives in the UK?*

2. Second, the application of comparative analysis will dive more deeply into inter-narrative and intra-narrative distinctions, and provide some of the reasoning behind the to-be explored *Wicked Narratives* concept. The comparison between narratives helps in understanding the specificity and generality of NZT narratives within the discourse (Hajer, 1995; Dryzek, 2009). This comparative approach can reveal whether certain narratives employ unique rhetorical strategies or thematic elements, when compared to other narratives (Nisbet, 2009). This will also involve a comparison between the DNZ narratives and institutional narratives, such as those presented in documents like the Committee on Climate Change's 'Net Zero – The UK's contribution to stopping global warming' (CCC, 2019). This comparison shows how different stakeholders construct meaning around NZT (Jasanoff, 2018), and helps us to understand narratives' influence on policy decisions (Fischer, 1993); laying the groundwork for answering ***RQ2****: How do justice framings challenge or complement the UK's emissions-focused NZT policies?*
3. Finally, the comparative narrative analysis is deployed to answer RQ3 by turning broad conceptual framings into operational categories that can be traced across cases. Juxtaposing sectoral and institutional narratives, and coding for embedded assumptions about problem structure, agency, temporality, uncertainty and legitimacy, enables the systematic application of 'wicked' and 'super-wicked' lenses without sacrificing empirical specificity; it also allows us to test whether these framings predict positions on concrete instruments and pathway logics (e.g., disruption-continuity, centralisation-decentralisation). In

doing so, the method distinguishes where "wickedness" is an artefact of political-institutional commitments rather than irreducible complexity, and when pluralism is productive versus paralysing (Head, 2019; Turnbull & Hoppe, 2019; Alford & Head, 2017; Scoones et al., 2020). It links narrative dynamics to socio-technical transition theory, relating narratives to regime strategies, niche pressures and directionality (Geels et al., 2018; Köhler et al., 2019; Winskel & Kattirtzi, 2020), and to justice and governance debates that condition feasibility (Turnhout et al., 2020; Sovacool et al., 2022). In sum, comparative narratology serves as a bridge between abstract frames and situated practice, yielding tractable, falsifiable propositions about how wicked framings shape UK NZT preferences and decisions (Levin et al., 2012; Hermwille, 2016; Jasanoff, 2018); thereby aiming to deliver the analytic value sought in ***RQ3***: *How can broad conceptual framings (e.g. wicked problem) be applied to the UK's NZT to yield valuable insight?*

3.7 Methodology Summary

This chapter set out the methodology for both the DNZ project and more specifically for this thesis, combining intelligent transcription and data curation with a hybrid coding strategy, and then consolidating these into a comparative narrative analysis of the DNZ corpus. The chapter justified a reflexive stance towards the dual primary/secondary status of the data and the author's positionality within DNZ; it also specified how themes and codes were iteratively developed to analytic saturation and aligned to the three research questions and hypotheses. This provided a transparent bridge from data handling to interpretation, and a defensible rationale for privileging narrative comparison over broader discourse analysis when the latter would have risked scope creep away from the thesis' UK's NZT focus (Braun & Clarke, 2006;

Fereday & Muir-Cochrane, 2006; Saldaña, 2016; Nowell et al., 2017; Williams & Moser, 2019).

Subsection 3.6 clarified how narrative analysis operates here as both lens and tool: stories are treated as patterned meaning-making devices that reveal actors' priorities, constraints, and imagined futures in the transition. Comparative narratology was specified to examine inter- and intra-narrative divergences, including contrasts between DNZ-elicited narratives and institutional framings (e.g., CCC 2019), while discourse analysis was retained in a limited, contextual role. This design reflects the need to interrogate how UK NZT is rendered governable through technocratic, eco-modernist, justice-oriented, and crisis framings; it also anticipates the plural, sometimes contradictory "transition logics" identified in recent sustainability transitions scholarship (Geels et al., 2018; Stirling, 2014; Winskel & Kattirtzi, 2019; Kattirtzi & Winskel, 2020; Scoones et al., 2020; Sovacool et al., 2022).

Finally, the chapter linked the methodology to RQ3, arguing that comparative narrative analysis is especially suited to operationalising a wicked-problem lens: it illuminates where justice and technocratic logics talk past each other, and where productive tensions, rather than consensus, generate insight. This sets up an evaluation of "Wicked Narratives" as empirically grounded, not merely conceptual; it also readies the analysis for tracing how these narratives shape expectations, temporality, and claims to knowledge in the UK's NZT (Head & Alford, 2015; Stirling, 2014; Scoones et al., 2020; Sovacool et al., 2022).

Looking ahead to Chapter 4, the thesis turns from methodology to results. Chapter 4 presents the thematic patterns surfaced through the hybrid coding (e.g., disruption vs. continuity), the narrative families most salient across participant groups, and the points

of convergence and contestation. It compares DNZ-derived narratives with institutional policy (e.g., CCC 2019) to address RQ1 and RQ2: how experts conceptualise narrative roles in the UK NZT, and how justice framings challenge or complement emissions-centred policy. The chapter also identifies the specific sites where wickedness is most visible, epistemic authority, distributional impacts, and temporal trade-offs, providing the empirical platform for the thesis's subsequent discussion of Wicked Narratives and transition artefacts.

4.0 Results and Analysis

This chapter presents the findings from the DNZ project data, analyzed through the lens of the narrative and thematic frameworks described in the methodology. While the DNZ project was initially designed to engage stakeholders in consensus building on the United Kingdom's decarbonisation goals, the research conducted here focuses specifically on how narratives, for example justice-oriented narratives, and wicked-problem framings intersect and influence the path to Net Zero. Recalling again the three research questions (Section 1.3) that guide this thesis, they ask how narratives are emerging, intersecting, and competing in shaping stakeholder's thoughts and actions; how justice-oriented framings challenge or complement an emissions-focused approach; and whether viewing Net Zero as a 'wicked problem' adds value.

The results presented here stem from workshop transcripts, expert evaluation outputs, and thematic/narrative analysis, all of which were part of the DNZ project's original data collection efforts yet examined here through the specific analytical lenses of this PhD. As described in the methodology, the DNZ project had multiple rounds of stakeholder workshops, bringing together policymakers, industry representatives, NGOs, local communities, and expert evaluators. While these events served DNZ objectives, their transcripts and discussions now function as the primary corpus for investigating how participants articulated visions of Net Zero, from balancing short-term technical imperatives with long-term justice concerns in policy-making. The workshop interactions revealed both convergences, such as a shared desire for

tangible, near-term action, and divergences, including contrasting views on the necessity of public engagement or the feasibility of radically equitable transitions.

This chapter is organised as follows:

1. Exploring the DNZ project's findings, so that they can feed into the analysis for this thesis.
2. The process for the deeper thematic coding applied for this thesis research is introduced.
3. Overview of thematic patterns and codes, such as *Disruption vs. Continuity*, emerging from the literature and data.
4. NZT narratives, including dominant and counter narratives. Findings align with Hypothesis 1 (on the role of narratives) and illuminate possible tensions around 'justice' (Hypothesis 2).
5. Inter- and intra-group divergences provide stage setting for the Discussion Chapter, which engages more directly with Hypothesis 3 on the value of the wicked framing of NZT.

Through this structure, the results chapter offers a structured and systematic view of the empirical data, making explicit the ways in which stakeholder narratives reflect and challenge official policy directions. The subsequent sections will detail each thematic axis and narrative domain, illustrating how they confirm, complicate, or refute the core assumptions laid out in the introduction to this thesis.

4.1 DNZ Project Results

This section reports the Delivering Net Zero (DNZ) project results as they relate to the thesis aims. It begins with the synthetic, cross-cutting results, namely the project's two overarching narratives and the two lists of themes distilled from the academic (Round 1) and stakeholder (Round 2) workshops, before turning to questions of agency and theories of change, and then to topic-specific insights (e.g., behaviour change, engagement, capacity). This focuses on what the project collectively surfaced across participants; and then narrows to who is expected to act, and finally addresses issue-specific discussions that recur through the data.

4.1.a DNZ Narratives and Cross-cutting Themes

Across the DNZ workshops, participants articulated two synthetic narratives about how the UK might deliver Net Zero. In broad terms, following the DNZ synthesis, Narrative 1 emphasised accelerating deployment of near-term options and "delivering co-benefits" while Narrative 2 prioritised "rapid demand reduction and social change". The final DNZ synthesis also highlighted two cross-cutting concerns, Just transition and Societal engagement, which sat outside the two principal narratives because they were persistently raised yet contested in scope and priority. These elements were represented in the DNZ Venn diagram of "emerging narratives on delivering Net Zero".

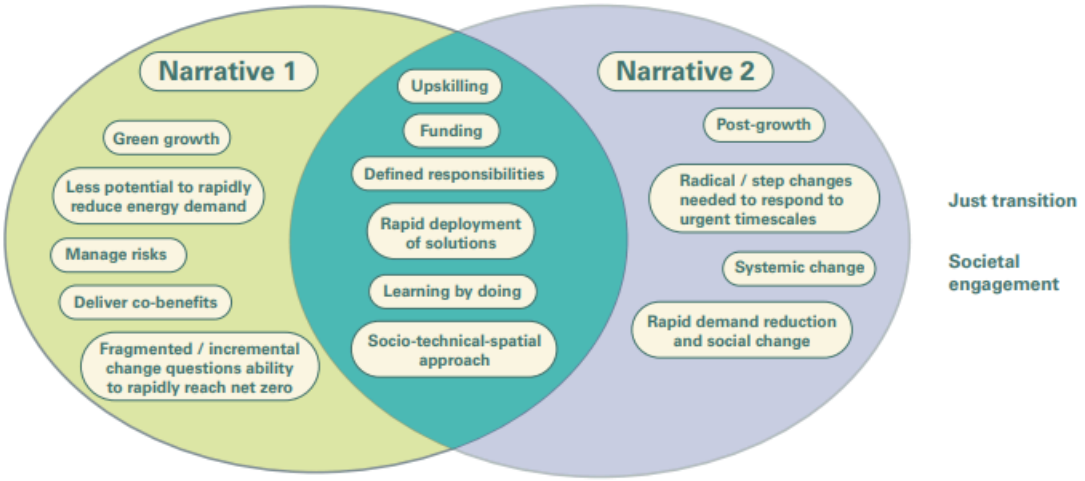


Figure 4.1.i: "Emerging narratives on delivering Net Zero" venn diagram (sourced from the DNZ Final Synthesis Report, 2022).

Participants' emphasis on both accelerated roll-out and social change mirrors current literature that stresses supply- and demand-side measures must advance together, with attention to fairness and legitimacy in the distribution of costs and benefits (Sovacool et al., 2022; IPCC, 2023). It also reflects a durable tension: many participants favoured immediate, technocratic measures to "get on with it", yet others insisted that Net Zero requires deeper transformations of practices, infrastructures and institutions, especially where demand, affordability and justice intersect (Newell & Mulvaney, 2013; Jenkins et al., 2018; Geels et al., 2018). The synthesis report's decision to place Just transition and Societal engagement outside the two core narratives captured the contestation around them without denying their salience, which is consistent with wider debates on energy democracy, participation and the politics of co-production (Healy & Barry, 2017; Turnhout et al., 2020; Jasanoff, 2018).

To inform subsequent analysis in this chapter, I retain the two DNZ-derived lists of cross-cutting themes that summarise the primary emphases of academics (Round 1) and of stakeholders (Round 2); presented below:

Academic Themes (Round 1):

- The need to develop social legitimacy for an ambitious decarbonisation pathway.
- Perspectives on the social and political feasibility of solutions.
- The role of technological optimism and system change.
- The need to rapidly roll out 'ready to go' infrastructure and technologies.
- The need to improve 'readiness' of solutions and roll out infrastructure for the long-term.
- The need to upskill and capacity build in the workforce, government and civil service.
- The need for a more active and interventionist policy approach.
- The need for continued investment into new, potentially disruptive technologies and solutions. (Carr-Whitworth et al., 2022).

Stakeholder Themes (Round 2):

- The need to improve public engagement with Net Zero and widen public participation.
- The need to overcome political barriers.
- The need to focus on rapid deployment and 'learning by doing'.
- The need to upskill and capacity build in the government and workforce.
- The need to ensure a just transition.
- The need for appropriate funding structures and business models.
- The need for urgency.
- The need for a shared sense of responsibility and collaborative endeavour. (Carr-Whitworth et al., 2022).

Both lists foreground capacity, legitimacy and urgency. Academics tended to bring system-level and methodological emphases (readiness, interventionism, disruptive innovation), whereas stakeholders stressed near-term implementation, engagement and governance obstacles. The juxtaposition aligns with scholarship on sociotechnical transitions that differentiates between "directionality" and "governance capabilities", and that warns against collapsing justice considerations into post-hoc distributional fixes (Stirling, 2014; Köhler et al., 2019; Bouzarovski et al., 2021). The DNZ materials thus reinforce "needs" to connect deployment pathways with social mandates and institutional capacities; they also position Just transition and engagement as conditions of feasibility, not merely add-ons (Sovacool et al., 2022; Jenkins et al., 2018).

4.1.b Agency, Responsibility and Theories of Change

The DNZ synthesis identified a conspicuous gap: participants struggled to specify who is responsible for initiating and coordinating change at the pace and scale implied by Net Zero. Only one participant articulated anything like an explicit "theory of change"; most expressed uncertainty or relied on high-level attributions to "government", "industry", or "the public", with considerable disagreement over whether the state should lead or whether distributed, polycentric action would be more effective. Some worried that focusing on Westminster risks inertia; others maintained that only the state can underwrite investment, set standards and ensure a just NZT. This absence of a shared, explicit theory of change is a finding of the DNZ project and is important for how narratives translate into plausible policy sequences and institutional arrangements.

The literature points to the same fault line as noted in section 2.1 of the Literature Review. Research on energy transitions and decarbonisation policy stresses that directionality requires politically anchored mandates, with credible accountability

across multiple centres of authority (Sovacool et al., 2022; Newell & Mulvaney, 2013). Transition management and multi-level perspective approaches emphasise the choreography of niches, regimes and landscapes; but without clear claims about agency and responsibility, narratives struggle to achieve practicability (Geels et al., 2018; Köhler et al., 2019). Meanwhile, governance studies caution that participation and co-production often remain procedural unless power, representation and knowledge claims are addressed (Turnhout et al., 2020; Jasanoff, 2018). The DNZ data echo these debates: participants debated whether the state is too slow, whether smaller actors are more agile, and how to coordinate experiments at scale; they seldom converged on concrete sequences that match tasks to actors with timelines and resources.

Without clarity on who acts when, and with which instruments, promises of a just NZT risk remaining rhetorical. The stakeholder theme list placed "the need to ensure a just transition" alongside calls for appropriate funding models and shared responsibility; the academic list emphasised legitimacy, feasibility and interventionist policy. This alignment could be seen to suggest an implicit theory of change: use state capacity to lower implementation risk and to guarantee justice, while enabling distributed actors to innovate and learn-by-doing. Yet the DNZ discussions rarely spelled this out explicitly in operational terms (e.g., which tier of government mandates which standard; which regulator changes which rule; which firm invests where; how costs are socialised or limited); and was far from universally agreed upon during workshop sessions. This "theory of change gap" is therefore a potential empirical finding, a likely result of our workshops' methodological limitations, and a normative challenge for the UK's NZT (Jenkins et al., 2018; Sovacool et al., 2022).

4.1.c Topic-specific Subthemes

Participants debated whether behaviour change would occur "organically" through price signals, convenience and social diffusion, or whether mandates and infrastructures were necessary. Those discussions intersected with Narrative 2's emphasis on rapid demand reduction and social change, and with a wider literature on practices and demand-side mitigation that stresses the importance of provisioning systems, not only individual choice (Shove et al., 2012; IPCC, 2023). Several participants called for a reframing from "nudging" individuals to reshaping contexts: housing quality, public transport, pricing, and standards, that enable lower-carbon practices at scale. Others stressed the political feasibility of such shifts, recalling the stakeholder list's emphasis on public engagement and political barriers; behaviour change was rarely presented as a purely informational problem.

Co-benefits, deployment and "learning by doing"

Narrative 1 (which centred on accelerating deployment and delivering co-benefits) reappeared when participants discussed visible, near-term actions: mass heat pump roll-out where appropriate, grid reinforcement, retrofits, and local area energy plans. Stakeholders highlighted "learning by doing," business-model innovation, and capacity in government and the workforce; academics pointed to "readiness" and the "need" for an interventionist policy stance to overcome coordination failures. Together, these positions reflect ongoing work on mission-oriented policy and a desire to derisk investment while building local legitimacy for visible change (Köhler et al., 2019). Participants were alert to rebound and distributional issues; they connected co-benefits (e.g., warmer homes, cleaner air) to public support, which aligns with evidence that co-benefits can increase acceptability and yield immediate welfare gains (IPCC, 2023).

Just transition and societal engagement as persistent, contested conditions

The DNZ synthesis placed Just transition and Societal engagement outside the two primary narratives because they were repeatedly raised yet contested. These concerns touch distribution (who pays, who benefits), participation (who decides, how) and recognition (which communities and knowledges count). They remained central in both rounds' theme lists, stakeholders prioritised a just transition and public engagement; academics stressed legitimacy and capacity. This reflects justice-oriented transitions literature which sees distributional, procedural and recognition justice as necessary to be addressed together to avoid accumulating harms and undermining lasting consent to achieve a NZT (Jenkins et al., 2018; Sovacool et al., 2022).

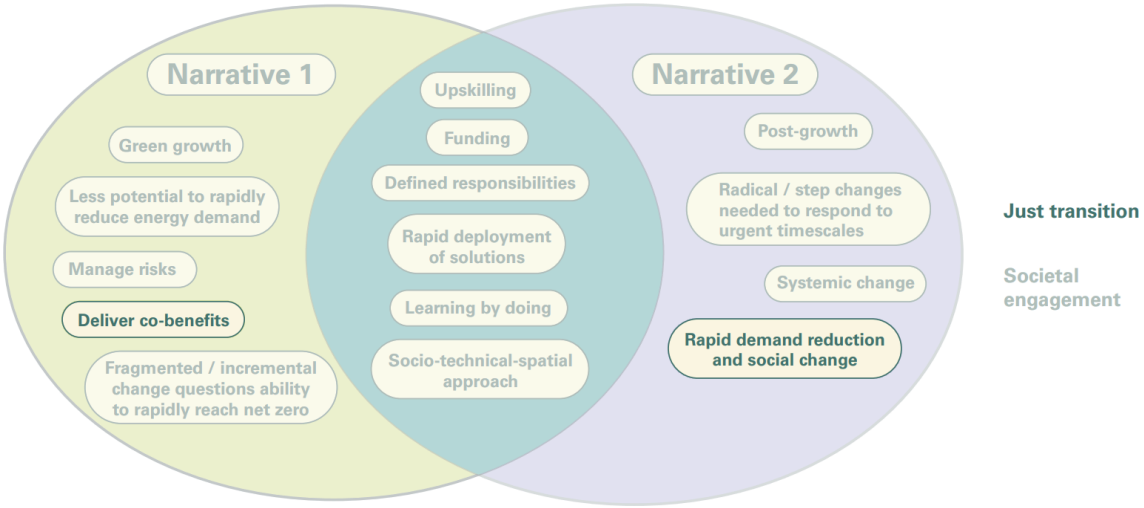


Figure 4.1.ii: An altered version of Figure 4.1.i, where I have slightly obscured everything apart from "Deliver co-benefits" in the Narrative 1 section, "Rapid demand reduction and social change" in the Narrative 2 section, and the words "Just transition" which sits outside the venn diagram.

The adjusted Venn highlights three phrases in different parts of the schema: "Deliver co-benefits" (Narrative 1), "Rapid demand reduction and social change" (Narrative 2), and "Just transition" (outside). This invites the question: can a just transition be achieved without co-benefits that are visible to those most burdened by transition

costs? A second question addresses distribution: would policy that targets reductions among highest emitters first be perceived as more just than uniform, population-wide reductions? These are not calls to collapse the two narratives into one, but to stress that demand reduction and co-benefit framings only gain legitimacy where justice is explicitly addressed (IPCC, 2023).

Roles of academics, government and other actors

Participants reflected on the roles of academics, government, businesses and civil society in shaping the Net Zero pathway and making research actionable. On the academic side, the theme lists and Round 3 reflections emphasised: providing credible synthesis, supporting experimentation and evaluation, and communicating uncertainty without paralysing decision-making. On the government side, participants debated the balance between setting standards, underwriting risk, and enabling local delivery. Stakeholders stressed business-model innovation and funding; they also highlighted the "need" to expand state capacity, echoing research on the importance of institutional capabilities for steering missions. These reflections connected to science-policy interface debates on co-production and legitimacy: scientific inputs matter, but trust and procedural fairness shape uptake (Healy & Barry, 2017; Jasanoff, 2018; Turnhout et al., 2020).

Political feasibility, consent and timing

Urgency featured strongly in stakeholders' lists; so did political barriers and public engagement. The DNZ discussions repeatedly linked feasibility to visible welfare gains, credible timelines and fair burden-sharing. This accords with work showing that transitions falter without durable coalitions that can maintain directionality across electoral cycles and economic shocks (Köhler et al., 2019; Newell & Mulvaney, 2013).

Participants connected "learning by doing" to consent, arguing that pilots and local exemplars build support and reveal implementation issues early. Others warned that local experiments require coordination and resourcing, otherwise they risk inequity or lock-in to suboptimal pathways. The upshot is familiar in transition studies: experimentation is necessary but not sufficient; the centre must set mandates, guarantees and metrics, while local actors customise delivery.

Bringing the topic-specific strands back to the narratives

Seen together, the issue-specific discussions reinforce the logic of the two narratives and the "outside" conditions. Demand-side measures and social practice change (Narrative 2) gain traction when institutions invest in capabilities, credible planning and fair allocation; accelerated deployment and co-benefits (Narrative 1) preserve legitimacy when they reduce exposure to energy poverty, improve air quality, and avoid regressive cost recovery. The DNZ project, like recent literature, points away from either/or framings: instead both narratives can be seen as valuable.

4.2 Thematic Data Analysis

The following section provides detailed examples of how the empirical data analysis was conducted, from coding through to thematisation. This section turns from the DNZ project–level synthesis to my independent thematic analysis. I set out the analytic steps and how they map to the thesis's framing, particularly the Disruption vs. Continuity axes introduced earlier; I then show, with worked examples, how codes were developed, grouped, and resolved into themes. The section is organised into three parts: (1) analytical approach and coding pipeline; (2) a worked example using Nature-based Solutions (NBS); and (3) cross-domain consolidation that links the coded

material back to the thesis narratives developed later in section 4.5 and the inter-/intra-group divergences considered in section 4.6.

4.2.a Analytical approach and coding pipeline

The goal was to move systematically from rich, overlapping statements to tractable themes applicable across sectors and actor groups without losing necessary specificity. Following section 3.6.d, I used open and iterative coding in NVivo, supported by constant comparison and memoing. Initial coding was line-by-line, alternating between in-vivo codes and researcher-generated abstractions where participants' phrasing invited synthesis. Closed codes derived from the DNZ synthesis and the literature already cited in Chapter 2 were used sparingly to avoid foreclosing novel patterns.

The pipeline comprised three steps:

1. Open coding (line-by-line) identified discrete ideas, tensions, and claims about feasibility, capacity, justice, and timing. Wherever statements pointed to enabling conditions (e.g., skills, supply chains, policy instruments) or to contestation (e.g., political feasibility vs social acceptability), I coded both the positive claim and the countervailing constraint.
2. Categorisation grouped related codes into conceptual categories. For example, training needs, supply-chain gaps, and institutional capability clustered into Structural Preconditions for Transition. Financial incentives, land-use economics, and valuation issues clustered into Economic Viability and Market Alignment. Cultural resistance, identity, and practice-based inertia formed Behavioural and Normative Barriers to Transition.
3. Thematisation resolved categories into cross-cutting themes aligned with the thesis' narrative framework and the Disruption vs. Continuity axes. In this

section I illustrate three recurrent themes that reappear throughout Chapter 4: Green Growth, Just Transition, and Instrumental–Normative Tension.

This procedure preserves participants' phrasing where it carries analytical weight, while making explicit the links between enabling conditions, political economy, and lived experience. It also keeps sight of directionality: who acts, with what instruments, and on what timescales, issues that recur in the DNZ dataset and in my narrative typology.

4.2.b Worked example: Nature-based Solutions (NBS)

Nature-based Solutions (NBS) are both companion and adversarial solutions to agricultural Net Zero. Among NBS, reforestation and habitat restoration present carbon sponges with the potential to absorb atmospheric carbon dioxide, offsetting emissions from agriculture and other sectors. However, the efficacy of NBS hinges on managing enduring carbon sequestration while avoiding unintended or less-valued ecological consequences. These externalities, such as biodiversity loss and water resource depletion, can be mitigated when NBS are deployed as part of a wider Net Zero strategy (CCC, 2020).

NBS is the first worked example, and (initially) shows how a single excerpt can sit across several codes, sub-themes and themes, especially where enabling conditions and valuation logics intersect. The quote below showcases overlaps between coding layers, e.g., a 'Green Growth' policy frame and a call for 'Upskilling', alongside the desire for actions and solutions that 'Deliver Co-benefits', all of which featured in the DNZ project's final report, and map to the additional narratives explored later in the thesis:

> *"There's an immediate issue with nature-based solutions, around skills and training, and a belief that this is available; but we don't have a supply chain,*

we don't have a skill base, and we need a lot more training…" - Academic, specialised in Energy Policy and Sustainability

"We also need financial incentives, because the value of nature-based solutions - in terms of land-based solutions - aren't anywhere near equal to the value of land for farming at the moment, so that financial imbalance needs addressing. There's the same issue for forests and forest products, value in terms of land use, particularly for food, isn't quite there." - ibid.

From these statements I assigned: Skills Gap; Training Lead-Time; Perceived Readiness vs Structural Gaps; Supply Chain Deficiency; Financial Incentives; Land-Use Valuation; Competing Land Economies; Deployment Barriers; Behavioural Inertia. Codes relating to skills, training, and supply chains clustered as Structural Preconditions for Transition; those concerning incentives and land valuation as Economic Viability and Market Alignment; concerns about perception and readiness as Behavioural and Normative Barriers to Transition.

- Green Growth, meaning deployment depends on supportive infrastructures, human, organisational, and industrial, including upskilling and institutional readiness; this sits squarely within an ecomodernist Green Growth frame that treats capacity as a growth-enabling asset.
- Just Transition, and a reallocation of value and incentives implies distributional choices; who bears land-use change costs matters for justice (CCC, 2020; Wang & Lo, 2021). Here I extend the traditional human-focused interpretation of Just Transition to include ecological systems, challenging anthropocentrism.
- Instrumental–Normative Tension, describes the short-run deployment logics (incentives, supply chains) coexisting with longer-run normative concerns about

whose livelihoods and identities are reshaped by NBS; economic feasibility and co-benefits reasoning can sit in tension with deeper normative transformations.

I use this example to surface a common pattern across the dataset: participants often treat technological or ecological options as "available" in principle but point immediately to preconditions, skills, supply chains, policy certainty, without which availability is illusory in practice. That logic connects directly to the thesis' Disruption vs. Continuity axes: NBS can be framed as incremental continuity (stacked onto existing land-use regimes) or as disruptive (if they repurpose land, reprice value, and reconfigure rural livelihoods).

The NBS quotes also help draw out an expansion of Justice beyond humanity. The environment is undergoing a largely adverse transition too (visualised in Pictures 1 and 2 below), and its needs can be counted under the Just Transition umbrella. People are not the only entities that experience, benefit, or lose out from socio-technical-energy transitions; the environment as a non-singular entity could benefit from an ecologically just transition (Wang & Lo, 2021: p.3–4). This expanded interpretation recognises that a truly equitable transition considers the resilience and rights of the entire biosphere, ensuring environmental entities, as much as human communities, are beneficiaries of conscientious and sustainable transition practices.



Picture 1: Thickets of staghorn coral replaced by a structure-less seabed of decaying coral. (Source: Muehllehner, et al. 2016).



Picture 2: Cattle ranch with remaining Amazon Rainforest in the background (Source: Barreto, 2023).

A second excerpt adds timing and payback profiles to the coding:

> *"Starting with the nature-based solutions, some of them are going to give you immediate payback so when you restore a peatland, you immediately switch off all the CO_2 that's being released, so for those ones you get a big hit quickly but for most of the nature-based solutions, like planting trees, it takes a while for the trees to get established so it may be sort of five years before you start to get a kick-in."* - Academic, specialised in Greenhouse Gas Removal

This quote sharpened two codes: Heterogeneous Payback Profiles and Sequencing Requirements; which feed back into Instrumental–Normative Tension. The data point to a pragmatic question: how to sequence "fast hits" (e.g., peatland restoration) with slower-burn measures (e.g., afforestation) while keeping social consent and funding aligned over time. Again, the Disruption vs. Continuity axes help: quick wins can anchor continuity; longer-term land-use change presses towards disruption. Both sit within Justice claims if the costs and benefits are unevenly distributed. These thematic

insights are drawn on in later sections of the chapter to explore both inter-narrative overlaps and divergences, particularly in how participants internalise multiple, sometimes conflicting narratives.

4.2.c Examples of coding and thematisation beyond NBS

The second worked set extends the coding beyond NBS to agriculture, buildings, transport, and public policy. The following two excerpts condense many of the recurring codes into portable themes.

> *"...you're going to have to change farming practises and I know in rural mid Wales there will be a big furore because it's linked to the Welsh language, if you start either removing farmers from the landscape or changing what the farmers are doing, so there's a cultural dimension to agriculture in certain parts and I'm sure it's similar in relation to some other supply options."* - Academic, specialised in Environmental Psychology

Here, Place-Identity Coupling, Cultural Externalities of Transition, and Recognition Claims were added to the list of open codes. They sit within Behavioural and Normative Barriers to Transition but also within Just Transition, by making recognition, whose identities and languages are implicated, explicit. Agricultural change triggers resistance not only because of economics but due to identity and place-attachment; this becomes valuable to the later discussion of inter- and intra-group divergences. A longer excerpt then ties sectoral specifics to political feasibility and equity:

> *"Politically, decarbonising supply is much more attractive and less risky than changing behaviour practices, changing people. We also discussed efficiency gains, who should claim them; and how decarbonisation could be accelerated:*
>
> *For food, through changes and shifts to agricultural production and*

sustainable diets and promoting these as healthy.

For buildings, economic policies and incentives have failed substantially. Two-thirds of UK homes are owned by the people who live in them, but they find it very expensive to invest in efficiency renovations and even though a lot of the budget goes towards renovations, only a small part goes towards reducing energy demand, so a need to rethink the policy engagement.

For government, points on needing different skill sets across departments, also understanding how to engage people more effectively, and open-up non-economic incentives.

On transport, needing to re-balance government priorities, there's lots of investment still in car and road infrastructure, and in expanding airports; and little investment in active travel, so we need to make driving and flying more unattractive; also the potential for more flexible arrangements, such as car sharing." - Academic, specialised in Equity and Justice

From this passage I coded: Political Risk Asymmetry (Supply vs Demand); Allocation of Efficiency Gains; Sustainable Diets Co-benefits; Policy Failure (Buildings Demand); Owner-Occupier Capital Constraint; State Capability and Skills; Non-Economic Incentives; Car- and Flight-Centred Investment Bias; Active Travel Rebalance; Flexible Mobility Arrangements. These cluster into Economic Viability and Market Alignment (buildings and investment bias), Structural Preconditions (state capability), and Behavioural and Normative Barriers (risk asymmetry; non-economic incentives; mobility habits).

- Techno-fix vs social change. The opening sentence encodes a familiar political preference for supply-side measures over behaviour change, the "techno-fix" tendency (Carmichael, 2019).

- Just Transition. Questions about who claims efficiency gains and who bears costs are distributional; they sit within justice debates (Wang & Lo, 2021).
- Food systems and co-benefits. Addressing decarbonisation through changes in agricultural production and sustainable diets (Chaudhary & Krishna, 2019; Carmichael, 2019).
- Buildings demand and policy engagement. The diagnosis of policy failure in buildings, particularly for owner-occupiers, links implementation barriers to the design of incentives.
- Mobility transition. Rebalancing away from roads and airports towards active travel and shared mobility points to policy, behaviour and investment working in concert (Pozoukidou & Chatziyiannaki, 2021; Nikolaeva et al., 2019; Carmichael, 2019).
- Holism and non-economic levers. The call for non-economic incentives and new governmental skill-sets feeds into a holistic governance view already present in the dataset (Lemos et al., 2018).

Taken together, these codes support the three themes used above and connect directly to the thesis narratives:

- Green Growth is evident in efforts to unlock co-benefits (healthier diets; warmer homes) and to derisk investment, particularly where owner-occupier capital constraints block action.
- Just Transition is made salient where benefits and costs are uneven, e.g., who captures efficiency gains; who pays for retrofits; which places lose out when transport investment is rebalanced.

- Instrumental–Normative Tension is present where near-term, politically "safe" instruments (supply-side) collide with longer-term social change (demand reduction), and where non-economic incentives are needed to shift practices.

While this is only a single excerpt from a large dataset, it demonstrates how thematic extractions were developed from the narratives expressed during the workshops. The respondent's consolidation across food, buildings, government capability, and transport also illustrates how sector-specific strands can be recomposed into a broader, system-level picture without diluting local realities. The mobility items resonate with literatures on active travel and commoning mobility; the food items with co-benefits; the buildings items with owner-occupier constraints and policy design; and the governance items with capability, engagement, and non-economic incentives (Carmichael, 2019; Chaudhary & Krishna, 2019; Pozoukidou & Chatziyiannaki, 2021; Nikolaeva et al., 2019; Lemos et al., 2018). The same pattern, of coupling instrumental levers with normative commitments, recurs across the DNZ dataset.

Returning to the Disruption vs. Continuity axes, these data show how the same participants often speak across both: continuity is visible in preferences for supply-side decarbonisation and co-benefits; disruption appears where land-use, diet, mobility and home energy practices are to be re-made. The analysis therefore treats "techno-fix" and "social change" as intertwined rather than mutually exclusive; sequencing, burden-sharing, and capability mediate between them.

The examples also provide a succinct framing for the dichotomy explored in the following section: a call for more holistic thinking on decarbonisation at a systemic policy level, alongside acknowledgement that deployable solutions already exist. This entails re-evaluating current economic policies and incentives, as well as shifting

governmental priorities to promote more sustainable practices. It also involves developing non-economic incentives to engage people more effectively and implementing flexible behaviour-change arrangements such as car-sharing (Lemos et al., 2018).

In contrast to supposedly more politically attractive "techno-fixes" reliant on greater renewable generation, carbon capture, storage of both electricity and CO_2, and technical innovations, the excerpt treats decarbonisation as requiring shifts in political and socio-economic values, norms and behaviours. It values active engagement with stakeholders across society, including individuals, businesses, governments and international institutions, which are supported by strong and effective policies adapted to local contexts. When combined with other coded quotes, this implies initiatives to foster public and private investment, pricing of carbon emissions, energy-efficiency standards, renewable-energy targets and regulations; it also points to adequate policy frameworks for secure governance of natural and human resources across borders (Lemos et al., 2018).

For the emerging Justice narrative, a holistic approach entails an expanded analysis of decarbonisation strategies, i.e., of the political, economic, and social factors necessary for success. Participants noted that technological solutions can provide enabling conditions, but without a wider perspective and combined effort across levels there will be insufficient support to facilitate the Net Zero Transition. These themes are not mutually exclusive; they overlap and interact.

> *"From a first principles perspective, if you want to change a system quickly, then you need to have significant interventions for the outcomes to change rapidly. Whether we're working to [Net Zero] by 2030 or 2050, it's still all very rapid changes that we're talking about... You need significant*

> *intervention otherwise we'll just get more of what we've been getting. So there's the logical bits and then there are areas with no real guiding hands, heat for example is an area with essentially no strong policy context. I'm not blaming the government, I'm just saying heat is a system that hasn't historically needed to be managed in the same way we've managed other systems."* - Public Sector Participant, working in Sustainable Cities and Climate Change

The quote above evidences awareness of the need to transition rapidly from high-carbon societies towards Net Zero emissions to avoid the worsening effects of climate change. Participants recognised that NZT requires both long- and short-term strategies, highlighting items such as green-recovery spending, just transitions for those affected by industrial change, targeting homes with higher carbon footprints first, and investing in infrastructure and skills. These narrative elements indicate a nascent consensus: invest in enabling systems; consider social justice alongside emissions; think beyond solely technological routes; and act with urgency.

These thematic consolidations feed directly into section 4.5, where I formalise the thesis' narrative set (ecomodern, crisis, technocratic, justice-centred) and examine how the DNZ-derived themes map onto them. They also set up section 4.6 on inter-/ intra-group divergences by showing how the same excerpt can encode both instrumental and normative claims, and how identity, place and practice complicate apparently technocratic pathways. Chapter 5 then returns to wickedness and plurality, using these themes to discuss why durable consent and credible implementation require attention to capability, value, and recognition, alongside technology and cost.

4.3 Overview of the Themes and Sub-themes

The thematic groupings and sub-themes presented in the table below (Table 4.2.a.i) were developed through an expansion of the abductive analytical process described above, using inductive patterns from the DNZ workshop transcripts and deductively informed concepts from the Literature Review (cf. Winskel & Kattirtzi, 2020; Stirling, 2014; Newell & Mulvaney, 2013; Turnhout et al., 2020), and DNZ Final Synthesis Report (Carr-Whitworth et al., 2022). As the codes were clustered through iterative axial coding (Saldaña, 2016), they revealed higher-level tensions, such as between continuity and disruption, and post-growth and growth. These groupings were subsequently refined through co-occurrence and thematic saturation in and across participant groups. These were further organised by subcoding hierarchical coding trees within NVivo (Saldaña, 2016). This structure allowed for the emergence of parent–child relationships among codes, for tracking both the broad themes and sub-themes.

For example, the thematic axis *Holistic vs. Technocratic* included sub-codes such as 'whole system', 'systems thinking', 'epistemic pluralism', and 'technocratic framing', each of which emerged across multiple participants' contributions yet manifested differently across participant groups. To strengthen internal validity, thematic saturation was assessed not only through repetition but also by tracing thematic consistency across participant groups, so that contentious themes, such as *Legitimacy*, *Justice*, and *Urgency*, were not overrepresented due to either any single group's interests, or any workshop session's specific focus, but reflected a wider narrative. The axes structure was an analytical choice to surface tensions, contradictions, and overlapping logics, presenting the themes along dialectic lines to reveal where trade-offs were implicitly or explicitly negotiated (cf. Stirling, 2006).

Table 4.2.a.i: Thematically grouped axes presented via Disruption vs. Continuity-led transition logics.

Thematic Axes	**Themes and Sub-themes**	**Code Count**
Disruption vs. Continuity	(The other axes function as this overarching axis' sub-themes and code count)	
Decentralisation vs. Centralisation	Spatially Bottom-up vs. Top-down, Spatial Distribution of Power and Responsibility, Whole System Energy, Localisation, Global South vs Global North, National and International, Place, Place-based Knowledge, Regional Credibility and Follow-through.	2,220
Holistic vs. Technocratic	Wicked vs. Tame Problem, Whole System Thinking, Epistemic Pluralism, Interdisciplinarity and Integration vs. Reductionism, Instrumental and Normative Tension, Expertise and Institutional Knowledge, Neo-Luddism vs. Techno-Optimism, Nature Based Solutions and Engineering Based Solutions, Radical vs. Incremental Change, Post-growth vs. Growth, Pragmatism, Supply-side and Demand-side.	2,206
Justice vs. Injustice	Redistribution vs. Free Market, Procedural Justice, Participation and Social Engagement, Legitimacy vs. Illegitimacy, Context sensitivity, Restorative Justice, Transformational Justice, Socialism vs. Capitalism, Structural reform, Collective vs. Individual Responsibility, Co-benefits, Lived Experience, Scientific Authority vs. Democratic Legitimacy, Ecological Justice, Depoliticisation vs. Public Engagement.	1,370
Urgency vs. Delay	Emergency Rhetoric vs. Deliberative Planning, Deployability, Viability vs. Feasibility, Long-termism vs. Short-termism, Iterative vs. Linear Change, Path dependency, Temporal Justice, Present Burden vs. Future Risk.	1,243

While the Holistic vs. Technocratic axis had the second-highest number of coded references (2,206) - suggesting strong cross-sectoral salience - the high code frequency should not be conflated with consensus; in many cases, these axes all represent deep-seated tension (see 5.3.a).

Particular attention was paid to themes containing abstract or potentially contentious terminology, such as 'reductionism', 'illegitimacy', 'neo-luddism', and 'techno-optimism', to avoid analytical imposition. These terms were only retained as thematic descriptors where triangulated evidence demonstrated both recurrence and conceptual coherence across participant groups. For instance, the phrase 'reductionist' did not appear once in the entire transcript, but related conceptualisations drawn from the works of Sarewitz (2010) and Winskel (2018.b, p.80) around "*limited, technocratic framings*" surfaced in roughly 11%, with usage spanning across academic disciplines (6%), third-sector (3%), funder participants (2%), and across the two remaining groups to a lesser degree. An example of this framing coming from an academic participant, saying:

> *"This is an age-old problem in the science-policy interface, the extent we can detach our scientific analysis from our normative judgements, I think we do more service to policy in action if we do that."* - Academic, specialised in the Built Environment

Going on to talk specifically about Just Transitions:

> *"Just Transition discourse is an example of what we would like to happen blurring with our analyses showing what could happen. They've become an integral element of how we want to transform, rather than a narrow enabler of rapid transformation."* - ibid.

Finally, they reiterate the sentiment that, "*wherever we can strip out our normative goals from our scientific analysis, we'll provide a better service as scientists*" (ibid). These were often contrasted explicitly with terms like 'systems thinking', 'holism', or 'place-based' approaches. One academic participant described current UK policy thinking as having a "*scientific* [...] *evidence base",* on the *"levels of development different technologies are at"*, but that the UK government lacked insight into *"how*

feasible and credibly they could be rolled out [and] what the barriers [are]", while a private sector respondent working in R&D was concerned that the NZT discourse in the UK "*skims over issues of integrated systems*", and instead too heavily "*focus[es] on one particular element at a time*".

Similarly, the word 'legitimacy' appeared directly in only 93 transcription excerpts (1.5%), but thematically recurred in nearly 16%. Its use varied from procedural legitimacy (e.g. 'who has the mandate to decide?') to epistemic legitimacy (e.g. 'whose knowledge is seen as credible?'). Participants specifically from publicly owned research funding organisations raised concerns on "*tokenistic consultations*". While one academic participant (specialised in energy demand reduction) - who described themselves as in favour of "*participatory decision making*" - noted frustration at certain modes of participation, in this instance national referenda, being "*insidious[ly]" used as opportunities for "climate denial and spreading misinformation*", rather than providing for "*informed and sensible debate*". Such divergences were reflected in subcoding, allowing *legitimacy* to contribute to a thematic grouping for both participatory justice and knowledge politics. This plural usage aligns with recent energy justice literature (Sovacool et al., 2022; Jenkins et al., 2018), and was retained because it embodied contested meanings across sectors, making it a useful axis for mapping intergroup tensions. Importantly, while the themes, such as 'Techno-optimism' and 'Justice' were informed by existing theoretical frameworks (e.g., Oreskes, 2004; Sovacool et al., 2022), they were only maintained if they consistently recurred in participant speech or reasoning across multiple sectors. Empirically grounding the thematic structure of the participants' discourse.

Reflexive attention was paid to the interpretive role of myself, as a researcher and theme constructor. As Braun and Clarke (2006) caution, thematic analysis is not

merely descriptive but constitutive; the themes reflect not only what participants said, but how their positions were interpreted within workshop sessions, rounds, the DNZ project as a whole, and the wider socio-political context. For this reason, each thematic axis should be understood as an interpretive tool describing narrative convergence and divergence, not as a definitive typology of participant intent. Where appropriate, direct quotations are used to anchor abstract concepts.

The axes identified were created with their distinctiveness from each other in-mind, but with the caveat that they do not have definitive boundaries. Each thematic grouping represents a polarity or spectrum (here termed 'thematic axis'), e.g., Decentralisation vs. Centralisation, Neo-Luddism vs. Techno-Optimism. Importantly, these thematic axes should not be read as fixed divisions between epistemological and political questions. As discussed in the Literature Review (see Section 2.4.b), epistemological claims, such as those surrounding holism, reductionism, or scientific authority, are difficult to divorce from political implication. As discussed, Sarewitz (2010) critiques holistic science not just on methodological grounds, but because it involves acts of boundary-drawing that encode normative and political values. Likewise, participant framings around legitimacy, evidence, and feasibility often blended epistemologies and ethics, raising not only questions about 'what is known?' but 'whose knowledge counts?' and 'who gets to decide?'. Thus, the axes here capture tensions between knowledge, authority, process, and value, reflecting how participants framed problems and narratives.

This captures the dialectical nature of stakeholder discourse, acknowledging NZT as not just contested between groups, but along multiple conceptual axes that cut across disciplines, institutions, and ideologies. These axes present how such transitions and associated narratives are framed in the literature review (Geels et al., 2018), where

behaviours, power-dynamics, knowledge, path dependencies, and social structures both constrain and enable certain positions. Thus, themes and sub-themes intentionally sit across multiple narratives. For instance:

- The Incremental Change sub-theme sits within the Holistic vs. Technocratic thematic axis, but could neatly be relocated into the Urgency vs. Delay axis, simultaneously fitting within both the 'ecomodern' and 'just-transition' narratives (see Section 4.3).

This supports the idea introduced earlier that participants inhabit multiple narratives at once (Kattirtzi & Winskel, 2020), where narratives are not siloed but overlapping interpretive frameworks (Scoones, et al., 2020; Hajer, 1995). Further the groupings attempt to capture both: individual/behaviour-orientations (e.g., "Training", "Skills", "Responsibility", "Behavioural Change"), and systemic/structural-orientations (e.g., "Path dependency", "Capitalism", "Procedural justice", "Centralisation"); as sustainability discourse is often criticised for over-emphasising behavioural nudging and personal responsibility while ignoring systemic causes (Thaler & Sunstein, 2008). What follows is a detailed discussion of each axis, presenting the patterns, divergences, and tensions identified. Where possible, these are triangulated with policy examples or wider literature, but grounded primarily in DNZ participant discourse. The aim is not to produce neat typologies, but to render visible the plural and sometimes conflicting logics shaping the UK's NZT.

4.4 The Disruption vs. Continuity Thematic Axes

The Disruption vs. Continuity axis has been directly informed by the two distinct "transition logics" outlined in Winskel and Kattirtzi's (2019) UK Policy Delphi study: disruption, where policies, technologies, and behaviours drive fundamental remaking of

the energy system; and continuity, where change is pursued through adaptation of existing institutions and infrastructures (see Section 2.3.d). This axis serves as the overarching thematic structure for the subsequent axes presented in this chapter. Rather than consisting of discrete sub-themes, it was constructed as a meta-axis, capturing the broader logics that structure how participants approached the NZT. Themes and sub-themes from all other axes were assessed in terms of whether they were primarily aligned with a logic of continuity (i.e. reform, optimisation, and incrementalism) or disruption (i.e. radical behavioural change, post-growth economics and revolutionary thinking). This dichotomy, while not always explicitly invoked, was latent across nearly all participant contributions and functioned as an interpretive lens through which other tensions were made sense of.

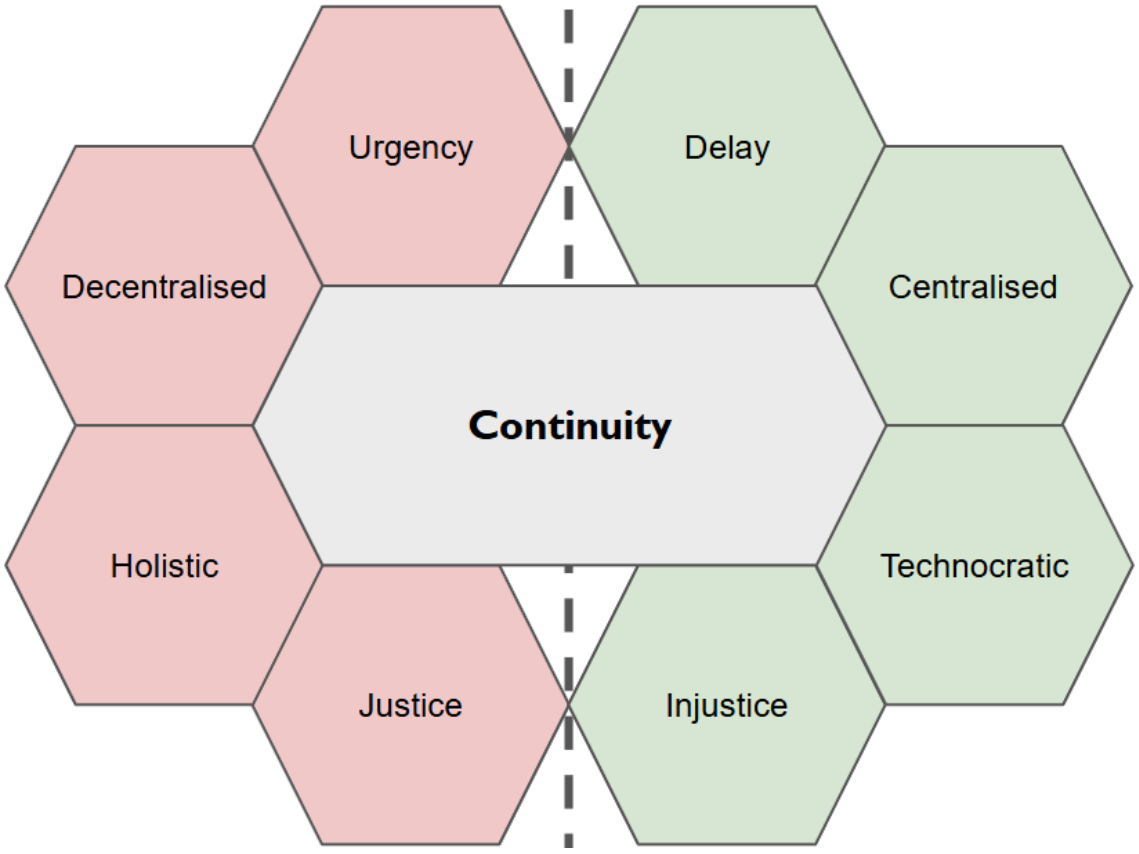


Figure 4.4.i: Author illustrated diagram of the Continuity axis, showing the more aligned sub-axes in green, and the less aligned sub-axes in red.

Figures 4.4.i above and 4.4.ii below schematise how the Disruption–Continuity meta-axis structures the other thematic axes developed in this chapter. In the continuity logic (Figure 4.4.i), NZT is associated with centralised, technocratic and delay-oriented framings, and with a tendency towards reproducing injustices through incremental optimisation of existing institutions. In the disruption logic (Figure 4.4.ii), NZT is instead associated with decentralised, holistic and justice-oriented framings, coupled with a sense of temporal urgency and an openness to more radical institutional reconfiguration. Together, these ideal-typical diagrams translate the abstract disruption/continuity logics discussed by Winskel and Kattirtzi (2019, 2020) into a concrete mapping of how DNZ participants contributed questions of time, justice, governance and expertise to different NZT narratives.

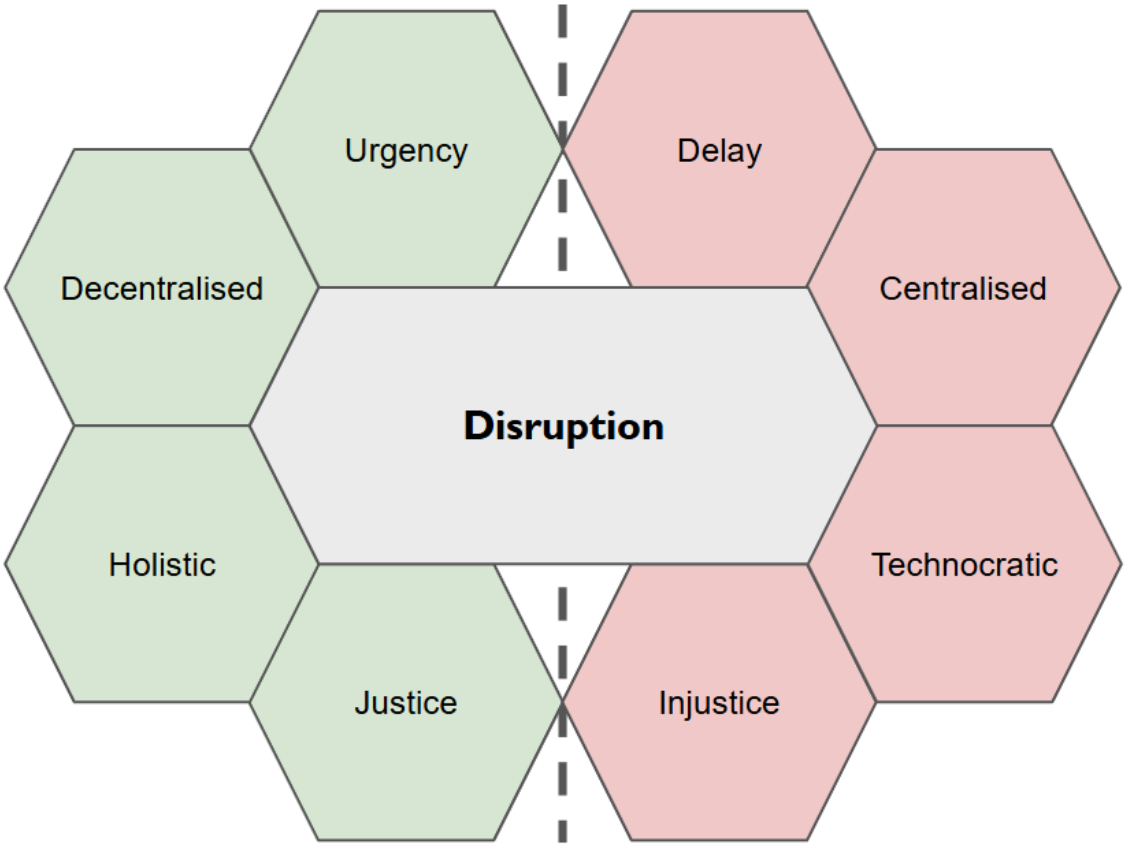


Figure 4.4.ii: Variation of the 4.4.i author illustrated diagram, with this being the Disruption axis, showing the more aligned sub-axes in green, and the less aligned sub-axes in red.

This meta-axis reflects a growing recognition and tension in the literature of the NZT being seen as both a matter of technology and a politicised sociological and epistemological debate (Winskel, 2018a; see also Figures 4.4.i and 4.4.ii). The DNZ findings broadly reinforced this typology, while also revealing that most participants did not fit neatly into either pole. While many DNZ participants voiced support for disruption in principle, they often leaned on continuity practices in specific domains, reflecting the co-existence of radical intent and institutional constraint. This narrative reflexivity exemplifies Lyotard's petit récits, fragmented and contextual accounts that resist closure. It also mirrors the multi-level perspective's view that transitions involve both niche-level experiments and regime-level inertia (Geels et al., 2018). The disruption vs. continuity axis, then, does not denote fixed camps of belief, but a dynamic spectrum through which NZT is made meaningful.

Narrative inconsistencies echo Lyotard's (1984) critique of metanarratives. Rather than adhering to a single, coherent story of progress or transition, many participants oscillated between smaller, situated framings of particular sectors or issues; as in Kattirtzi and Winskel's (2020) study, where respondents deploy disruption or continuity logics on an *"issue-by-issue basis"*. For example, while many participants anticipated relative continuity in transport (due to EV rollout), some saw sweeping disruption in long-distance mobility options through the collapse of both aviation and private car ownership, alongside an imperative for walkable cities. In contrast, the heat sector was generally framed as one requiring adaptive continuity (e.g., hydrogen blending or heat pump deployment within existing networks), and few participants discussed disruptive shifts in access to heating. These issue-specific oscillations between disruptive and continuity framings mirror the configurations illustrated in

Figures 4.4.i and 4.4.ii, but highlight the lack of consensus across NZT aspects on which of either continuity or disruption is or will be the prevailing direction.

Disruptive framings were characterised by participant demands for transformational change. These narratives often emphasised systemic crises in energy, economy, and governance, and called for fundamental shifts in institutions, social contracts, or political economies. Examples included critiques of capitalism and a rejection of growth logics, as well as calls for a complete reimagining of public participation, state-market relations, and energy ownership. One participant, representing a climate justice NGO, remarked that *"net zero is being used to sustain the system, rather than challenge it. But this system is the problem, it's extractive, inequitable, and unsustainable*".

Conversely, continuity framings presented NZT as an opportunity for technological modernisation and economic renewal within existing governance structures. These narratives emphasised innovation, investment, skills development, and infrastructure deployment, often drawing upon language of green growth and low carbon solutions. These framings featured most strongly in sessions focused on delivery, where the feasibility of radical restructuring was questioned, and where discussions gravitated towards upskilling, infrastructure, and technology deployment as levers for transition. A public sector policy advisor framed this perspective succinctly: *"The transition doesn't mean we throw out what works, it means we scale what works better"*.

Across the coded dataset, approximately 41% of contributions by central government-affiliated public sector participants reflected continuity framings, as did 46% of private sector participants. This numerical skew towards continuity-aligned framings resonates with the dominance of centralised and technocratic logics in the continuity configuration in Figure 4.4.i, even where participants rhetorically endorsed

disruption. However, this does not mean the remaining 59% of central government participant contributions are disruption-aligned. Many were thematically hybrid, or neutral. Participants often discussed the tension between needing bold national strategy and working within the pragmatic constraints of existing institutional structures. This reflects the narrative ambiguity that Winskel and Kattirtzi's (2020) found, participants flexibly switch between narrative positions depending on sectoral and issue-specific contexts. The DNZ workshops further revealed that some participants held extremely flexible positions, narrating both polarities on single issues, a point that will be expanded upon further in this chapter (see section 4.6), and chapter 5.

The ideal-types depicted in Figures 4.4.i and 4.4.ii should therefore be read as heuristic devices rather than empirical categories into which participants neatly fall. Most workshop contributions occupied positions somewhere along, or moving across, the dividing line in the diagrams, combining disruptive framings on some issues with continuity-oriented framings on others. This fluidity is shared in the findings of UK energy policy and transitions research that stakeholders mobilise disruption and continuity logics in a selectively strategic manner, depending on sectoral context and perceived constraints (Geels et al., 2018; Winskel & Kattirtzi, 2020; Winskel, 2018a).

This narrative pragmatism was evident in many DNZ discussions. A third sector community energy advocate noted: *"We need state support now, but we need it to help us build alternatives, not just run the grid"*. Such positions suggest what might be termed 'radical incrementalism' or 'strategic disruption', where short-term continuity in some areas, enables longer-term reconfiguration in others. These pragmatic combinations were particularly visible among the private sector, and those engaged in local energy systems and infrastructure planning, where institutional inertia was seen

to need a tactical appreciation. This mirrors findings from Winskel (2018.b), who notes that UK energy research and policy are increasingly characterised by a 'whole systems' orientation that aspires to be interdisciplinary and integrative, but in practice often reproduces disciplinary silos and political contestations. A noteworthy tendency was reflected in DNZ discussions: while 'disruption' was welcomed by many in principle, the means of achieving it were couched in depoliticised terms.

This axis provides an interpretive anchor for the other axes, and the subsequent narratives, revealing that disagreement extends beyond which technologies to deploy and what emissions targets to pursue, to what kind of socio-political world NZT should create. For some, NZT represents a technocratic optimisation challenge; for others, it is a transformative moment requiring radical restructuring. As such, this axis is both empirical and normative, surfacing values about progress, justice, and the role of institutions in transition. However, and as with all the following axes, this axis should be understood as a dynamically held spectrum of positions on scale, responsibility, and legitimacy rather than a simple binary division (cf. Figures 4.4.i and 4.4.ii).

4.4.a Decentralisation vs. Centralisation Axis

This axis maps to a spatial and governance-based tension central to stakeholder understandings of NZT: Where is the problem located, and where is it being solved? It reflects a recurrent theme throughout the DNZ workshops regarding the geography of both responsibility and authority (Bulkeley & Betsill, 2005). The following questions helped frame the theme:

- Where is the problem?
- Where is the solution implemented, or imposed?
- Where is the authority to solve the problem?

- Where are the problems and solutions conceptualised and designed?

In essence, this axis captures divergent views on whether NZT should be predominantly top-down or bottom-up in orientation. Centralisation logics often hinged on the need for consistency, regulatory coherence, and the economic efficiency of scale - especially in relation to infrastructure or national mandates (Patterson et al., 2017). By contrast, participants framed decentralisation around the value of place-based knowledge, local legitimacy, and the agility of smaller actors (Forester 1999; Fischer 1993; Stirling, 2014). One public sector participant resisted a simplistic framing of *"national government dictating to local government"*, insisting that *"it's much broader than this"*. Their account instead pointed to a desire for *"joined-up"* coordination and policy clarity: *"we need the overall picture to make sense of what needs to change nationally in order to enable us all to change how we live our lives locally"*. Reflecting on delays in public communication and inconsistent signals in the heat sector, they stressed the danger of *"a whole load of greenwashing and a whole lot of false starts",* drawing parallels with public mistrust triggered by the VW diesel emissions scandal. Noting that *"you could spend 15–20 years trying to do complex regulation... or you can actually work out which are the things you really want to stop or tax the hell out of"*, this contribution reflects a hybrid logic. Blending a desire for strategic top-down policy action with an awareness of local implementation realities and pervasive institutional friction. Such statements show how participants often adopt both disruption and continuity logics in overlapping and context-sensitive ways.

This axis links closely to the 'Justice vs. Injustice' axis in two respects. First, because *locations are inhabited*: decisions about where solutions are implemented will materially affect specific communities, often unevenly (Sovacool et al., 2022). Second, because questions of *who decides where* a solution is implemented entail issues of

procedural justice and epistemic legitimacy (Jasanoff, 2018; Jenkins et al., 2018; Turnhout et al., 2020). For example, rural communities being asked to host solar or wind infrastructure without meaningful consultation were raised as illustrations of decision-making that appears centralised but socially brittle.

A further overlap exists with the Holistic vs. Technocratic axis. The question of "where" a solution is conceptualised, legislated, and realised reflects not just jurisdictional concerns, but also epistemologies: whether solutions should not only be tailored to local socio-ecological systems, but also co-produced within the locale (holistic), or whether generalisable, top-down solutions should dominate (technocratic) (Winskel & Kattirtzi, 2020; Stirling, 2014; Newell & Mulvaney, 2013).

While 2,220 coded excerpts mapped to this axis, many did not fall neatly into either side. Approximately 38% of excerpts were coded as supportive of decentralisation, 24% aligned with centralisation narratives, and the remaining 38% represented ambivalent, or such thoroughly pragmatically mixed positions they were difficult to clearly divide. Of these, academic participants and a majority of those from local government and community organisations framed decentralisation as enabling flexibility, local legitimacy, and more rapid mobilisation. One third-sector participant remarked: *"decisions from Westminster ignore our [local] constraints, we have answers, we just need permission and resource"*. Meanwhile, academics and a majority of private sector and central government participants stressed the need for national clarity and a guiding strategy, particularly around long term funding and policy frameworks. However, it is yet again worth mentioning that while a majority of participants in location specific roles or specialism appeared to favour more decentralisation, there also existed a persistent call for high-level strategic alignment and stability from national government.

None of the participants presented a case for disbanding central government in favour of radical localism, or vice versa.

Many participants expressed a desire for joined-up governance, in which clarity of national ambition is paired with place-sensitive delivery, a concern represented in the DNZ Synthesis Report as shared across both core narratives (Carr-Whitworth et al., 2022). Recurring references to the codes "regional credibility" and "policy follow-through" suggested that although local actors were often viewed as more trusted, systemic transformation still depended on central government's control over regulation, taxation, and investment signals. The qualitative data thus revealed a persistent call for institutional coordination across levels, rather than a binary commitment to either centralisation or decentralisation. This complex pattern supports the thesis' broader argument that NZT narratives are seldom rigid but often layered, relational, and responsive to scalar dynamics.

4.4.b Holistic vs. Technocratic

This axis explores conflicting epistemological and methodological approaches to defining, understanding, and addressing the NZT. It asks:

- What is the problem?
- What is the solution?
- What knowledge credibly answers the prior two?

Across the DNZ workshops, this axis emerged as a key site of tension between those participants who called for integrated, participatory, and interdisciplinary modes of knowing and acting, and those who articulated preference for more conventional, expert-led, and target-oriented approaches. Participants who provided technocratic

framings frequently cited linear models of change, assumptions of predictability, and a reliance on quantifiable indicators. These framings typically privileged infrastructural solutions, scaling technologies, and policy instruments grounded in behavioural economics (Stirling, 2014; Sarewitz, 2016). By contrast, holistic framings stressed contextual specificity, epistemic pluralism, and socio-political embeddedness. Participants expressing these views often called for co-production, systems thinking, and deliberative engagement with communities - insisting the transition be not only a technical undertaking, but also a socio-political transformation (Funtowicz & Ravetz, 1993; Turnhout et al., 2020). However, as will be reiterated below in the Urgency axis, and as was presented in the DNZ Synthesis Report (ibid.) via the cross-narrative call for "rapid deployment of solutions" (ibid. p.3), when participants promoted holism, even those very same participants would regularly provide a refrain along the lines of:

> *"We need to get started. We've been ready to get started since 2008, and the Energy act, but haven't been able to because of government policy. We have all the technology now. We've been ready to go for ages, we just need to be allowed to."* - Private Sector Participant, Heat Pumps
>
> *"We just need to get on and start doing the immediate things."* - Academic specialised in Energy Economics
>
> *"We need to get things going now. Most of the stuff that's going to get us to Net Zero, is already known technologies"* - Research Funder, Public Sector.

Similarly, some academic participants shared a common feeling that they get *"the sense some people in [central government] believe we just need to get on with it, and that we don't need any more research."* (Academic specialised in Energy and Climate Policy). In contrast, another participant expressed a positive attitude toward a holistic framing, saying that doing so helps:

> *"reveal the complexities of what we're trying to do. There's an impression that tackling climate change, while not easy, is obvious, that we know what we need to do, we just need to get on and do it. That somehow governments are blatantly ignoring what should be done, and instead pursuing other things for some selfish goal, rather than because it's actually a really complicated arena."* - Academic specialised in Energy Systems

This remark brings nuance to the critique of technocracy. It suggests that complexity itself can necessitate streamlined, expert-led policy, particularly when political legitimacy and democratic mandates are weak. These contributions see technocratic framings as not inherently apolitical, but within concerns of institutional reliability, delivery capacity, and policy coherence (Sarewitz, 2010). One academic participant offered a particularly pointed critique of what were perceived to be dominant NZT narratives within the DNZ process. In a single extended intervention, they challenged the implicit assumptions behind concepts such as "social legitimacy" and "political feasibility":

> *"There's this implicit assumption that there's something acceptable about the situation we live in now... the 'need to develop social legitimacy for ambitious decarbonisation' implicitly assumes there's social legitimacy for what we have right now, and a lot of people would entirely disagree. Particularly when you're talking about global South issues and marginalised communities… there is no social legitimacy for what we have now."* - Academic, specialised in Social Practices and Public Engagement

They went on to critique the UK state's reliance on tools like the Behavioural Insights Team, arguing that these instruments are grounded in narrow assumptions about how social change happens. Instead, they called for more experimentation, localised

co-design, and the deliberate building of an evidence base that supports "social change" in a manner that is sensitive to vulnerability and risk. As they put it:

> *"We're just trying the same things, poking the same bear with the same stick over and over again, and then we're surprised we're not creating change."* - ibid.

This critique exemplified a broader frustration, especially held by academic participants, with technocratic approaches that frame citizens as passive or malleable recipients of change, rather than as agents of transformation. However, participants of other groups also echoed this concern, arguing that NZT will require not only new infrastructure, but new values, relationships, and institutional cultures. The coding data reflect the broad salience of this axis: with 2,206 coded references, it was the second most prominent axis after Decentralisation vs. Centralisation. Notably, holistic framings appeared more frequently in academic, NGO, and community contributions, whereas technocratic framings were more common among participants from government, academics from engineering disciplines, and industry backgrounds. This axis interacts substantively with both the Justice and Decentralisation axes. Calls for greater inclusion, participation, and place-based legitimacy were frequently framed in holistic terms. Technocratic framings, conversely, often emphasised efficiency, scalability, and coordination, sometimes at the expense of perceived legitimacy or responsiveness.

Finally, this axis invites a reconsideration of how NZT knowledge is shared, and areas of consensus. Some participants expressed concern that holistic perspectives, despite being well-represented within some workshop groups, were under-emphasised in the DNZ Project's final workshop round. As another academic participant reflected:

> *"Perhaps our group had more of an emphasis on justice, social participation and sociotechnical change, and that wasn't reflected in the wider discussions in other groups... But that's probably because energy is dominated by technologically oriented people... I just don't think there's anyone who's been in these workshops who doesn't recognise the importance of integrating the social and the technical. So that's not coming across as strongly as I would like to see in the conclusions."* - Academic, specialised in Social Practices and Public Engagement

This quote suggests not only divergence in group-level discourse but also a perceived asymmetry in how different framings were carried through into the DNZ Project's outputs. Another participant made a complementary point, highlighting the predominance of both technocratic and statist assumptions:

> *"I find the whole thing... very statist, in the sense that the government is supposed to intervene and upskilling in government and civil service, yet the expectation is the majority of this investment is going to come from the private sector. So the private sector, business and industry is missing... one of the reasons for the technocratic framing is as that is the way the government is framing delivering net zero, and perhaps we're just reflecting that?"* - Academic, specialised in Energy Governance

Here, the participant recognises how government framings can become self-reinforcing through participatory processes that mirror dominant narratives. These reflections present the Holistic vs. Technocratic axis as not just an abstract analytical construction, but as being actively critiqued and problematised by workshop participants themselves.

4.4.c Justice vs. Injustice Axis

This axis addresses distributive, procedural, and recognitional justice (Newell & Mulvaney, 2013), focusing on how power, legitimacy, and responsibility are negotiated across sectors, regions, and social groups. This axis interrogates questions of:

- Who benefits?
- Who is burdened?
- Who participates in decisions?

Further questions followed on 'what narratives are we allowed to tell?' and crucially, 'who is allowed to tell them?' As discussed in the Literature Review, the voices of those most directly affected by transitions, the vulnerable and marginalised, are by definition underrepresented, or sometimes entirely absent in decision making processes, and until more recently, academic discourses also. This thematic axis presents this omission which not only skews our understanding but also perpetuates the inequalities transitions, especially those aiming for sustainability and equity, often seek to address. In the DNZ workshops, justice-oriented framings emerged both explicitly - through direct references to "*just transitions*", "*vulnerability*", and "*fairness*" - and implicitly, through concerns about voice, legitimacy, and exclusion. However, "*justice*" was not uniformly defined. For some, it meant ensuring that low-income households were not disproportionately burdened by decarbonisation policies; for others, it involved ensuring that historically marginalised communities were empowered to shape the transition on their own terms. Still others saw justice as entailing intergenerational fairness, equity between regions, nations, and continents; or ecological justice, so the needs of non-human systems (cf. Wang & Lo, 2021).

A central tension emerged around the concept of legitimacy, as reflected in the DNZ Synthesis Report (ibid.). One participant, from a third-sector organisation specialising in energy access, reflected on how legitimacy can be framed as permission to act, but what may be more productive is to inspire:

> *"One of the arguments that the Energy Systems Catapult makes on social legitimacy and permission is that sure, you can force people to do this stuff, but actually it's about flipping that on its head and making a sustainable way of life desirable, beautiful, flourishing… creating really positive statements… to promote the customer - or societal - pull for this transition. We need more than just 'legitimacy', it gives the impression that all we need is the permission to force people to do things."* - (ibid.)

This quote captures the core contestation in how legitimacy is constructed: as either top-down consent (enabling technocratic implementation) or as bottom-up desire (driven by participatory co-creation). Several participants challenged the idea that transition legitimacy can be "granted" by the public via consultation alone, calling instead for iterative engagement and redistribution of agenda-setting power. This supports procedural justice framings which argue that how decisions are made is as important as what is decided (Jenkins et al., 2018).

The DNZ coding supports the salience of this axis. With 1,370 references tagged across codes such as *participation*, *responsibility*, *co-benefits*, *equity*, *fairness*, and *social legitimacy*, the axis revealed particularly strong resonance among public sector, academia, and third sector participants. Codes referring to *scientific authority* and *free-market*, meanwhile, were more commonly cited by the private sector and some academics, indicating a tension between meritocratic and democratic justifications for decision-making authority. Moreover, justice claims were frequently scalar. Local

injustices such as retrofitting costs falling disproportionately on low-income homeowners were often linked to national or global dynamics, such as uneven capacity to access green finance, or the legacy of colonial resource extraction. In one discussion on aviation and food, participants contrasted the high emissions of frequent flyers and wealthy meat consumers with those of subsistence communities (Godfray et al., 2018). These reflections recalled broader critiques of transition policies that fail to distinguish between high-consumption and structurally constrained populations (Newell & Mulvaney, 2013; Bouzarovski et al., 2021).

Participants advocating for social justice argued that those who will suffer most during this process should receive adequate compensation through welfare reform initiatives; whilst others suggest targeted investment in skills training programmes so individuals can adapt their knowledge base accordingly. In addition, some participants saw importance in not only investing money but also time into upskilling workers across multiple sectors including oil/gas extraction industries where jobs may become obsolete due to low demand associated with decarbonisation efforts. Considerations promote both economic stability throughout any transitional period while simultaneously advocating greater levels of equity between different groups impacted differently by changes required for reaching Net Zero goals. Related to discussions on just transitions, were debates about what constitutes 'social engagement' when it comes to transitioning away from fossil fuels towards renewable energy sources (e.g., O'Neill et al., 2017).

The axis intersects directly with Holistic vs. Technocratic tensions. Participants critical of technocratic modes often saw them as depoliticising justice issues, treating them as constraints to be managed rather than demands to be addressed. Conversely, some participants warned that excessive attention to justice could paralyse action. As one

government-affiliated participant noted (paraphrased): *"Sometimes, waiting for the perfectly fair solution just delays everything. There's injustice in inaction, too."* This illustrates the ethical dilemmas facing NZT governance: balancing urgency with equity, and feasibility with fairness. For example, participants when discussing and contributing to the Justice narrative would express sentiments such as: *"it's not that I believe in an unjust transition. The actions that should be taken should incorporate justice within relevant policies and activities. But focusing on ensuring a just transition would distract the wider transformation"* (Academic, specialised in Energy Systems).

The Justice vs. Injustice axis sees that NZT is for many not simply a question of technology or cost, but of values, accountability, and inclusion. It reveals disagreements that inhibit consensus, are not just about *how* to decarbonise, but *who* decides, *who* wins or loses, and *who* is involved in the process. These questions are neither ancillary nor rhetorical, but for a majority were central to not only whether the transition would be socially just, politically legitimate, and ethical, but also whether the transition could realistically be achieved without answering these questions.

4.4.d Urgency vs. Delay Axis

This axis engages with temporality, specifically how time is understood, prioritised, and acted upon. It asks:

- When is the problem?
- When is the solution?
- When should trade-offs be negotiated?

Participants in the DNZ workshops consistently expressed a shared awareness of the scale of the climate crisis, but diverged on the temporal logics that should guide action. The *urgency* framing was very dominant in rhetorical terms. Phrases such as "climate

emergency," "tipping points," and "the window is closing" recurred throughout the workshops, and there was a near universal appreciation for urgency across all participant groups, but particularly among academic and third-sector participants. These framings often drew on the language of planetary boundaries, carbon budgets, and cumulative emissions (Anderson et al., 2020). One academic participant specialising in climate policy put it clearly:

> *"There won't be one person in this room who isn't really aware the UK needs to continue the rapid transition from a high carbon society to one where greenhouse gas emissions are close to zero as quickly as possible... the UK must achieve rapid transitions, not just in the long term but also in the short term, to avoid the build-up of cumulative emissions."* - Academic, specialised in Climate Policy

This quote expresses a dual temporality: short-term emissions reductions are not just preparatory but essential in themselves, due to the irreversibility of cumulative carbon impacts. This view was consistently echoed, especially by academic participants advocating for "*deployment-first*" approaches, rapid roll-out of heat pumps and retrofits, and immediate regulatory action. However, a countervailing set of concerns centred on the *risks of premature action*, *institutional unpreparedness*, or *false starts*. Several participants argued that urgency, while important, must be carefully managed to avoid reinforcing existing inequalities or undermining legitimacy. One stakeholder warned against a "*desperation logic*", in which the speed of deployment leads to top-down imposition, failed implementation, or erosion of trust. In this sense, urgency can itself become a vector of injustice. Some participants made the case for deliberative sequencing, emphasising that durable transitions require social acceptance, regulatory clarity, and institutional learning. These participants expressed preference

for iterative, adaptive roll-outs rather than rushed implementation. The tension here mirrors broader literature on "pace-layering", the idea that different systems (e.g. technological, social, political) change at different speeds and must be synchronised to avoid failure (Stirling, 2014).

The DNZ coding supports this polarity. While over 1,200 coded excerpts related to urgency, many of these were also tagged with terms like "*feasibility*," "*deployability*," or "*short-termism*", highlighting ambivalence. Calls for urgency were often accompanied by caveats, particularly from participants with policy delivery backgrounds. For example, one participant argued that *"if we rush things without resourcing the system, we just burn out the civil service and lose public support"*. Urgency framings also varied by sector. In transport and heat, participants stressed that the technological options already exist and thus delays are unjustifiable. In sectors like agriculture, land use, and housing, participants were more likely to cite institutional inertia, cultural resistance, and planning bottlenecks as reasons for paced transitions. This suggests that urgency and delay are not abstract temporalities but tied to sectoral feasibility, resourcing, and political context.

As with other axes, the urgency vs. delay spectrum was not binary. Many participants advocated for a mixed temporal strategy: act immediately where ready, while planning participatively and cautiously where not. This view supports the idea that rapid action does not necessarily forgo equity, trust, or justice. This axis reveals not a full conflict between action and inaction, but between competing visions of *how* and *when* to act; and surfaces the Just Transition's narrative tension between moral imperatives to act now, vs. systemic calls to act wisely to avoid unnecessary pain, especially for those seen to already be excessively burdened. The disagreement within the workshops was not about whether NZT should happen - likely due to the participant sample - but about

how to sequence, resource, and legitimise the pace of change across everything impacted by the NZT.

4.5 Narratives Synthesised from Thematic Analysis

This section complements the axes analysis by moving away from clear positions to the less clear reality of the DNZ participants' internalised narratives. The axes frame *what* tensions participants occupy (e.g., disruption–continuity, technocratic–holistic); whereas the below narrative analysis shows *how* those positions are simultaneously occupied and stitched into varyingly coherent narratives with diagnosis, prognosis and motivation. This adds analytical leverage in four ways; by first grouping multiple axes into portable narrative types that travel across sectors (here: ecomodern, crisis, justice, technocratic), avoiding a siloed, axis-by-axis reading. Second, it links claims to implied theories of change: who acts, with what instruments, and when, yielding expectations about policy that can be interrogated against evidence. Third, politics and legitimacy: the analysis reveals how narratives mobilise coalitions, allocate responsibility and justify trade-offs, clarifying why some configurations gain traction while others stall. Fourth, it allows tracking of hybridisation and narrative shifts over time and between groups, not just movement along single axes. Operationally, I coded relevant excerpts for diagnostic, prognostic and motivational elements, and implied agents/instruments; these fed into the four synthetic narratives below and also fed Section 4.6 on inter-/intra-group divergences and Chapter 5.

The following NZT narratives were developed through the above thematic analysis of the DNZ workshop data, along with insights from the DNZ Final Synthesis Report (Carr-Whitworth et al., 2022), relevant UK policy documents, and the academic literature. These narratives reflect not only differing understandings of the purpose and

pathway of NZT, but also divergent visions of societal change, responsibility, legitimacy, and risk. Further, these narratives represent more than individual opinions; they illustrate collective, changeable, imaginaries and structuring frames through which participants understood and contested the UK's NZT. All the narratives intersect and hybridise, while some appear mutually antagonistic, participants regularly dispelled this notion. Taken together, they reveal not a single consensus on the meaning or direction of the UK's NZT, but a plurality of situated interpretations on how authority, science, justice, and urgency are, and should be, understood in practice.

4.5.a Ecomodern Narrative (Extension of DNZ Narrative 1)

The first narrative the DNZ project detailed was an ecomodernist, green growth, continuity-led, transitional narrative, and presented a counter-narrative to the more radical post-growth, disruption-led NZT narrative; Figure 4.5.a.i below locates this narrative within the broader axes framework as predominantly continuity-oriented, albeit retaining selective disruptive elements. The Ecomodern narrative proposes economic growth and environmental sustainability can and must be pragmatically aligned, to deliver a feasible NZT. The DNZ proponents of green growth advocated for the decoupling of economic growth from environmental degradation through the use of clean renewable energy technologies, further moves towards knowledge-based economies, carbon pricing, and more sustainable production practices (OECD, 2011).

This narrative casts NZT not as entirely being a burden, but potentially also a technological and economic opportunity. Drawing from the "green growth" paradigm, it presents sustainability as the new frontier for prosperity, where innovation, market mechanisms, and human ingenuity are the primary tools for climate mitigation and adaptation (Martin et al., 2022: p.8-9). Economic growth is not antithetical to climate

action but reimagined as its enabler (Stern, 2008). Unlike fully techno-centric or denial narratives that downplay climate risk or promote indefinite postponement of action (Gifford, 2011), the ecomodern view accepts the reality of climate change while asserting it can be managed without altering foundational economic structures. It celebrates individual behavioural agency (ibid.) and encourages consumer-driven change, relying heavily on lifestyle optimisation and technological change (Geels et al., 2018). The simultaneous emphasis on urgency, infrastructural centralisation and institutional continuity is reflected in the Ecomodern narrative axis configuration shown in Figure 4.5.a.i.

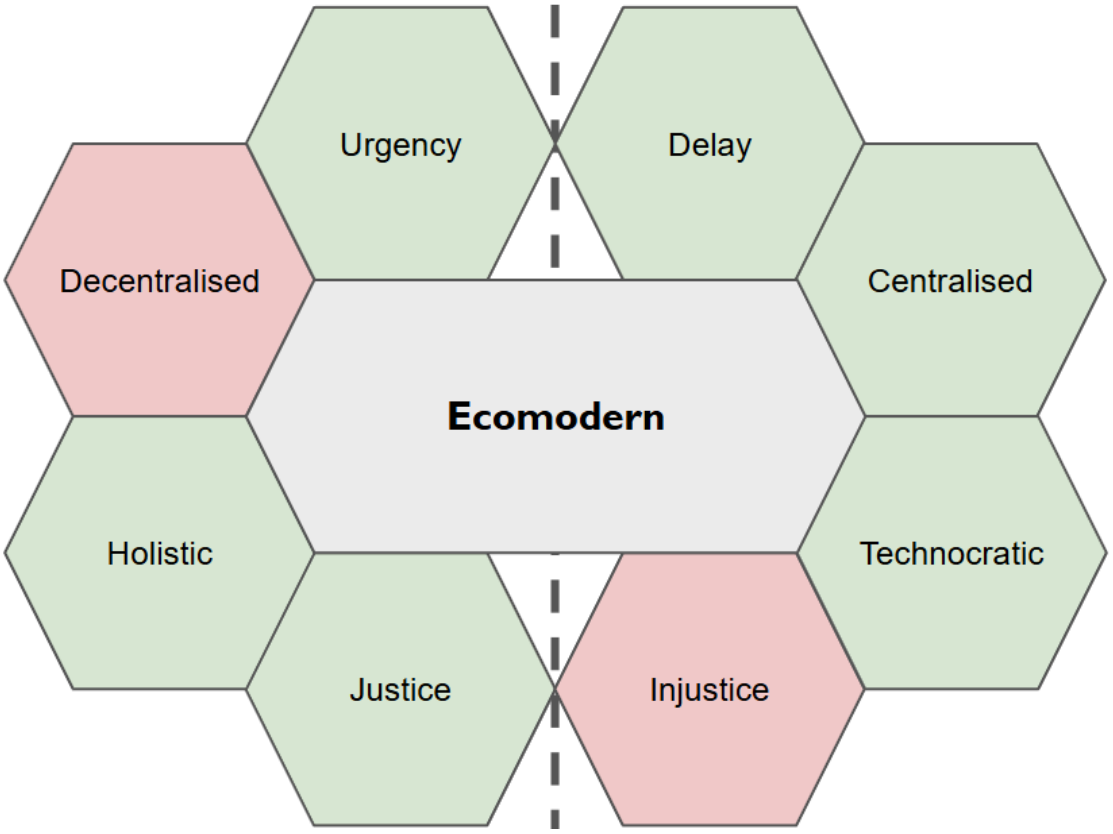


Figure 4.5.a.i: Variation of figure 4.4.i, with this being the Ecomodern narrative, showing the more aligned sub-axes in green, and the less aligned sub-axes in red. Note first the deviations from the continuity-disruption split, and second the green shading of both the poles of the Urgency-Delay, and Holistic-Technocratic axes.

Figure 4.5.a.i maps the Ecomodern narrative onto the disruption–continuity axes developed in Section 4.4. It shows how this narrative combines a strong sense of urgency and a concern for justice with a commitment to centralised, infrastructure-led delivery and a broadly holistic view of NZT. Decentralisation, technocracy and the risks of injustice are problematised rather than fully rejected, indicating a preference for coordinated state–market leadership and expert knowledge, but with attention to distributional outcomes and public legitimacy (Geels et al., 2018; Martin et al., 2022).

The use of green shading on both sides of the urgency–delay and holistic–technocratic axes is deliberate: DNZ participants drawing on this ecomodern narrative sought to reconcile rapid climate action with a phased, managed rollout of infrastructure, and to combine whole-system, justice-aware framings with a strong reliance on expert-led planning and delivery (cf. Geels et al., 2018; Winskel, 2018a). These internal tensions and hybrids are explored further in Section 4.6 and Chapter 5. This narrative reflects wider green growth and ecomodern debates, where climate action is framed as an opportunity for renewed prosperity through large-scale investment, innovation and efficiency, while leaving core economic structures intact (Stern, 2008; Newell & Mulvaney, 2013; Hickel, 2019; Kallis et al., 2020). The figure therefore visualises an ideal-typical "win–win" position: rapid decarbonisation delivered through centralised low-carbon infrastructure and market mechanisms, rather than through more disruptive transformations of ownership, consumption or political economy.

> Associated Narratives: Continuity, Leapfrogging, Enlightenment Now, Techno-optimism, Discourses of Delay

These associated narratives cluster around the central, continuity-led position depicted in Figure 4.5.a.i, reinforcing its optimism about technological innovation and managed

transition, while also foreshadowing the critiques developed in the subsequent narratives.

4.5.b Crisis Narrative (Extension of DNZ Narrative 2)

However, the ecomodern narrative was not without its critics. Participants advocating for a post-growth transition argued the notion of unlimited economic growth was inherently incompatible with the finite nature of Earth's resources, a view echoed by ecological economists like Jackson (2009). This post-growth critique underpins the Crisis narrative mapped below in Figure 4.5.b.i. The green growth paradigm, while calling for sustainability, was seen to fail in addressing issues of consumption patterns and the societal fixation on economic indicators as the primary measure of progress (ibid.). The debate between green growth and post-growth reflected a key persistent divergence in narration on the relationship between economic development and environmental sustainability.

Rooted in climate science and planetary boundaries frameworks (IPCC, 2018), the Crisis Narrative (see Figure 4.5.b.i) frames NZT as an urgent and existential threat. It emphasises the narrowing window of opportunity for meaningful action and positions the current (and often past) moment as a decisive historical juncture. Here, the dominant emotional register is alarm: transition is not optional, but imperative. While the narrative sometimes overlaps with nihilistic tones, it often channels urgency into calls for immediate, large-scale disruption, whether in lifestyle, infrastructure, or governance. Crisis, brings forth narratives warranting immediate interventions to salvage situations on, or beyond, the brink. The Crisis narrative especially, was not monolithic; but held with a high degree of individuality; where one participant's crisis would seem to be perceived to be trumped by the *real* crisis, perceived by another. These tensions also opened space for justificatory narratives of deferral and

moderation, which are captured in the contrasting Delay configuration (Figure 4.5.b.ii) and are explored further in Section 4.6.

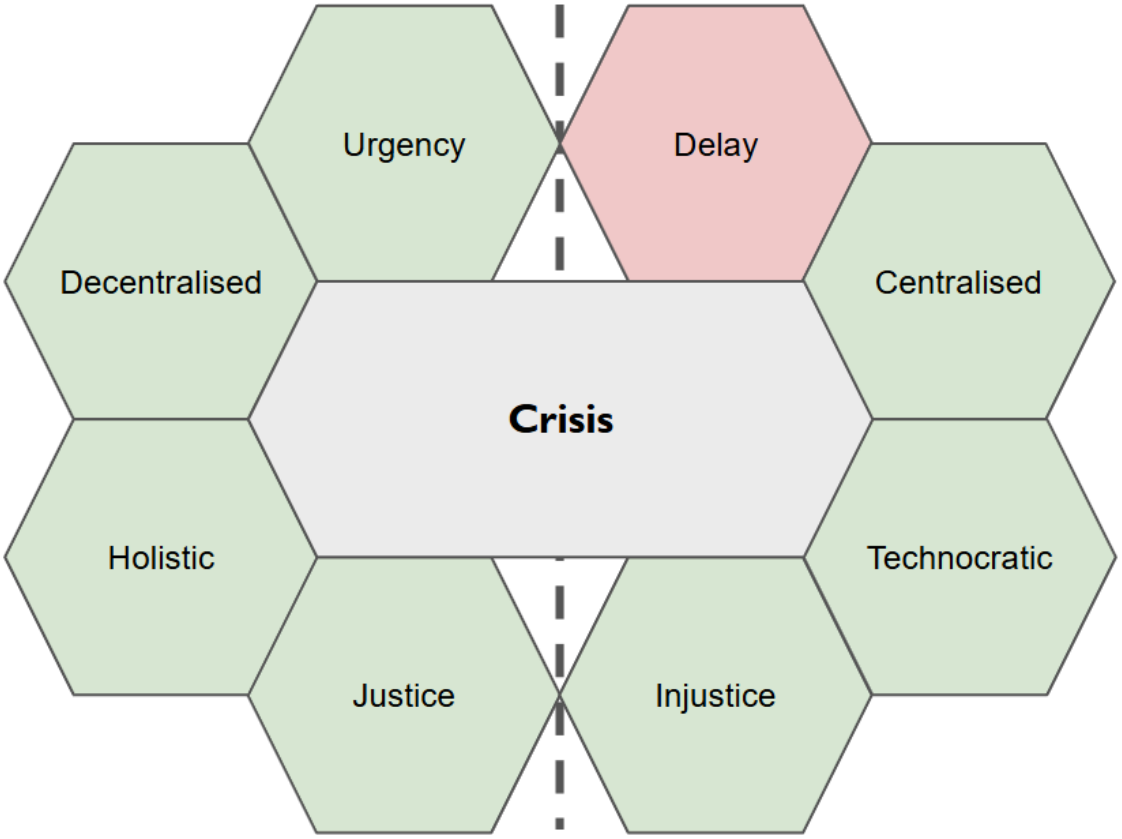


Figure 4.5.b.i: The Crisis Narrative variation of figure 4.4.i.

In Figure 4.5.b.i we can see almost all axes are *activated*: participants combined strong urgency, decentralised and holistic framings, and justice claims with support for centralised, technocratic interventions. Both justice and injustice are shaded green to indicate that crisis framings rely on naming existing and anticipated injustices as well as articulating demands for their redress; delay alone is problematised (shaded red), reflecting the view that further postponement of action is illegitimate in light of planetary boundaries and cumulative emissions (Jackson, 2009; IPCC, 2018).

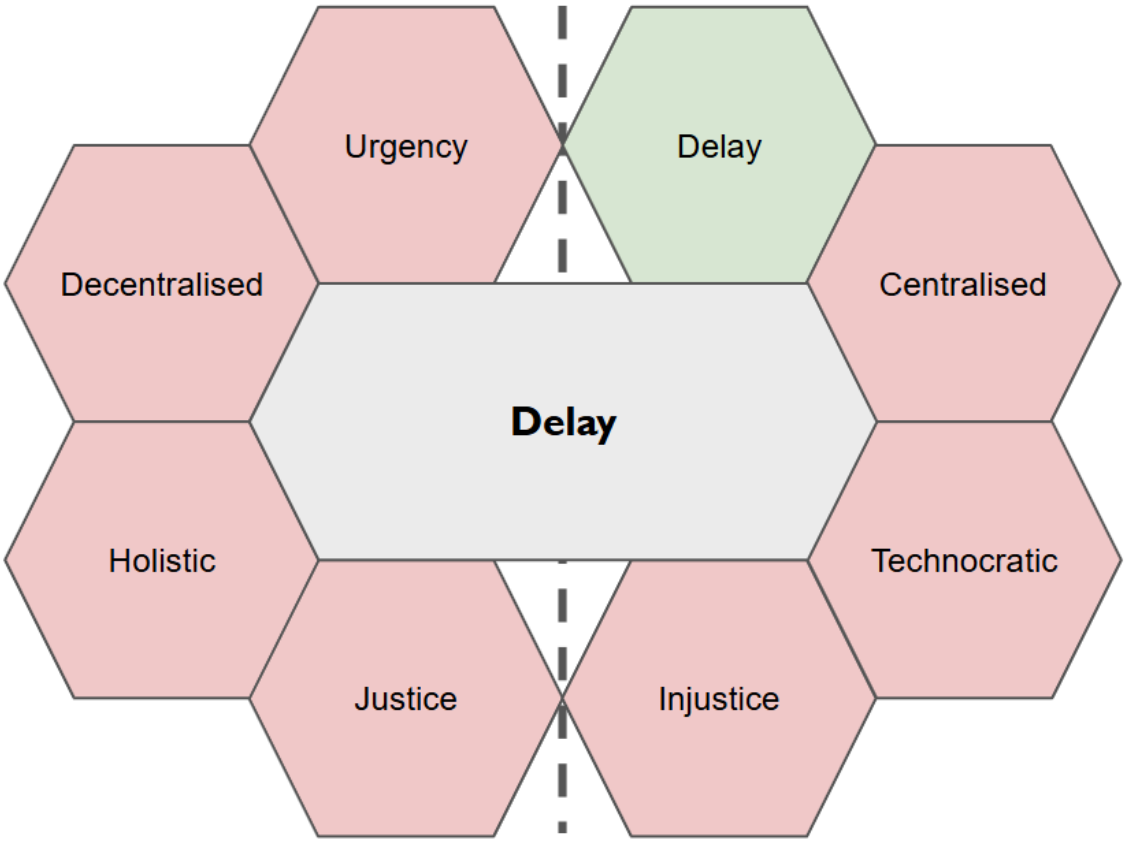


Figure 4.5.b.ii: Variation of figure 4.4.i, presenting Delay. Note this was not an identified narrative from the DNZ data, but represents research into "discourses of delay", which were mentioned participants.

Figure 4.5.b.ii presents a contrasting Delay configuration, which distils discourses that legitimise postponement or dilution of NZT. Here delay is the only positively coded axis, while urgency, centralisation-decentralisation, technocratic-holistic framings and injustice-justice claims are largely muted rather than explicitly opposed. This ideal-type captures arguments that portray ambitious action as premature, too costly, or socially unfair, and that displace responsibility onto future technologies, other jurisdictions, or later generations. It resonates with recent analyses of "discourses of climate delay" (Lamb et al., 2020), in which calls for gradualism, more evidence, or technological salvation function to defend the status quo.

Associated Narratives: Urgency, Disruption, Post-Growth, Nihilism, Acting Illegitimately; Counter-narrative: Delay (see Figure 4.5.b.ii).

4.5.c Justice Narrative

The Justice narrative foregrounds questions of equity, responsibility, and participation. Informed by social and environmental justice scholarship (Newell & Mulvaney, 2013), it argues that the NZT must be not only fast and effective but fair. It resists transitions that exacerbate structural inequalities and calls for redistributive, restorative, and inclusive approaches. This narrative draws heavily from holism, emphasising interconnectedness between ecosystems and social systems. It champions community-led action, participatory governance, and lived experience. While it shares some urgency with the Crisis Narrative, it is more cautious on technocratic and imposed solutions, advocating for participatory co-production and intersectionality (Beck, 2019; Turnhout et al. 2020).

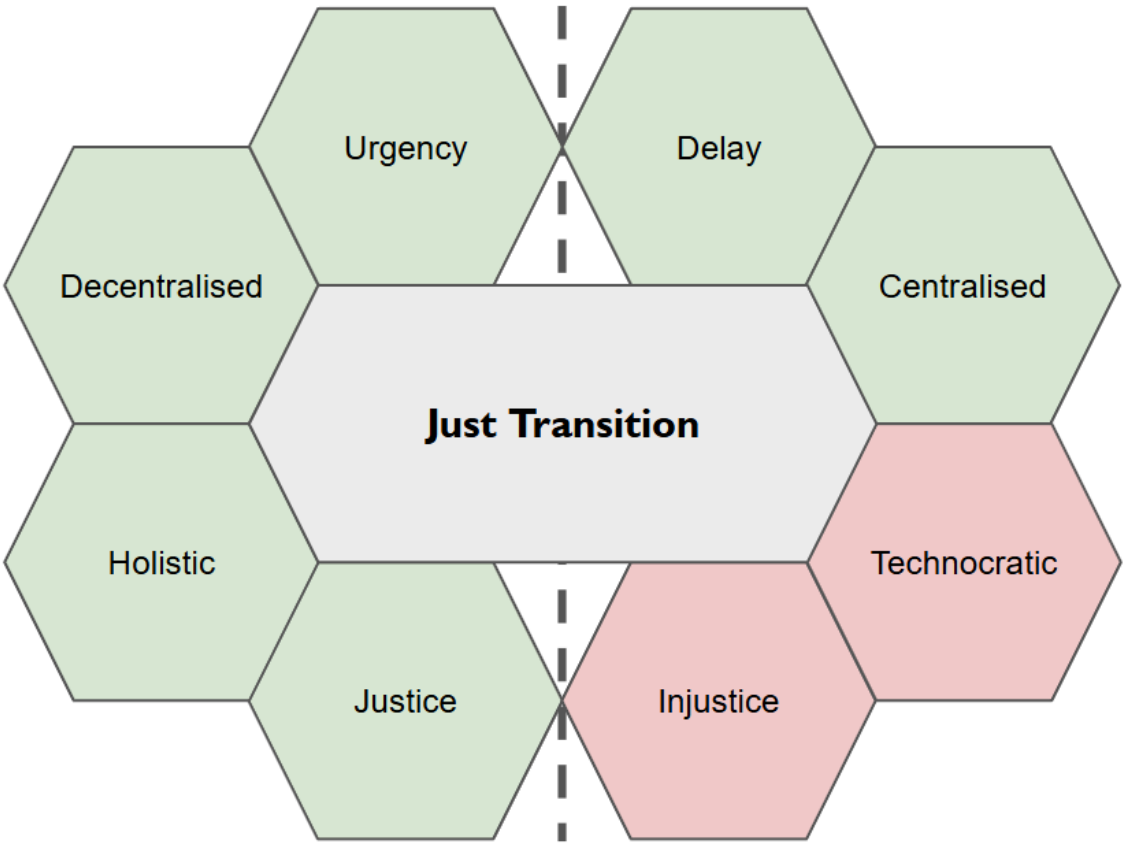


Figure 4.5.c.i: The Justice Narrative variation of figure 4.4.i.

Figure 4.5.c.i locates the Justice, or Just Transition, narrative within the disruption–continuity axes. The narrative foregrounds decentralised, holistic and justice-oriented framings, alongside an emphasis on urgency, while still recognising the role of centralised institutions in delivering transition. Technocracy and injustice are shaded red to indicate that participants associated justice with democratised, participatory forms of expertise rather than purely technocratic decision-making, and with actively countering existing and anticipated harms to workers, communities and marginalised groups (Newell & Mulvaney, 2013; Healy & Barry, 2017). The dual green shading on both the urgency–delay and decentralised–centralised axes reflects a concern to balance rapid decarbonisation with adequate time, support and state involvement to protect livelihoods and secure procedural fairness.

> Associated Narratives: Holism, Marginalisation, Justice and Injustice, Acting Legitimately and Illegitimately, HDI-Continuity, Liberal-Continuity, Growth / Post-Growth Tension

As discussed further in Section 4.6, participants mobilised this Just Transition configuration in different ways, sometimes combining its justice-oriented commitments with more continuity-led or technocratic framings on particular issues (cf. Figures 4.4.i and 4.5.a.i).

4.5.d Technocratic Narrative

The Technocratic narrative frames the NZT primarily as a problem of coordination, data, and system optimisation. It privileges expertise, modelling, and delivery mechanisms over normative contestation or democratic deliberation. Participants expressing this narrative often favour centralised planning, metrics-based accountability, and depoliticised language of *"evidence-based policy"* (cf. the centralised and

technocratic emphases in Figure 4.5.d.i). While not always overt, the narrative was visible in framings that treated justice, legitimacy, or engagement as implementation risks rather than guiding principles (Sarewitz, 2016.b).

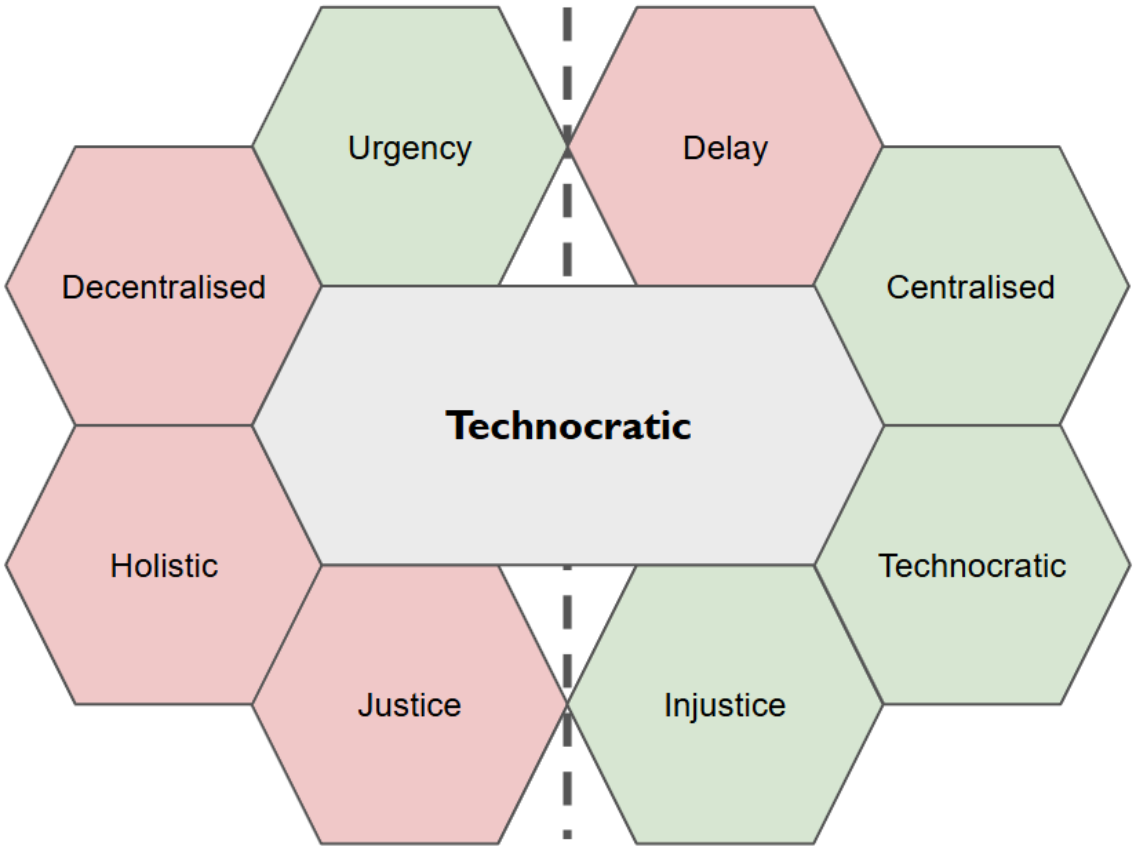


Figure 4.5.d.i: The Technocratic Narrative variation of figure 4.4.i.

Figure 4.5.d.i highlights a narrative that combines urgency with centralised, expert-led control: urgency and the centralised / technocratic poles are shaded green, while delay is problematised. Decentralisation, holism and justice are shaded red to reflect the way distributional concerns, local knowledge and wider socio-ecological relationships tended to be bracketed or treated instrumentally. Injustice is shaded green because social and regional inequalities are acknowledged, but primarily as risks to be monitored and mitigated, for example through *"targeting"*, consumer protection

measures or compensatory schemes, rather than as starting points for re-designing institutions (Sarewitz, 2016.a; Turnhout et al., 2020; Stirling, 2014).

In the DNZ workshops, this narrative was most visible when participants framed NZT as a sequencing and optimisation challenge: getting *"the right pathway"*, *"the right numbers"* or *"the right incentives"* in place, and then insulating these from political contestation. References to least-cost pathways, system models and *"no-regrets options"* exemplified what Jasanoff (2018) and Turnhout et al. (2020) describe as the authority of modelled knowledge in environmental governance; political disagreement appears as noise to be filtered out rather than a constitutive feature of transition. This narrative overlaps with both the Ecomodern and Crisis narratives, which also call for decisive state action and system control, but it is distinctive in its reluctance to dwell on ethical complexity or participatory processes, echoing wider critiques of climate technocracy and delivery-state logics (Stirling, 2014; Scoones et al., 2020; Newell, 2019).

> Associated Narratives: Acting Illegitimately, Systems Rationality, Managerialism, Delivery-State Logics

4.6 Inter-/Intra-Group Narrative Divergences

Building on the typology of NZT narratives above, this section examines how those narratives were unevenly and inconsistently distributed across and within stakeholder groups. Although the narratives were developed through a thematic synthesis of DNZ workshop data, they were not mutually exclusive, nor were they uniformly adopted. Instead, significant divergence both between and within participant groups emerged as a feature of the dataset. Between stakeholder groups broadly defined by institutional affiliation (public sector, private sector, third sector, academics by discipline, and

funders of research) there were marked divergences in how the NZT was conceptualised and narrated. For example, public sector participants gravitated towards technocratic and eco-modernist framings, often aligning Net Zero with policy instruments, measurable outcomes, and green growth pathways. This finding aligns with other research suggesting that institutional actors favour technologically-oriented - perceived to be economically feasible - narratives to maintain policy legitimacy and political viability (Stirling, 2006; Meadowcroft, 2009). By contrast, NGO and community sector participants, and social science academics, were more likely to articulate the holistic, Justice narrative, emphasising distributional fairness, ecological integrity, and participatory governance (Healy & Barry, 2017; Newell & Mulvaney, 2013).

These patterns are summarised in Table 4.6.i, which displays, for each stakeholder group, the percentage of coded excerpts associated with the four synthetic narratives introduced in Section 4.5 (Ecomodern, Crisis, Justice, Technocratic).

Stakeholder Group	Ecomodern	Crisis	Justice	Technocratic
Public Sector	37%	9%	21%	33%
Private Sector	48%	6%	16%	30%
Third Sector	12%	26%	52%	10%
Eng./Nat. Sci. Academics	31%	24%	9%	36%
Humanities/Soc. Sci. Academics	17%	33%	40%	10%
Research Funders	34%	14%	27%	25%

Table 4.6.i: Stakeholder groups' alignment with the four NZT narratives, expressed as the proportion (%) of each group's coded excerpts mapped to each narrative.

Table 4.6.i shows public sector, private sector, and engineering and environmental science academics devote the largest share of their contributions to Ecomodern and Technocratic narratives, reflecting continuity-led and expert-driven framings of NZT. In contrast, third-sector and community organisations, and social science and humanities academics, allocate a higher proportion of coded excerpts to the Justice and Crisis narratives. Research funders occupy an intermediate position, with their contributions distributed across Ecomodern, Justice and Technocratic framings; they often combined calls for rapid deployment of known technologies with concerns about legitimacy, participation and vulnerability.

Academics, while ostensibly aligned with disciplinary specialisations, displayed both convergence and divergence. Those from engineering and environmental sciences were often embedded in continuity and technocratic narratives, while those from social science disciplines, especially geography and political ecology, leaned more toward crisis, post-growth, or justice-oriented framings. This pattern reflects broader disciplinary norms in sustainability research, where epistemological orientations shape narrative construction (Hulme, 2009; Stirling, 2014).

Intra-group divergence (variation within institutional or sectoral groupings) was equally pronounced and arguably more revealing. As the more evenly distributed profiles for public sector, private sector and funders in Figure 4.6.a suggest, intra-group plurality is often as pronounced as inter-group difference. Within the same sector or discipline, it was common for participants to move between, for example, Ecomodern and Justice narratives, or to combine Crisis framings with Technocratic ones; resonant with Hajer's (1995) "discursive coalitions", and with Kattirtzi and Winskel's (2020) observation that actors draw selectively on different transition logics on an issue-by-issue basis rather than adhering to a single narrative consistently across all areas.

Such tensions may be explained through the lens of Winskel and Kattirtzi's (2019; and Kattirtzi & Winskel, 2020) 'transition logics', explored in section 2.3.d of the Literature Review. Where individuals draw on multiple and sometimes conflicting rationalities to make sense of complex socio-technical problems. In the context of NZT, where transitions are by definition multidimensional and contested, this phenomenon was not only common but arguably necessary. Participants navigating institutional constraints, personal commitments, and professional norms often inhabited multiple narrative positions simultaneously, negotiating, rather than resolving, these tensions.

A number of participants appeared to use narratives strategically, adapting their framing in response to different audiences or contexts. This strategic ambiguity may serve various purposes: sustaining cross-sectoral dialogue, legitimising contested interventions, or maintaining alignment with organisational goals. For instance, a government participant expressed strong commitment to inclusive policy design rooted in justice, but later invoked a growth-focused green industrial strategy grounded in eco-modernist discourse. These articulations were not mutually exclusive, but rather revealed the narrative pluralism underpinning Net Zero governance (Scoones, et al., 2020).

However, divergences were not purely discursive, but reflected contestations over values, priorities, and political imaginaries. Participants disagreed not only on how NZT should be achieved, but on what it should fundamentally entail: techno-economic opportunity, socio-ecological repair, existential crisis, or business-as-usual reconfiguration. These conflicting interpretations suggest that NZT is a contested transition artefact (Turnhout et al., 2020), a placeholder enabling collaboration across epistemic communities while masking deep ontological and normative disagreements. Moments of alignment did regularly occur, particularly around the imperative for action

and the inadequacy of current trajectories, as noted in the DNZ final synthesis report (Carr-Whitworth et al., 2022). Even participants aligned with growth-centric narratives acknowledged the legitimacy of justice concerns, while justice advocates recognised the need for strategic compromise. These points of convergence suggest potential sites for coalition-building across narrative divides (Scoones et al., 2020).

4.7 Summary of Results

Chapter 4 has shown that DNZ participants did not speak about the Net Zero Transition (NZT) in isolated themes but through patterned narrative logics. The disruption–continuity meta-axis and its four sub-axes (decentralised–centralised, holistic–technocratic, justice–injustice, urgency–delay) provided a way of mapping how participants located NZT between radical system change and adaptive reform (Winskel & Kattirtzi, 2019; Geels et al., 2018). Across these axes, four composite narratives were identified: Ecomodern, Crisis, Justice and Technocratic, each clustering particular combinations of positions while remaining internally diverse.

The hexagonal axes figures used to present these four DNZ narratives (Figures 4.4.i–4.5.d.i) show that they are not pure, internally consistent constructs, but hybrid formations that draw simultaneously on logics across continuity and disruption. For example, the Ecomodern narrative in Figure 4.5.a.i is shaded green on both sides of the urgency–delay and holistic–technocratic axes: DNZ participants invoking this narrative articulated a strong sense of temporal urgency and whole-systems concern, yet coupled this with expectations of a carefully phased, infrastructure-led rollout and reliance on expert-driven planning. Similar dualities were evident in the Crisis narrative, where calls for disruptive, justice-oriented action coexisted with demands for decisive state control; in the Justice narrative, where decentralised participation

was often tied to expectations of state support; and in the Technocratic narrative, where urgency was mobilised in support of centralised optimisation rather than deliberative change (Newell & Mulvaney, 2013; Scoones et al., 2020).

Section 4.6 showed that these narrative configurations also varied across and within participant groups. Central government and private-sector participants tended to lean towards continuity and technocratic delivery, yet frequently adopted disruptive framings on specific issues such as fossil fuel phase-out or public engagement. Third-sector and community actors articulated stronger justice and decentralisation claims, but often relied on state finance, modelling and infrastructure to realise their visions. Individual participants moved between narratives over the course of single discussions; crisis and delay, ecomodern and post-growth, or justice and technocracy were frequently invoked together, or in rapid succession, depending on the sector, scale or temporal horizon under discussion (Scoones et al., 2020; Stirling, 2014).

These internal contradictions should not be read simply as analytical noise or respondent confusion. Rather, they reflect the structurally "wicked" character of NZT as a policy and societal project, in which actors negotiate competing goals: in attempts to variously act quickly yet manage risk, or to expand low-carbon infrastructure while addressing inequalities, or to open space for decentralised experimentation while maintaining system reliability (Rittel & Webber, 1973; Turnhout et al., 2020). The narratives developed here therefore function as *both/and* devices; stabilising particular accounts of NZT, but also hold together incompatible demands and values that cannot always be fully resolved within any single narrative (Newell & Mulvaney, 2013; Scoones et al., 2020).

This narrative hybridity provides the empirical foundation for the argument advanced in Chapter 5 (see Section 5.2) that Net Zero can be understood as a "wicked" meta-narrative composed of multiple, internally inconsistent narratives. The tensions mapped in Figures 4.4.i–4.5.d.i and discussed here demonstrate how actors simultaneously mobilise all the identified aspects of disruption and continuity logics. Rather than undermining NZT, these contradictions are what enable diverse coalitions to engage with it, even as they contest what NZT should deliver, for whom, and on what terms. Chapter 5 builds on these findings to examine the implications of this narrative hybridity for the UK's NZT.

5.0 Discussion

This chapter re-examines the NZT narratives developed in Chapter 4 in order to address the research questions and hypotheses set out in Chapter 1. Whereas Chapter 4 focused on presenting the four narrative configurations: Ecomodern, Crisis, Justice and Technocratic, and their positioning across the thematic axes, this chapter asks what happens when these narratives interact. It follows the analytic thread from axes, to narratives, to meta-narratives and wicked problems, and considers how these conceptual framings help or hinder progress towards the UK's Net Zero goal.

Section 5.1 first revisits the notion of the Net Zero Transition as a *wicked problem*, characterised by structural complexity, value conflict and systemic uncertainty (Rittel & Webber, 1973; Head & Alford, 2013). It introduces the idea of *transition artefacts* as markers of that wickedness. Section 5.2 then develops the concept of a *wicked* NZT narrative: a metanarrative composed of at least the four first-order narratives identified above, and their overlaps and contradictions. Subsections 5.2.a–5.2.d examine three cross-cutting narrative devices: pragmatism, legitimacy and justice, that mediate between the four narratives. Subsection 5.2.e uses sectoral examples, notably aviation and heating, as case illustrations of how these narrative tensions play out in specific domains.

Across the chapter, the analysis moves from *wicked problems* to *wicked narratives*, and from individual narratives to their hybridisation in policy and practice. The conclusion to the chapter (Section 5.3) draws together these insights, arguing that NZT is best understood as a wicked meta-narrative: internally inconsistent yet stabilising enough to

organise action. It then points forward to the conclusion Chapter 6, which considers the implications of this narrative hybridity for future research.

5.1 The Wicked Net Zero Transition Problem

As noted above, wicked problems are characterised by their complexity, uncertainty, and interdependencies, making them resistant to straightforward solutions (Head & Alford, 2013). NZT's wickedness manifests in multiple dimensions: reducing greenhouse gas emissions' technical challenges, conflicting interests, values, and beliefs among stakeholders (Scoones, et al., 2020), and climate crisis' urgency. NZT then captures characteristics of a wicked problem, with the following quote helping us understand NZT wickedness:

> *"The decision-making around creating the solutions for Net Zero and the just transition, can be at odds, whether a policy maker decides to think about the costs on people's bills, or trying to invest in solutions which create benefits for the UK economy, those [decisions] may take you to different places."* - Academic, specialised in Renewable Technologies

Research conducted by Freeman and Pye (2022), emphasises energy scenarios to meet future sustainability demands. A combination of wind power, solar power, and storage could supply most of the UK's electricity, reducing emissions (ibid.). However, feasibility is contingent on factors from technological advancements, and economic considerations, to societal acceptance:

> *"[T]he private sector is coming forward and saying 'you're on a Net Zero transition, how can we help?' [...] In Glasgow, we've got 70,000 tenemental properties. That's 70,000 boiler systems that are going to be removed.*

Everyone sees lots of problems, but to businesses that's a massive opportunity."
- Public Sector Participant, working in Climate Enterprise

The importance of a coherent NZT "strategy" - to be provided by central government - was highlighted consistently across all four NZT narratives. Participants repeatedly stressed that without national clarity, local actions risk being piecemeal, duplicative, or misaligned. This emphasis on top-down coordination reflects not only a practical concern with governance gaps, but also a broader tension about the framing of transitions themselves. For the Crisis narrative, and for some strands of the Justice narrative that foregrounded ecological justice or radical redistributional justice, realising a 100% renewable energy system was often linked to a paradigmatic shift away from market-centric approaches and towards post-growth or steady-state socio-technical perspectives. Other Justice-aligned contributions, however, focused less on questioning growth per se and more on protecting local economies, jobs and communities within a broadly growth-oriented framework, where the perceived benefits of growth were deployed to address injustice (Newell & Mulvaney, 2013; Healy & Barry, 2017). Such a shift entails recognising that energy systems are not merely technological infrastructures but embedded within institutional, behavioural, and political contexts. In this framing, strategy is not just about targets or technologies, but about designing transitions that consider interdependencies between actors, structures, and practices (Turnpenny et al., 2009). This suggests an absence of strategic clarity reflects deeper conceptual misalignments between technocratic ambitions for rapid deployment and holistic understandings of the systems being transformed.

5.1.a Artefacts of the Net Zero Transition

To make sense of NZT's wickedness in practice, I introduce the idea of *transition artefacts* (TAs). Building on work on complex governance and socio-technical

transitions (Head & Alford, 2013; Geels et al., 2018; Kattirtzi & Winskel, 2020), TAs are defined here as tangible or intangible entities that signify, facilitate, or impede transition. Policies, infrastructures, technologies, organisational arrangements, dominant stories, and everyday practices can all function as TAs when they mark and shape the trajectory of NZT.

This framing complements the wicked problem literature. Whereas the category "wicked problem" labels the overall problem–solution space as complex and intractable (Rittel & Webber, 1973; Levin et al., 2012), TAs draw attention to the specific instances through which that wickedness is experienced and contested. A stalled carbon capture and storage programme, an ambiguous policy on the gas grid, or a *"self-correcting mess"* in building control (DNZ academic participant, heat and energy systems) are all TAs: they crystallise conflicts, trade-offs, and uncertainties at particular moments in the transition. Labelling climate change and NZT as "wicked" is itself a TA rather than a neutral description; it shapes expectations about feasibility, responsibility, and pace (Head, 2019). Thinking in terms of TAs therefore helps to break down an overwhelming problem nebula into observable markers, making it possible to track how NZT evolves over time as particular policies, technologies, and narratives emerge, interact, and are left behind.

For the UK's NZT, examples of transition artefacts include:

- Government policy, regulations, or incentives: The UK's gas grid, and debates around repurposing it for hydrogen, are TAs: "The gas grid is becoming a bit of an elephant in the room... But far more significant is our absolute reliance on it for heating space and water..." (Academic, specialised in Energy Policy).

- Innovations or technologies: References to retrofitting energy-intensive "big homes in the country" (ibid.) point to the way particular technologies shape which pathways are seen as viable.
- Discourses, norms, and values: Statements such as "If you're just thinking about the carbon emissions gains, then you could end up with some very unjust policies..." (ibid.) illustrate how prevailing attitudes towards justice in NZT become artefacts in their own right.
- Incremental decisions and indecisions: "What happens over the next 30 years is going to be a mega muddling through" (Academic, specialised in Heat and Energy Systems) suggests that all the steps involved in "muddling through" can be read as TAs (Lindblom, 1959). Similarly, government indecision over CCUS is a TA: "the biggest impediment has been the UK government simply not being prepared to choose and back a winner" (Academic, specialised in Greenhouse Gas Removal).

Each artefact, whether a policy decision, technology, narrative, institution, or social practice, reflects the current state of the transition. The following reflection illustrates this:

> *"It's taken about more than 30 years for the consequences of the removal of the local authority monopoly on building control to fully emerge and it will probably take us another 10 years, even if we can summon up the political will, to undo those changes and move back to something like a single building control authority for the whole of the United Kingdom. We don't have a lot of time between now and 2050 to undertake and measure the impacts of significant changes to the way we organise things. The energy system transition is going to be a mess. Hopefully it's going to be a self-correcting mess, at least to some extent, and at least over the kind of 40 to 50 year time scale, but*

probably not over a time scale of 30 years." - Academic, specialised in Heat and Energy Systems

The quote highlights the long-term nature of transitions, the potential for unintended consequences, and the likelihood of a "self-correcting mess" evolving over time. The long time-horizons associated with wicked problems challenge cognitive and institutional capacities for long-term planning. Theorising via transition artefacts can help address this by breaking wicked problems and transitions into more tractable components.

5.1.b Wickedly Good

While previous and subsequent sections have and will further discuss the challenges associated with the wickedness of NZT, it may be useful to consider the potential benefits of this framing and its perceived complexity. I have detailed how the problem of NZT can be defined as wicked, and also how portraying any of the Ecomodern, Crisis, Justice, or Technocratic transition narratives as wicked could be problematic in itself. However, let me now develop wickedness, by looking at how wickedness might be *good*. In this section, I will explore 'wicked goodness', drawing on wickedness as a stimulant for innovative solutions.

The wicked nature of NZT, as detailed earlier, stems from its interconnections. However, this complexity does not necessarily denote negativity. Instead, it may bring the issue to the forefront, prompting stakeholders to grapple with it, encouraging both holistic and reductive approaches to its resolution. Wickedness would here be seen as a reflection of a problem's relevance and urgency. Signifying people both care about the issue and are cognizant of it, driving action for solutions addressing the problem. However, as presented in Section 2.4.b, a wicked framing may consequently engender

holistic interpretations. Here then, no problem exists in isolation; they are intertwined with other issues, creating a web of tension. This tension, while challenging, may be beneficial. Encouraging holistic approaches to problem-solving, where solutions are designed to address issues simultaneously. Consider, for example, the energy trilemma, which posits it is challenging to simultaneously achieve energy security, energy equity, and environmental sustainability. This trilemma is a wicked problem, but it also presents an opportunity. By acknowledging the tension between these three goals, we can develop integrated solutions balancing energy production and consumption, social equity, and environmental protection.

The energy trilemma refers to the challenge of balancing energy security, energy equity, and energy sustainability. This concept emphasizes the interconnectedness of issues within an NZT.

1. Energy Security, the reliable and uninterrupted availability of energy at affordable prices, is a concern for all countries, especially those reliant on fossil fuels or imports for their energy needs. However, potentially exacerbated by strategies to tackle climate change, such as carbon pricing (Klenert et al., 2018) In a Just Transition, energy security involves transitioning to renewable energy sources without compromising the reliability and affordability of energy supplies (Lopez-Gonzalez et al., 2019).

2. Energy Equity, the accessibility and affordability of energy services is a concern in many developing countries, where large proportions of the population lack access to energy services. In a Just Transition, energy equity means the benefits of the transition to Net Zero are shared equitably, and no groups are impacted disproportionately by the costs.

3. Energy Sustainability, the management of energy production and consumption to minimise environmental harm, a key concern of climate change, as the burning of fossil fuels for energy contributes to greenhouse gas emissions. In a Just Transition, environmental sustainability involves transitioning to an energy system with minimal environmental impact (Ali Shah et al., 2021).

The energy trilemma presents a significant challenge, as efforts to improve one aspect can have negative impacts on the others. For example, efforts to improve energy security by increasing fossil fuel production can undermine environmental sustainability. Similarly, efforts to improve environmental sustainability by transitioning to renewable energy can raise concerns about energy security and equity, if the transition leads to higher energy prices or if access to renewable energy technologies is unevenly distributed. However, the energy trilemma also presents an opportunity for addressing the challenges involved in a Just transition; while acknowledging the interconnectedness of these issues, it opens the way for solutions to balance all three aspects. For example, small-scale renewable energy technologies can offer a way to improve energy security and equity while also promoting energy sustainability.

The Justice narrative suggests recognising persistent tensions within the NZT may require sustained attention rather than permanent solutions. These tensions stem from structural characteristics of the issue itself. For example, the pursuit of a Pareto-efficient Just Transition - where no group faces disproportionate harm - may prove unrealistic given competing priorities and unavoidable compromises. Instead, the focus shifts toward addressing tensions in ways that balance fairness with practical constraints, accepting perfect outcomes are unlikely. This aligns with the challenges posed by the energy trilemma, which requires reconciling competing demands of security, equity, and sustainability. In this sense, the Just Transition exemplifies a ‘wicked

problem'. Yet while such challenges pose obstacles, they also create opportunities for inventive approaches: engaging with these difficulties may encourage flexible strategies for addressing climate change.

The DNZ project, exemplifies how 'wicked problems' catalyse holistic problem-solving. The Justice, Ecomodern and Crisis narratives all called for integrating social and technological factors, tailored to local needs, reflecting an understanding where problems require adaptive solutions (Turnpenny, et al., 2009). Through incorporating a range of stakeholders from research, private, public, and third sectors, the DNZ project aligned with Ansell and Gash's (2008) participatory decision-making recommendation, as being essential for tackling wicked problems (Turnpenny, et al., 2009). The DNZ project shows how problems, recognised as *wicked*, often promote holistic interpretation (Turnpenny, et al., 2009).

5.1.c The Decay of Wicked Problems

The nature of wicked problems and their housing of transition artefacts are worth considering in the life cycle of these problems. Specifically, the *decay* of Wicked Problems. Wicked problems are characterised by their persistent and intractable nature (Rittel & Webber, 1973). However, as societies traverse time their understanding of these problems changes. This change may - for some problems - be seen as the decay of a wicked problem, not in the sense of total resolution, but rather as shifts in their relevance or form. The decay of a wicked problem intentionally does not imply neat resolution. Instead, it may mean the problem moves to incorporate a different-, or sub-set of problems, being gradually reframed, or becoming less pressing a collection of problems to solve. This perspective presents wicked problems as constellations of other problems, and the transition artefacts that mark both the

attempted solutions - successful or not - and societal shifts that change the scope of wicked problems.

Similarly, climate change, a super wicked problem, can be observed as undergoing a transformation in how the problem is perceived and addressed. Across all four narratives there is a consensus on the need for rapid action. This understanding and approach may signify that the problem is - along certain axes - decaying. One private sector participant, working in energy transitions states, *"There's stuff that's ready to go, the catch is not technological, it's about policies and incentives".* The participant sees technological solutions to some aspects of the energy transition, but an additional challenge in creating the right policies and incentives - a shift from a purely technological problem to a socio-political one. Another participant notes:

> *"There's broad enough consensus, decarbonising your electricity supply rapidly and then spreading electricity to large parts of transport, heating and other methods, there's a key role for energy efficiency; I think those kind of things are broadly agreed, and that's the agreement that's come about in the last decade wasn't there before."* - Academic, specialised in Greenhouse Gas Removal

This reflects the changing understanding of NZT as a wicked problem and the shift towards consensus on certain aspects of the solution. However, the decay of a wicked problem does not mean the end of uncertainty. As one wicked problem decays, it may give rise to new problems (Rittel & Webber, 1973). While I have used the term decay to describe wicked problems changing, it is important to clarify: certain wicked problems may appear to never fully disappear. Instead, as is their nature, they in turn change, alongside socio-technical change; a key aspect of their 'wickedness'. Enduring wicked problems is highlighted by a DNZ participant while questioning the term *"transition"*:

> *"I question the use of the term "transition". I don't like it and much prefer "transformation", there's a degree of path dependency here, "transition" suggests we know where we need to go, what the target is, Net Zero, but we've got no idea of the state of the energy system gets us Net Zero so transformation allows for a path dependency and messiness and so I much prefer term because I think transition suggests we know what the hell we're doing and we don't."* - Academic, specialised in Energy Governance

The term *"transition"* suggests a clear path to a known end state, an oversimplification when dealing with wicked problems. Instead, a participant's preference for *"transformation"* captures the reality of these issues: the path is messy, dependent on numerous variables, and the final state is uncertain. Consider again the super wicked problem of climate change, while attempts have been made in understanding and addressing it, it continues to change in response to factors including scientific advancements, policy changes, and societal attitudes. The 'problem' of climate change today is not the same as it was decades ago, and it will likely be different again in the decades hence, as noted here:

> *"People used to be miners for generations then they were told they can't be miners anymore, and they got on with it. To what extent can we consider everybody's individual or community concerns? To what extent do we say that the scale of the problem is so huge that we can't? Like we did with miners, they were destroyed, we destroyed their livelihood, and their collective memory. Do we need to do the same again, and say 'sorry we just can't consider all individual concerns'"* - Academic, specialised in Built Environment

This change does not see the problem decaying and thus shrinking, but rather transforming. Thus follows a transformation a wicked problem may take, it shifting into being someone else's problem.

The decay framing of wicked problems presents opportunities for policy-making. Where traditional approaches to problem-solving, which involve defining a problem, identifying a solution, and implementing solution, may not be seen to be effective in addressing wicked problems (Levin, et al., 2012). In this light, the decay of a wicked problem can be seen not as its absolute end, but as a transformation in our understanding, approach, or values.

5.2 The Wicked Net Zero Transition Narrative

As the UK's wicked NZT is narrated and re-narrated we develop greater understanding of its lingering, decaying, dynamism, but also better understand the changing whole, as constituent problems are solved or forgotten over time. As noted in the literature review, I will position wicked narratives as distinct from, but related to, Lyotard's (1984) 'metanarrative' concept, a metanarrative, being an aligned group of narratives all describing a single situation or transitional trajectory, often encapsulating a cohesively storied historical lineage (Stephens & McCallum, 2013).

In contrast, a wicked narrative, exemplified by the four identified first-order NZT narratives, is a metanarrative, an internally contradictory - or oxymoronic - collection of similarly internally contradictory first-order narratives, describing contested transitional trajectories of the past, present and future. For example, in one workshop exchange, a local authority participant presented the tension between placing economic growth at the heart of pragmatic decarbonisation strategies while simultaneously calling for reductions in consumption for new modes of living. A participant from the private sector shows this tension within policy discourses, highlighting the previous Conservative government's promotion of technological fixes such as carbon capture and storage, while also endorsing further fossil fuel extraction.

This is a wicked narrative; an amalgam of divergent and contested rationales utilised within an overarching narrative (Head, 2019; Kattirtzi & Winskel, 2020; Turnheim et al., 2015).

These seemingly paradoxical stances extend beyond local authorities and the private sector, into broader discussions on the UK's industrial strategy, post-Brexit trade policy, and international climate commitments; with the contradictions highlighted in the workshops reinforced by policy documents. The Sixth Carbon Budget (CCC, 2020) states the UK is a global decarbonisation leader, yet the award of new North Sea oil and gas licences were justified on grounds of energy security. While the Net Zero Strategy (BEIS, 2021) mentions *"a whole-of-government approach"*, *"whole-economy perspective"*, and both *"a whole-sector and whole-system approach"*; DNZ participants from across all sectors frequently noted a disconnect between top-down policy frameworks and grassroots capacities for local climate action.

Collectively, these tensions show the '*wickedness'* (Rittel & Webber, 1973) of these metanarratives, they contain multiple, connected and politically, socially, and economically embedded logics, colliding in ways that defy straightforward resolution (Bernstein, 1991). Workshop findings and UK policy help substantiate a wicked NZT narrative, where competing narratives are all housed within a metanarrative. The thematised DNZ narratives suggest historical, cultural, and institutional factors show NZT consensus as elusive; thus policy actors cannot rely on a single, consistent metanarrative to guide decisions (Geels et al., 2018). Instead, they, and everyone else, will parse *"a mix of disruptive and continuity-led*" narratives of social and environmental justice, economic growth or degrowth, and technology and energy transition (Winskel & Kattirtzi, 2020).

A Wicked Narrative then, is not a story of evil misdeeds, but a confluence of stories interacting and entrenching their contradictory selves into the minds of their listeners. These narratives are marked by transition artefacts, policies, technologies, and shifts in public opinion, serving as tangible indicators of changes resulting from and contributing to the transition narrative. Wicked Narratives and transition artefacts frame wicked problems as no longer being insurmountable obstacles, but as battles against recurring villains. For instance, a Wicked Narrative which initially frames NZT as daunting, evolves to reflect the progressive achievements marked by transition artefacts, such as the adoption of renewable energy technologies or changes in legislation.

Reframing wicked problems as narratives recognises each constituent problem as a potential transition artefact, encouraging stakeholders and the public to engage with the issue as part of a longer journey of transformation. Narratively viewing the transition as an opportunity for innovation, highlighting transition artefacts help to present NZT's iterative nature, seeing each step as both a result of past actions and a foundation for future progress. Drawing on the academic insights of Shanahan et al. (2011) on the role of narratives in public policy, Nisbet's (2009) exploration of environmental communication framing, and Newell and Mulvaney (2013) on environmental justice narratives, this thesis provides Wicked Narratives as a way to view an achievable NZT.

Relevant literature shows how narratives shape societal responses to these issues; for instance, Shanahan et al. (2011) evidences the role of narratives in public understanding and engagement with climate change, examining their influence in policy-making, in sustainable development. Their study can be seen to show the potential of Wicked Narratives to steer the course of NZT. Complementing this, the DNZ Synthesis Report (ibid.) reveals a narrative for change, integrating perspectives from research,

private, public, and third sectors, has been identified as key to realising a Net Zero future. The report suggests understanding narratives can clarify points of consensus and divergence, facilitating the identification of key processes and structures necessary for NZT (ibid.). However, it is important to note Wicked Narratives, like the wicked problems they pertain to, are not static. They change, influenced by a range of factors, including changes in scientific understanding, societal values, and political contexts.

As mentioned in the Literature Review, Freeman and Pye's (2022) Shared Socioeconomic Pathways (SSPs) serve as narrative frameworks, but also as transition artefacts illustrating potential pathways in the UK's NZT. These transition artefacts reflect the UK's current position and challenges in the context of NZT, serving as indicators of where the journey stands and any shifts for future progress. The alignment of the UK's current energy strategy with SSP5, which assumes a maintenance of lifestyles, reliance on new nuclear power, and decarbonisation of air travel, can be viewed as a transition artefact; signifying a specific stage in the UK's NZT wicked narrative, one that may require significant adjustments to meet the Net Zero target (ibid.). The SSPs and the UK's current NZT strategy are components of the NZT wicked narrative, shaping perceptions and marking points in the UK's response to climate change.

5.2.a Claiming Pragmatism

Within the DNZ workshops, 'pragmatism' emerged as a recurring but polysemic narrative device. Participants invoked it both as a self-description and as a boundary marker against competing views. While ostensibly denoting flexibility, context-sensitivity and deliverability, in practice "being pragmatic" was often used to defend incrementalist strategies, to acknowledge the difficulty of structural reform, or to align with incumbent techno-economics (Stirling, 2014; Scoones et al., 2020;

Sovacool et al., 2022). The DNZ data show that no single NZT narrative owns pragmatism; all four drew on it, sometimes in mutually contradictory ways.

In the first round of workshops, nature-based solutions (NBS) were frequently framed as the pragmatic option. Participants highlighted NBS as ecologically credible and cost-effective, stressing their potential to deliver "multiple benefits" and "no-regrets options". At the same time, the same speakers expressed scepticism about feasibility, given limited skills, training pathways and financial incentives for implementation at scale. Here, "pragmatic" functioned both as a call for careful sequencing and as a concession to infrastructural and institutional inertia (Sovacool et al., 2022).

Competing growth framings also laid claim to pragmatism. Some contributors argued that post-growth or degrowth trajectories were the only realistic way to respect planetary boundaries, portraying continued growth as utopian or self-deceiving. Others dismissed post-growth as doctrinaire and insisted that innovation-led green growth was the only pragmatic, politically viable route. Both positions framed themselves as grounded in realism and cast their opponents as idealistic or naïve (Stirling, 2014; Sovacool et al., 2022). Pragmatism here did not resolve the tension between growth and post-growth narratives; it was the label each side attached to its own stance.

A related pattern concerned what kinds of change were considered pragmatically tractable. Ecomodern and Technocratic framings often treated structural changes such as "how things are powered" as manageable, especially if they could be made technically or socially invisible (for example, switching generation sources without consumers noticing). By contrast, lifestyle or norm changes around diet, travel or heating practices, were presented as harder, or almost impossible, to achieve. Yet these claims were sometimes challenged by reference to the Covid-19 pandemic, when

changes once deemed politically unthinkable were implemented rapidly. Crisis-aligned participants in particular used this recent experience to argue that more disruptive social change might, in fact, be pragmatic under conditions of perceived emergency.

Several DNZ discussions juxtaposed participatory approaches and technocratic governance through the lens of pragmatism. Advocates of whole-systems thinking and deliberative governance argued that inclusive, reflexive processes were more pragmatically responsive to real-world complexity. Others characterised such approaches as vague or unwieldy, insisting that expert-led decision-making and clear lines of authority were the only pragmatic way to deliver NZT at scale (Section 4.4.a; Scoones et al., 2020; Winskel, 2018b). "Pragmatism" thus legitimised both participatory pluralism and centralised authority, depending on who used the term and against which imagined alternative.

Justice provided another fault-line. As discussed in Chapter 5, one academic participant argued that "an unfair transition" might be more pragmatic than no transition at all, on the grounds that climate change is intrinsically unjust and inaction would hurt the most vulnerable most. Here, pragmatism was used to justify deprioritising distributive and procedural justice in favour of rapid emissions reduction. Other contributors, however, insisted that a fair and inclusive transition was the only pragmatic option in practice, given the risks of social backlash, resistance or systemic instability if justice was sidelined (Section 4.5.c; Sovacool et al., 2022). In each case, actors claimed pragmatism for their position while casting alternatives as either unethical or unworkable.

These examples suggest that pragmatism in the DNZ data operated less as a stable principle and more as a flexible narrative resource. It was attached to very different proposals: post-growth and green growth, technocratic control and participatory

governance, justice and injustice; and used to close down debate as often as to open it up. This polysemy reinforces the wicked narrative character of NZT: appeals to pragmatism help maintain narrative coalitions by allowing actors to present their preferred pathways as the only realistic ones, even when those pathways are structurally incompatible. The following subsection considers how this dynamic interacted with the DNZ project's shift from consensus-building to agenda-widening, and with wider tensions between holistic aspirations and technocratic delivery in UK Net Zero governance.

5.2.b From Consensus-Building to Agenda Widening

The DNZ data offers no consensus on whether holistic reframing is inherently superior. Many participants endorsed whole-systems thinking in principle, but expressed frustration at its vagueness, lack of prioritisation and perceived distance from delivery realities. Public-sector participants, particularly those in regulatory and policy roles, were sceptical about integrating equity and participation into formal decision-making, citing limited capacity, institutional resistance and political volatility. These concerns resonate with Sarewitz's (2010) argument that holism can obscure accountability and dilute purpose. By contrast, contributors from community energy and academic contexts warned that failing to embed justice and plurality risks long-term legitimacy problems and implementation failure.

Reflecting on the original aims of the DNZ project makes these tensions explicit. As set out in the Methodology chapter, the workshops were initially designed with a consensus-building orientation, emphasising alignment around a single coherent narrative or strategy for Net Zero. As the doctoral research progressed, however, the analytical framing broadened to consider explicitly multiple narratives, justice dimensions and wicked problem dynamics. This move from consensus-seeking towards

agenda-widening allowed a deeper exploration of conflict, contradiction and narrative hybridity. It also had costs. A wider lens brought under-represented perspectives into view, but made it harder to distil clear, shared recommendations, and sharpened the ambiguity that Sarewitz (2010) and others associate with holistic framings.

The DNZ data suggest that the most resilient narrative coalitions were not those that simply rejected technocratic tools or, conversely, bracketed justice concerns. Rather, they were coalitions that acknowledged both political realities and ethical demands; they tried to hybridise pragmatism and justice rather than prioritise one entirely over the other. This has implications for UK Net Zero governance. Instead of championing holism as a policy silver bullet (cf. Winskel, 2018b), the findings here point towards a more reflexive technocracy: one that recognises uncertainty, values distributed expertise and designs with equity in mind. Pragmatic shifts in how NZT's wickedness and responsibilities are framed, particularly in domains such as heat decarbonisation and local area energy planning now led by NESO, could support more grounded forms of justice integration (Turnpenny et al., 2009).

Placed alongside the discussion of pragmatism in Section 5.2.a, this evolution in the DNZ project illustrates how appeals to "what is realistic" intersect with methodological choices. Consensus-oriented designs tend to favour singular, ostensibly pragmatic narratives; agenda-widening surfaces competing claims to pragmatism and exposes their political and ethical stakes. The DNZ workshops therefore do not resolve whether holism or technocracy is more pragmatic. Instead, they show that pragmatism itself is contested, and that choosing between consensus-building and agenda-widening is part of the wider wicked narrative of how NZT should be governed.

5.2.c Acting Illegitimately

> *"Just do what're perceived as legitimate approaches to address the problem"* - Academic, specialised in Greenhouse Gas Removal

> *"If you're committed to Net Zero, you've got to get on and make decisions, do something, knowing that whatever solution we adopt, is going to have problems, there will be unintended consequences"* - Academic, specialised in Energy and Climate Policy

Across the DNZ workshops, acting with legitimacy captured a persistent tension between procedural legitimacy and the perceived necessity of decisive action. Participants used legitimacy both to justify caution and to endorse interventions that might stretch, or temporarily suspend, conventional norms of democratic process. Legitimacy was rarely treated as a fixed standard; instead, it was negotiated, contested and unevenly distributed across narratives.

For some contributors, particularly those aligned with Crisis framings, the urgency of NZT justified experimentation that might initially appear illegitimate. One social practices scholar argued that "sometimes what needs to happen first is there needs [to] be the experience of something different before it can be in any way normalised or legitimised." Trial projects, pilots and local experiments were framed as ways of creating future legitimacy through "learning by doing", even where they departed from existing rules or expectations (Turnhout et al., 2020). Crucially, illegitimacy was not confined to radical grassroots action; several participants noted that states and corporations can also act illegitimately, for example by imposing infrastructure without consent or exporting transition costs to marginalised communities (Geall & Ely, 2018; Eriksson & Grief, 2023).

Other contributors were wary of treating legitimacy as an optional extra. One academic, also working on social practices, challenged the assumption that broad social licence must always precede action; yet they simultaneously criticised the vague invocation of "social and political feasibility" without specifying "for who… and the what and the when". In their view, current policy practice relies on a narrow behavioural repertoire – nudges and information campaigns – underpinned by thin assumptions about how social change happens. They called instead for more careful experimentation that recognises vulnerabilities and builds an evidence base on what causes harm as well as what is feasible. Here, questions of legitimacy were inseparable from questions about whose knowledge counts and how social evidence is produced.

Representation in energy planning was a recurring concern. Participants stressed that legitimacy depends not only on aggregate public support, but also on which communities are heard. One energy policy academic criticised the urban bias of both research and policy: "rural communities are missed out, but we're assuming rural communities use and think of heating in the same way urban communities do and it's just not the case." Another highlighted the neglected narrative around local skills and socio-economic benefits, asking whether skills programmes should be national and generic or locally tailored, and warning that the latter "gets lost" when policy is framed primarily through national growth and efficiency lenses. In these contributions, local delivery was not a secondary implementation issue but central to building social legitimacy.

These tensions map unevenly onto the four NZT narratives. The Just Transition narrative places legitimacy and participation at its core, treating social engagement as both a normative requirement and a practical condition for durable change. Technocratic framings, by contrast, often treated legitimacy as a hurdle to be cleared –

a matter of managing opposition and ensuring "public acceptance" once the technical pathway had been determined (Sovacool et al., 2022). Ecomodern contributions, while sometimes acknowledging co-benefits and "levelling up", tended to present justice and participation as desirable side-effects of successful growth-led decarbonisation rather than as prerequisites. Crisis framings were internally divided: some invoked emergency logics to justify bypassing consultation; others argued that existential risk increased the need for deeper democratic engagement.

Taken together, the DNZ discussions indicate that debates over legitimacy are not peripheral to NZT but mark core fault lines between narratives. They concern who is counted in, on what terms, and at what stage of decision-making. Whether centralised policy delivers coherence or disempowerment depends as much on these narrative logics as on formal institutional design. From a wicked narrative perspective, legitimacy in the UK's NZT is best understood not as a settled criterion but as an ongoing site of contestation, in which different actors advance competing claims about what counts as "doing the right thing" fast enough, fairly enough and for whom.

5.2.d The UK's Wicked Net Zero Just Transition

This subsection explores further the DNZ themes of Just Transition and social engagement. I treat social engagement as one dimension of a Just Transition, while recognising that neither concept is hierarchically prior; they overlap and inhabit each other's space. 'Just transition' has gained prominence in academic and policy debates, emphasising the realisation of social justice and equity within NZT (Heffron et al., 2018). Beyond the DNZ project, this thesis initially approached just transition as a theme; it subsequently became a narrative configuration in its own right, because participants repeatedly framed NZT not only as a technical or economic issue but as a

question of justice. This emphasis emerged as a broad, cross-group perception that NZT relies on social engagement and will have unequal impacts that at least need to be understood, and ideally addressed (Jenkins et al., 2018). Participants also saw the perceived justness of NZT as shaping its legitimacy and long-term success. One DNZ academic specialising in energy systems put it starkly: "It's really important we don't lose the justice framing… Who pays and who benefits? I think this is extremely important."

While Chapter 4 presented Justice as one of four first-order NZT narratives, questions of justice and knowledge also cut across Ecomodern, Crisis and Technocratic framings. This subsection therefore examines justice and knowledge politics as cross-narrative dimensions of the wicked NZT narrative, rather than as a self-contained narrative. Where Crisis and Justice framings appear to converge, for example in critiques of uneven vulnerability or growth-led transition, I treat this not as conflation but as evidence of narrative hybridity, consistent with Chapter 4's finding that participants frequently mobilised multiple axes simultaneously.

The Justice narrative nonetheless foregrounds, for many, the centrality of justice in NZT. As Newell and Mulvaney (2013) note, justice framings demand that the costs and benefits of transitions are equitably distributed, so as to address disparities and power imbalances. Another DNZ academic, working on energy demand, suggested justice is simultaneously instrumental and intrinsic: "[For] achieving immediate reductions in greenhouse gas emissions, you can think of social justice as an enabler of immediate reductions, or you can see it as a desirable outcome of the transformative change." Justice was framed by many DNZ participants as both means and end.

Several contributors noted that any serious commitment to justice would require greater participation by marginalised groups in decision-making. A lack of such participation was seen as a structural barrier to achieving a Just Transition in practice. In contrast, there were occasional contributions that accepted transitional injustice as an unfortunate but necessary trade-off. One academic in the built environment argued that "an unfair transition" could still be preferable to "no transition", on the grounds that climate change itself is unjust and would otherwise hurt the most vulnerable the most. Here justice was explicitly downgraded to a lower priority relative to urgency, revealing a telling minority position within the workshop data.

Participants repeatedly highlighted how existing societal structures place the most vulnerable and marginalised at the periphery, exacerbating their susceptibility to both climate impacts and transition costs. These groups include women, low-income households, minoritised ethnic groups and communities in the Global South, who are least resilient and most affected by climate change and NZT (Adger et al., 2013). DNZ discussions stressed that climate change does not affect all equally; it amplifies social and economic inequalities. Those living with inadequate infrastructure, for example, are more exposed to floods, storms and heatwaves. The transition to a Net Zero economy, while necessary, can impose further costs that are disproportionately borne by these same groups: carbon pricing or energy efficiency obligations, for instance, may increase energy bills for low-income households (Klenert et al., 2018). At the same time, the people and places most affected by climate change and NZT are least responsible for causing it; Godfray et al. (2018) and other studies on diet and consumption highlight how wealth, gender and lifestyle shape emissions, a point echoed by DNZ participants distinguishing between high-consumption "frequent flyers" and those with minimal carbon footprints.

These discussions extended to local and regional imbalances, including rural–urban differences and London's relative privilege compared with other UK regions. One academic specialising in energy governance described decarbonisation as driving "another round of industrial restructuring, which will be geographically differentiated, and there will be winners and losers." Another, focusing on energy systems, critiqued urban "Silicon Valley" imaginaries that celebrated high-tech, low-carbon clusters while neglecting workers in legacy industries such as brickworks or glass manufacturing. Such contributions foregrounded the Justice narrative's concern that NZT, if governed narrowly, risks reproducing or deepening existing patterns of uneven development.

At the policy level, participants recognised that governments increasingly reference Just Transitions in green recovery and Net Zero programmes. One academic specialising in science, technology and innovation noted that "huge spending in the cause of green recovery" is now accompanied by keen interest in just transition "in all its forms… being sensitive to losers and changing welfare across the transition." This was interpreted as both a discursive opportunity and a site of contestation. Drawing on Krawchenko and Gordon (2021), DNZ participants implicitly invoked three types of just transition evident in the wider literature: jobs-focused, environment-focused and society-focused. For some, just transition was primarily about employment and industrial restructuring; for others, long-term environmental integrity; for yet others, social equity and the rights of vulnerable communities. These different emphases imply different policy designs and value trade-offs.

While the Justice narrative and the aspiration for a Just Transition were widely endorsed, there were also explicit arguments against strong redistributive interventions. A small minority (a single DNZ participant) characterised justice as a "welfare programme", arguing that governments should allow markets to dictate

outcomes during the transition and that taxpayers should not shoulder responsibility for those who lose out. This position reflects familiar political cleavages over welfare and free-market economics, and was treated with scepticism by most other participants. Across the three non-explicitly technocratic narratives (Ecomodern, Crisis and Justice), there was a shared view that without state intervention many workers and communities would be left behind. A third-sector participant summarised this succinctly: "For me, it has to be Net Zero plus, it can't just be a straight decarbonisation story. It has to be a social equity story, not a pathway to Net Zero which is brilliant from a carbon metrics perspective but terrible from a social equity and social justice perspective."

These debates raised questions about the extent to which market-based approaches can align with principles of justice (Rawls, 1971). Some participants emphasised efficiency and innovation, while others doubted the capacity of markets to deliver equitable outcomes or deep decarbonisation without stronger public intervention. Following Creswell and Poth (2017), I resist reducing individual DNZ contributions to fixed ideological types. Instead, I treat them as situated narrative moves: ways of positioning justice, markets and the state within a wider wicked Net Zero narrative. Justice themes: affordability, distribution of benefits, who pays and who gains, were voiced across all narratives. Even Ecomodern contributions, which tended to foreground growth and co-benefits, contained warnings that decarbonisation policies could become unjust if they primarily subsidised "lovely Teslas" or the retrofitting of large, energy-intensive homes owned by the already affluent (Roberts & Henwood, 2020).

Alongside these distributional concerns, DNZ participants raised questions about whose knowledge counts in shaping NZT pathways. Here, justice was articulated not

only in socio-economic terms but also as knowledge justice. Crisis and Justice framings foregrounded epistemic exclusion: the marginalisation of local, lived and place-based knowledge, especially from rural communities, devolved administrations or the Global South, in comparison with expert modelling and central government analysis (Smith et al., 2005; Hall & du Gay, 1996). One private-sector participant working in research and development criticised existing technology transfer KPIs as "killing some very important collaborative programmes" in pursuit of intellectual property revenue. For these contributors, restrictive IP regimes and proprietary knowledge cultures were transition artefacts that limited accessibility to climate technologies and undermined solidarity (Ockwell et al., 2009).

By contrast, Ecomodern and Technocratic framings in the DNZ discussions tended to adopt linear innovation models, assuming that knowledge flows from elite scientific and engineering institutions to implementers, with limited interrogation of the knowledge–power dynamics embedded in such models. From a Justice perspective, this represents a double inequity: those most exposed to climate impacts are both least responsible for emissions and least empowered to define what counts as relevant expertise. A Just Transition perspective recasts knowledge as relational, situated and co-produced, implying that technocratic institutions should not simply "engage" publics after solutions are designed, but open up upstream spaces where diverse values and knowledges inform problem-framing itself (Turnhout et al., 2020; Stirling, 2014).

Participants were not naïve about the challenges here. Some echoed Sarewitz's (2010) caution that expanding inclusion and interdisciplinarity can overwhelm decision processes, creating risks of gridlock. Others argued that existing institutions nonetheless have room to adjust incentives and metrics: for example, by redefining technology transfer KPIs to reward collaborative licensing or public-interest outcomes,

without abandoning strategic clarity. These contributions suggest that knowledge justice is itself a wicked problem: it involves a tension between efficiency and plurality, between the desire for timely, evidence-based action and the need to recognise and redistribute epistemic authority.

For these reasons, the Justice narrative exhibits many properties of a wicked problem. It involves multiple, partly incompatible goals: rapid emissions reductions, good jobs, reduced inequality, knowledge pluralism; alongside disagreements about sequencing and responsibility, and unavoidable trade-offs and unintended consequences (Newell & Mulvaney, 2013; Köhler et al., 2019). Justice is simultaneously framed as distinct from NZT (a normative horizon) and as a condition for its feasibility and legitimacy. This dual positioning was evident across participant groups and narratives.

DNZ discussions of justice also intersected with the concepts of wicked narratives and transition artefacts developed earlier in the chapter. Calls for a "more human-centred" approach to NZT (Kemp et al., 2007), one that engages people in envisioning their futures and acknowledges unintended consequences, were rooted in the recognition that transition artefacts such as insulation schemes, hydrogen pilots, skills programmes or IP regimes can exacerbate or mitigate inequality. Energy efficiency measures may primarily benefit wealthier households; shifts to new fuels may impose new costs on those with the least capacity to adapt; tightly controlled knowledge may slow diffusion to those who need it most (Bouzarovski et al., 2021; Ockwell et al., 2009). In this sense, transition artefacts demarcate not only technological progress but also socio-economic and epistemic impacts. Many participants noted that limited time, money or information constrained citizens' ability to engage actively with NZT processes, reinforcing a pattern in which decisions are taken elsewhere and only experienced "downstream" (Fischer, 1993; Shove & Walker, 2007).

Understanding how Justice and knowledge-justice narratives shape, and are shaped by, these artefacts is therefore essential to grasping NZT as a wicked narrative: one in which aspirations for fairness are continually negotiated against structural constraints, entrenched knowledge hierarchies and competing visions of what a "good" transition should deliver, for whom, and at whose expense. The next subsection turns from these governance and knowledge dynamics to the more mundane, yet revealing, arenas in which they are enacted in practice: mobility, heat and consumption.

5.2.e The Wicked Everyday: Mobility, Heat and Consumption

This subsection examines how Net Zero narratives materialise in everyday and sectoral contexts, focusing on aviation, domestic heating and consumption practices. Rather than providing full sectoral case studies, these examples are treated as transition artefacts: concrete sites where Ecomodern, Crisis, Justice and Technocratic framings collide in the routines, infrastructures and interactions of daily life (Geels et al., 2018; Scoones et al., 2020).

Aviation

For many DNZ participants, aviation epitomised the uneven distribution of climate responsibility. Its share of total emissions is modest compared with heating or surface transport, but its users are highly concentrated. One academic specialising in sustainable development captured this clearly:

> *"Emissions from flying are very significant, sometimes you see them against emissions from other sectors and they look very small, but you've got to bear in mind everyone eats and buys stuff and travels by land, but a far smaller proportion of people fly, so if you take flying as X percent of the whole economy emissions, but X percent of the people do it then it's a much higher proportion."* - Academic, specialised in Sustainable Development

Here, aviation functions as a transition artefact that crystallises questions about who "needs" to decarbonise most, and whose practices are treated as negotiable. Crisis and Justice framings seized on aviation as a paradigmatic "high-carbon luxury" (Gössling et al., 2019), highlighting frequent-flyer inequalities and the limited scope for zero-carbon substitutes in the near term. Justice-aligned participants explicitly connected this to global and intra-national inequalities, arguing that targeting aviation demand was both symbolically and substantively important for a fair NZT.

By contrast, Technocratic and Ecomodern contributions tended to emphasise technological substitution and incremental efficiency: sustainable aviation fuels (SAFs), electric or hybrid aircraft, and airspace optimisation. One public-sector funder noted the promise of SAFs, but also their dependence on crop-based feedstocks: "you will have to have something made from crops. I don't think you're going to get away from burning carbon." Another participant, from the energy transition private sector, questioned the coherence of current policy:

> *"[Sustainable] aviation fuel at the moment, I can't see it. You know we're talking about reducing the tax on domestic aviation, for levelling up. Tell me how flying from Manchester to London helps with levelling up, as opposed to providing better infrastructure to allow our public transport to be used."* - Private Sector Participant, Energy Transition

These exchanges illustrate a familiar pattern in the DNZ data. Technocratic and Ecomodern framings often treated aviation primarily as a site for innovation and competitiveness, aligning with growth-oriented imaginaries. Crisis and Justice framings foregrounded sufficiency, fairness and alternative mobility infrastructures (rail, digital substitution), questioning both the desirability and legitimacy of continued demand growth. Both sides appealed to "realism": one participant anticipated "a revolution" in

aviation via cheap electric planes, while another argued that the "most feasible" restriction mechanism would be flight rationing rather than taxation, due to political optics.

The Covid-19 pandemic and subsequent rebound in air travel appeared frequently as an empirical reference point. For some, the temporary collapse of aviation demand during lockdowns revealed the scale of change technically possible when mobility is constrained. For others, the rapid resurgence of flying underlined the depth of social and economic lock-in, and the limits of crisis-induced behavioural change. In both readings, aviation functioned as a laboratory for NZT narratives: a sector where appeals to connectivity, economic growth and lifestyle expectations clash with arguments for sufficiency and justice.

Heating

Domestic and district heat emerged as a second everyday arena where narratives collided around infrastructure, responsibility and feasibility. One DNZ participant, an academic in energy policy, described the UK's gas system as "an elephant in the room":

> *"Britain is unusual in the extent we rely on gas for heating and electricity… far more significant is our absolute reliance on it for heating space and water. And at the moment UK policy is to connect properties to the gas grid even though this is a major source of fossil fuel consumption. You could argue, as the gas industry does, the future is to repurpose the gas grid for hydrogen, although without any real understanding of the costs and much less any social licence for progressing it. And yet, because hydrogen is being offered to politicians as a solution, it is stopping anything else happening effectively."* - Academic, specialised in Energy Policy

Here hydrogen appears as both a technological prospect and a narrative device. Within Technocratic framings, repurposing the gas grid for hydrogen exemplified continuity-oriented pragmatism: leveraging sunk infrastructure, preserving existing delivery models, and minimising disruption to consumers. Within Crisis and Justice framings, the same proposal risked entrenching delay, locking in costly assets, and displacing more systemic options such as demand reduction, building fabric upgrades, heat networks or electrification.

Justice-oriented participants repeatedly questioned who would pay for fabric retrofits, appliance swaps and infrastructure conversion, and which communities would benefit from hydrogen trials or heat pump incentives. One energy policy academic, reflecting on Scottish off-gas-grid homes, noted:

> *"We have a policy in Scotland saying decarbonise heat in homes off the gas grid first, typically meaning air source heat pumps, but my colleagues who live in houses off the gas grid in Scotland say when they inquire about air source heat pumps, they're told it won't work because you can't get the house to sufficient thermal efficiency to make an air source heat pump system viable. So without a UK government decision about the future of the gas grid, we aren't going anywhere on heat."* - Academic, specialised in Energy Policy

This quote illustrates several of the chapter's core themes. First, heat systems are "wicked" because they combine long-lived infrastructures, diverse housing stocks and local climatic conditions with national-level policy and regulation. Second, narrative claims to pragmatism and legitimacy hinge on highly situated realities: off-grid rural households, solid-wall housing, fuel poverty and differing local delivery capacities. Third, indecision at the centre, over the gas grid's future, hydrogen's role, or the balance between grants and regulation, was experienced by DNZ participants as a

transition artefact in its own right: a form of policy drift that shaped what was thinkable and permissible locally.

Ecomodern framings in the heat context showed a characteristic ambivalence. Hydrogen and heat pumps were seen as elements of a diversified technology portfolio, supported by growth-oriented industrial strategies (e.g. green jobs, "world-leading" supply chains). Yet questions of social licence, affordability and place-based fit were often under-specified. Technocratic framings tended to prioritise what could be "scaled and measured": rollout targets, boiler phase-out dates, pipeline conversions, while Justice framings asked who was being asked to absorb risk and cost, and on what terms.

The heating debate thus reinforced a key argument of this chapter: that NZT narratives are not just competing visions, but different ways of allocating attention and responsibility across infrastructures, places and publics. Heat decarbonisation policies can be read as attempts to stabilise a wicked problem through particular narratives: hydrogen as "clean gas", heat pumps as "modern appliances", consumers as "rational upgraders", that partially obscure their distributive consequences.

Consumption and Voluntary Simplicity

Debates about mobility and heat continually returned to a broader concern with everyday consumption. Several DNZ participants expressed unease not only about emissions, but about "excess" as such: excessive flying, excessive energy use in large homes, excessive purchasing of goods. These concerns resonated with the literature on voluntary simplicity and minimalism, which frames lower-consumption lifestyles as both environmentally necessary and potentially more fulfilling (Jackson, 2009; Kallis et al., 2020).

It would be inaccurate, however, to infer that Crisis and Justice narratives straightforwardly imply post-growth or degrowth futures. The DNZ data instead suggests a more ambivalent picture. Some contributors aligned with Crisis framings explicitly questioned the compatibility of indefinite GDP growth with planetary boundaries, echoing post-growth arguments (Hickel, 2019). Others, including Justice-oriented participants, focused less on aggregate growth and more on distributional issues: who benefits from consumption and who bears its costs. For these respondents, sufficiency for high-consuming groups and improved living standards for those in poverty could coexist within a reoriented economy, without assuming a single macroeconomic trajectory.

Voluntary simplicity appeared in the DNZ discussions less as a named movement than as a set of latent ideas. Participants questioned whether NZT imaginaries had the political courage to make certain practices – most notably frequent flying – socially less acceptable. One climate change academic contrasted visions of "flying taxis and loads of electric flights" with scenarios in which flying simply became something people did far less often. Others connected sufficiency to housing and everyday energy use, noting how large, poorly insulated homes owned by affluent households both emitted more and captured the lion's share of retrofit subsidies (Roberts & Henwood, 2020).

At the same time, Ecomodern and Technocratic framings in the workshops typically preserved assumptions of growth and high consumption, focusing on changing fuels, efficiency and information rather than lifestyles. A commonly voiced ambition was to "make Net Zero cheaper, easier and more convenient than the alternative", implying continuity in demand patterns. Behavioural interventions were framed through nudging, pricing or product design, rather than deeper cultural or structural shifts (Thaler & Sunstein, 2008).

This produced a recurrent tension across the DNZ data: between narratives that locate responsibility primarily in individual choice and narratives that emphasise structural drivers of consumerism. Crisis and Justice contributions described a need for both: individual behavioural change as necessary but insufficient without shifts in infrastructure, governance and political economy (Shove & Walker, 2007). Aviation again served as an example. The post-Covid rebound was read by some as evidence that voluntary simplicity gains are fragile when broader systems of work, leisure and status remain unchanged.

Taken together, aviation, heat and consumption intensify the wickedness of NZT rather than help in resolving it. Each domain brings surfaces the contentions in earlier subsections: 1) Is it more pragmatic to bet on SAFs and hydrogen, or to promote sufficiency, fabric upgrades and demand reduction? 2) Centralised strategies to repurpose the gas grid or subsidise electric planes foreground metrics and investment pipelines; while the justice-aligned narratives argue for place-based processes, co-production and knowledge pluralism in deciding what constitutes a "good" transition path. 3) Repurposing existing infrastructures and business models can be framed as minimising social disruption, but may also entrench inequalities and rebound effects. More disruptive strategies, such as flight rationing, deep retrofit programmes or mandated efficiency standards, promise larger long-term gains but carry short-term political and distributive risks.

In all three arenas, DNZ participants did not speak from neatly bounded narratives. They moved between framings, combining Ecomodern optimism about innovation with Crisis-style warnings about time, or blended Justice concerns about distribution with Technocratic appeals to feasibility. Everyday artefacts, a holiday by aeroplane, a gas boiler, a cluttered home, an insulation grant, are the points at which these hybrid

narratives translate into choices. The aim of this subsection has been to treat aviation, heat and consumption as examples of the wicked everyday of NZT.

5.3 Summary of Discussion

This chapter has extended the analysis of DNZ data beyond the mapping of axes (Chapter 3) and first-order narratives (Chapter 4), towards a more synthetic account of Net Zero as a wicked, contested socio-political project. It has done so by tracing an analytic thread from the thematic axes, through the four identified NZT narratives (Ecomodern, Crisis, Justice and Technocratic), to a wicked metanarrative and the role of transition artefacts in stabilising or unsettling them. In doing so, the chapter has shown how apparently abstract disagreements over growth, disruption, holism and urgency are continually re-worked through claims to pragmatism, legitimacy and justice, and through the mundane infrastructures and practices of everyday life.

First, the chapter argued that "pragmatism" functions as a key narrative resource in the DNZ data. Participants across all four narratives claimed their own position as the most "realistic", implying others as naïve, ideological, or irresponsible. This was evident along all axes, where gradual reforms and radical changes across various aspects of life were framed as the only feasible route to Net Zero. The shift from a consensus-building orientation in the original DNZ design towards an agenda-widening analytical stance highlighted how methodological choices also embed narrative assumptions about feasibility: more plural, justice-oriented framings widen the range of issues and voices considered, but complicate efforts to produce singular strategies or "actionable" recommendations.

Second, the chapter developed legitimacy and justice as cross-cutting concerns, rather than topics confined to the Justice narrative. The discussion of "acting illegitimately" showed how participants wrestled with the tension between the perceived need for rapid, sometimes top-down action and the risks of eroding social consent. Justice was repeatedly framed both as a normative horizon and as a practical condition for the durability of NZT, particularly in relation to who pays, who benefits, and whose knowledge counts. The notion of a "wicked Net Zero Just Transition" captured the way in which distributive, procedural and epistemic justice issues (including knowledge hierarchies and IP regimes) are not external to decarbonisation, but constitutive of how Net Zero is imagined, governed and contested.

Third, by focusing on aviation, heat and consumption, the chapter illustrated how these narrative dynamics are materialised in everyday and sectoral settings. Aviation foregrounded questions of luxury emissions, rationing and frequent-flyer inequalities; domestic heat highlighted the politics of infrastructures, hydrogen and place-based vulnerability; and debates around voluntary simplicity pointed to latent sufficiency discourses and post-growth concerns. Across these cases, transition artefacts, from gas grids and boilers to SAF pilots and insulation schemes, were shown to both embody and shape narrative struggles over continuity, disruption and responsibility.

Taken together, these discussions support three overarching claims: firstly, Net Zero in the UK cannot be understood as a single, coherent project; it is better seen as a contested meta-narrative composed of overlapping, hybrid and sometimes contradictory narratives. Second, justice is neither a peripheral add-on nor a universally agreed principle, but a deeply wicked domain of NZT in its own right, marked by structural inequalities, competing goals and unavoidable trade-offs. Third, the analytic move from axes to narratives, and from narratives to wicked narratives and

transition artefacts, offers added value over either axis-based or narrative-based framings alone, by connecting high-level discourses to concrete sites of contention and decision.

Chapter 6 synthesises the thesis' overall answers to the three research questions, clarifies the conceptual and methodological contributions (on NZT narratives, wicked problems and transitional artefacts), reflects on the implications for the UK's NZT, and identifies limitations and priorities for future research. In doing so, the conclusion considers what it might mean to take the wickedness of NZT narratives seriously in both analysis and practice.

6.0 Conclusion

6.1 Introduction to the Conclusion

This chapter concludes the thesis by drawing together the core empirical and conceptual contributions on how narratives shape the United Kingdom's Net Zero Transition (NZT). Across the preceding chapters, the thesis has argued that NZT is not only a technical and economic undertaking, but also a narrative process in which different coalitions advance competing ideas of what "Net Zero" should mean, for whom, and at what cost. The analysis has shown that these narratives structure how experts understand feasible pathways, legitimate decision-making, and acceptable distributions of risks and benefits.

The research was guided by three questions. First, how are experts conceptualising the role of NZT narratives in the UK (RQ1)? Second, how do justice framings challenge or complement the UK's emissions-focused NZT policies (RQ2)? Third, how can broad conceptual framings, such as "wicked problems", be applied to the UK's NZT in ways that yield valuable insight (RQ3)? Chapters 4 and 5 answered these questions by, first, developing a set of thematic axes and a four-fold narrative typology, and then extending this with a meta-level analysis of wicked narratives (WN) and transition artefacts (TA). Together, these stages showed how narrative conflicts are patterned, how they intersect with questions of justice and legitimacy, and how they crystallise in concrete policies and everyday practices.

The remainder of this chapter is structured as follows. Section 6.2 presents an integrated summary of results, bringing together the findings from the thematic axes, the four NZT narratives and the WN/TA meta-analysis, and showing how they jointly

address the three research questions. Section 6.3 reflects on the limitations of the study, including its design, scope and conceptual positioning, and clarifies how these shape the claims that can be made. Section 6.4 outlines priorities for further research and offers recommendations for transition governance, with particular attention to technocratic–holistic complementarities, the management of consensus and plurality, and the risks of populist backlash. In doing so, the chapter positions the thesis as both an empirical contribution to understanding NZT narratives in the UK and a methodological contribution to how transitions might be analysed and governed in the face of persistent uncertainty.

6.2 Summary of Results and Discussion

This section summarises the main empirical and conceptual findings of the thesis and shows how the stages of analysis, the thematic axes, the four-fold narrative typology, and the Wicked Narratives (WN) and Transition Artefacts (TA) concepts, together address the three research questions.

6.2.a Narratives and Thematic Axes (RQ1)

RQ1 asked how experts are conceptualising the role of Net Zero Transition (NZT) narratives in the UK. Chapter 4 showed that the DNZ workshop data does not present a single, coherent Net Zero narrative, but a patterned plurality of narratives structured along a set of thematic axes. These axes captured recurring tensions in how participants framed NZT, including:

- Disruption vs. Continuity
- Centralised vs. Decentralised
- Holistic vs. Technocratic
- Justice vs. Injustice

- Urgency vs. Delay

These axes emerged inductively from the data and cut across sectoral discussions (e.g. aviation, heating, land use) and institutional roles (academia, government, industry, third sector). They showed that disagreements between participants were not random, but clustered around recurring questions: Should NZT be delivered primarily through expert-led, technology-centred interventions, or through more participatory and place-based approaches? Is growth-compatible decarbonisation a realistic goal, or are post-growth trajectories the only credible route? Is justice an optional add-on, a constraint, or a constitutive part of what "Net Zero" means?

Building on these axes, Chapter 4 developed a four-fold NZT narrative typology: Ecomodern, Crisis, Justice and Technocratic. Each narrative is a specific configuration of the axes:

- **Ecomodern** framings emphasised innovation, green growth and policy stability, leaning towards technocratic delivery but often acknowledging co-benefits and limited forms of participation.
- **Crisis** framings highlighted planetary limits, emergency logic and the need for rapid, disruptive change, often questioning growth and calling for stronger state intervention.
- **Justice** framings placed distributive, procedural and recognitional equity at the centre, treating NZT as inseparable from addressing historic and ongoing inequalities.
- **Technocratic** framings foregrounded expert authority, modelling, and incremental reform within existing institutions, often prioritising deliverability and governance feasibility.

These narratives are ideal types rather than fixed categories; individual participants moved between them, and hybrid positions were common. However, the typology clarified recurring coalitions and faultlines. For example, government and industry participants more often voiced Technocratic and Ecomodern framings, whereas academics and third-sector actors more frequently articulated Crisis and Justice narratives. At the same time, there was significant intra-group divergence, with some civil servants adopting justice-oriented framings and some academics defending technocratic realism.

The key finding for RQ1 is that expert understandings of NZT in the UK are structured by a small number of shared axes but are articulated through distinct narrative logics that have different implications for agency, scale and timing. Narratives do not simply describe the transition; they embed assumptions about who should act, what counts as evidence, which trade-offs are legitimate and when disruption is acceptable. This supports Hypothesis 1: narratives, especially technocratic and holistic variants, do shape how transitions are imagined and debated.

6.2.b Justice and Emissions-Focused Policy (RQ2)

RQ2 asked how justice framings challenge or complement the UK's emissions-focused NZT policies. Across Chapters 4 and 5, justice emerged both as a distinct narrative (the Justice narrative) and as a cross-cutting concern that appears within the other three narratives. Participants repeatedly raised issues of who pays, who benefits, who decides and whose knowledge counts, particularly in discussions of heat, mobility, land use and skills.

On the one hand, these justice framings clearly challenge the dominant emissions-first policy logic. Many participants criticised UK policy documents, such as strategies on

aviation and heat, for foregrounding technological options and carbon metrics while relegating affordability, regional inequality, labour impacts and procedural inclusion to secondary status. Justice was invoked to question whether policy instruments that appear efficient in aggregate (e.g. carbon pricing, tech-first subsidy schemes) are fair or politically sustainable when their distributional effects are uneven.

On the other hand, justice was also framed as a complement or precondition to effective emissions reduction. Participants argued that transitions perceived as unfair are likely to provoke resistance, undermine social licence and generate future policy instability. Justice, in this view, is not only a normative horizon but an enabling condition for durable NZT. Just Transition debates in the DNZ data illustrated this dual role: justice as both outcome (a fairer low-carbon society) and means (legitimising and stabilising the transition itself).

The Justice narrative thus did not simply oppose emissions-focused approaches; it sought to reframe what counts as a successful transition. Ecomodern and Technocratic framings often treated justice as an externality to be managed through compensation or communication, whereas Crisis and Justice framings were more likely to treat justice as intrinsic to the definition of NZT. This friction was especially visible where growth-compatible transition claims met critiques of overconsumption, frequent flying, and uneven industrial restructuring.

The analysis therefore supports Hypothesis 2, but with an important nuance. Justice framings are in tension with UK emissions-focused objectives insofar as they expose blind spots and challenge narrow definitions of success. Yet they also point towards ways of complementing emissions targets by broadening the criteria for legitimate

transition pathways; from "least-cost carbon abatement" towards "socially robust and politically durable decarbonisation".

6.2.c Wicked Problems, Wicked Narratives and Transition Artefacts (RQ3)

RQ3 asked how broad conceptual framings such as "wicked problems" can be applied to the UK's NZT in ways that yield valuable insight. Chapter 5 extended the narrative analysis to a meta-level by introducing two linked concepts: Wicked Narratives (WN) and Transition Artefacts (TA).

First, the thesis showed that participants did not only debate policies or technologies; they also engaged, implicitly or explicitly, with the *wickedness* of NZT itself: its complexity, contested values, and uncertain outcomes. Wickedness was narrated in different ways across the four narratives:

- For some Technocratic and Ecomodern framings, wickedness was treated as a management challenge: something to be reduced through better modelling, sequencing and governance design.
- For Crisis framings, wickedness was the urgency and depth of transformation required, often justifying radical interventions, and questioning incrementalism.
- For Justice framings, wickedness was interlocking inequalities and the risk of unintended harms, reinforcing arguments for deeper participation and redistribution.

The concept of Wicked Narratives captures these meta-level disagreements about what kind of problem NZT is, and hence what kinds of responses are appropriate. Rather than assuming a single shared understanding of NZT as a wicked problem, the thesis shows that narratives differ over how wickedness is interpreted and governed: as

a reason to centralise control, to broaden participation, to accelerate action or to slow down and deliberate. This adds analytical value beyond the four-fold typology by explaining why appeals to "pragmatism", "evidence-based policy" or "urgency" can mean quite different things depending on the underlying wicked narrative.

Second, the thesis introduced Transition Artefacts to link these abstract narratives to sites of practice. TAs are policies, infrastructures, technologies, or programmes, such as long-term contracts for renewable energy, hydrogen pilots, skills schemes, or domestic retrofit incentives, that both embody and reshape narratives. They are points where stories about what NZT is and should be, become material, visible and contestable.

For example, aviation decarbonisation strategies and sustainable aviation fuel proposals were shown to stabilise particular combinations of Ecomodern and Technocratic narratives (innovation, growth, and incremental efficiency) while being challenged by Crisis and Justice framings concerned with consumption levels and unequal access to mobility. Similarly, debates over the future of the gas grid and hydrogen in heat revealed how TAs can lock in certain trajectories by keeping open the promise of continuity, even when their costs, social licence and distributional effects remain unclear. Everyday practices (heating homes, flying, consuming) were analysed as domains where these artefacts and narratives intersect in ways that are experienced unevenly by different groups.

The WN and TA framework therefore adds a layer of explanation for RQ3. It shows that framing NZT as a wicked problem is analytically useful not only at the level of policy discourse but also in understanding how interventions portray conflicts and trade-offs. It shows why some artefacts become focal points for contestation (e.g.

hydrogen, aviation) while others are normalised or hidden, and how this affects possibilities for coalition-building across narrative divides. At the same time, the analysis cautions that wicked problem framings can themselves be appropriated, as reasons to delay decisions, to centralise power, or to defer justice.

6.2.d Statement of Findings

Taken together, the axes, narrative typology and WN/TA meta-analysis form an analytic thread. The thematic axes mapped the main lines of contention in expert understandings of NZT. The four-fold narrative typology then organised these tensions into recognisable narratives (Ecomodern, Crisis, Justice and Technocratic) each with implications for who acts, how, and on what timescales. Building on this, the Wicked Narratives and Transition Artefacts concepts showed how those narratives are themselves nested within higher-order disagreements about the nature of NZT as a problem, and how they materialise in specific policies and everyday practices. Across this analysis, the thesis makes four overarching claims:

1. The UK's NZT is shaped by enduring, structured disagreements rather than a simple convergence towards a single Net Zero metanarrative. These disagreements are patterned, but they do not resolve into a stable hierarchy.
2. Justice concerns permeate all four narratives but are weighted and framed differently. They challenge narrow emissions-first logics while also offering pathways to more legitimate and durable transition strategies.
3. There is no single wicked problem view of NZT; rather, wickedness is narrated in ways that support different governance preferences, from technocratic control to democratic deepening.
4. Policies, infrastructures and everyday practices are not neutral instruments but artefacts through which narrative conflicts are enacted, stabilised or re-opened.

Understanding NZT requires analysing these artefacts as material expressions of narrative settlements and their limits.

These findings jointly confirm the three hypotheses in a qualified way. Narratives do shape transitions; justice framings both contest and complement emissions-focused policy; and wicked problem framings can provide insight but also create new challenges. The conclusion that follows is not that one narrative should triumph, but that transition governance must work with narrative plurality, rather than assume it away. The next sections consider the limitations of this study and draw out implications for further research and recommendations for governing the UK's Net Zero transition in a context of enduring narrative conflict.

6.3 Limitations

While no single study can encompass the full complexity of the UK's NZT; this section outlines the main limitations of the research design, data and conceptual framing, and indicates how these shape, and constrain, the claims made in this thesis.

6.3.a Project–thesis

The thesis was embedded in the DNZ project, which was initially designed to support consensus-building and the production of actionable knowledge for UKRI and policy/industry stakeholders. By contrast, the thesis shifted progressively towards an emphasis on narrative plurality, justice and wickedness, and towards exploring diversity and disagreement rather than convergence.

This divergence is analytically productive, but it is also a limitation. The DNZ workshops were not originally designed as a pure narrative-analytic study; they were structured to surface areas of agreement and to generate consensus on concrete

recommendations. The data therefore reflect facilitation choices, topic selection and briefing materials shaped by consensus-oriented objectives. The thesis goes against that design by foregrounding dissensus and contestation. This means that the plural, conflictual narrative landscape described here is partly reconstructed from a process that also sought to smooth over differences in order to deliver synthesis.

At the same time, this project–thesis tension mirrors wider tensions in transition governance between funder and policy preferences for actionable synthesis, and academic demands for agenda-widening and inclusion. The DNZ–thesis trajectory can be read as a small-scale learning experiment in negotiating that tension. However, this also means that the analysis is necessarily partial: it is based on a dataset generated under institutional expectations that did not fully align with the thesis's later analytical priorities.

6.3.b Positionality and Analysis

A second limitation concerns my positionality; as I was an embedded researcher in the DNZ team: involved in workshop design, data collection, and internal discussions about project aims and outputs. This insider position brought advantages: sustained engagement with participants, deeper contextual understanding of sectoral and policy debates, and familiarity with the evolving dynamics of the project. It also introduced risks of bias.

The selection of themes, the construction of the axes and the identification of the four narratives were all interpretive acts, shaped by my own conceptual interests and prior exposure to transition, justice and wicked problem literatures. While I used reflexive memoing, regular note-taking, and iterative coding to examine and challenge my assumptions, and triangulated my interpretations with published DNZ outputs, the

analysis remains my reading of the material rather than a neutral reflection of it. Another researcher, especially one not involved in DNZ, might have emphasised different tensions, drawn different boundaries between narratives, or placed less weight on wickedness and justice framings.

This also applies to the development of Wicked Narratives and Transition Artefacts. These concepts emerged through my attempt to make sense of recurrent patterns in the data and to connect them with existing debates on wicked problems and socio-technical transitions. They are presented here as heuristic devices rather than as fully validated theoretical innovations. Their delineation from neighbouring ideas such as meta-narratives, and grand narratives or "cultural" and "boundary" artefacts, is necessarily approximate. The originality and usefulness of these concepts will ultimately depend on whether they prove helpful to other researchers and practitioners in different cases.

6.3.c Methodology

The empirical basis of the thesis is also limited in several ways. First, the DNZ workshop participants were predominantly experts from academia, central and local government, industry, and the third sector. This expert focus was appropriate to the project's remit, but it means that the narratives analysed here are mainly elite framings of NZT, not a representative cross-section of public or community perspectives. While participants often spoke about "the public", "communities", "workers" or "households", these references were mediated through their professional roles and institutional vantage points. The thesis therefore cannot make strong claims about how NZT is narrated among the wider public, or among those most marginal to formal governance processes.

Second, participation was self-selecting. Individuals agreed to join the workshops on the basis of interest, availability and organisational support. It is likely that those most sceptical of NZT, or most hostile to climate policy, are under-represented in the dataset. The rise of more explicit Net Zero scepticism and populist backlash in UK politics suggests that the narrative field is now even more plural than the DNZ workshops captured. The analysis should therefore be read as mapping a structured subset of expert narratives rather than the full spectrum of UK climate discourse.

Third, the format and timing of the workshops impose further constraints, due to COVID-19, most sessions were conducted online. This enabled participation from a wider geographical spread, but may have limited informal interaction, depth of deliberation, and the ability to trace how positions evolve within and across sessions. There was no longitudinal follow-up with participants outside of the academic participants being re-invited for the 3rd round of workshops, so the thesis cannot assess how all participants' narratives have changed over a longer period of time, for example in response to shifting energy prices, policy announcements or political contestation.

Fourth, the data corpus is restricted to workshop transcripts and associated project materials. The thesis does not incorporate complementary methods such as document analysis of internal policy processes, ethnographic observation of decision-making forums, or interviews with non-participating stakeholders. As a result, some inferences about the links between narratives and institutional practice remain indirect. The focus on workshop talk also means that what is analysed are articulated narratives, meaning what participants felt able and willing to say in that context, rather than necessarily the full range of views they hold or enact in other settings.

Finally, the narrative and thematic analysis itself is interpretive and selective, as coding inevitably involved decisions about which extracts to foreground and how to assign them to axes and narratives. The resulting four-fold typology is an ideal-typical reconstruction that simplifies a more fluid and messy empirical reality. Hybrid positions and shifts in stance within a single contribution are discussed, but they cannot be fully represented within a small set of labels. This reification risk is acknowledged; the typology is offered as a useful map, not a complete territory.

6.3.d Conceptual and Contextual

The conceptual framing adopted also carries limitations. First, the thesis deliberately centres the UK context: its institutions, policy debates and socio-technicalities. This grounding is necessary to make sense of the DNZ data, but it limits the generalisability of the findings. While the axes and narrative types may resonate with other high-income democracies, they may be less applicable to countries with different political systems, energy infrastructures or colonial histories, particularly in the Global South. Justice and wickedness are experienced and narrated differently in contexts where climate vulnerability, resource constraints and geopolitical power imbalances take other forms. The thesis does not claim direct transferability; at most, it suggests that similar narrative analyses could be usefully conducted elsewhere.

Second, the adoption of wicked problem framing is itself double-edged. It helped to illuminate how participants described complexity, uncertainty and value conflict, and it motivated the development of Wicked Narratives. But it may also have steered attention towards certain aspects of the data: ambiguity, contestation, trade-offs; and away from others, such as routine policy learning or incremental institutional change. Framing NZT as a wicked problem risks normalising paralysis or suggesting that conflict is inevitable and unresolvable. This thesis attempts to avoid that by emphasising

the possibility of partial settlements and coalitions, but the danger remains that wickedness is over-emphasised at the expense of other analytic lenses.

Third, the focus on expert narratives and governance debates necessarily sidelines other important dimensions of NZT, including technological innovation pathways, detailed distributional modelling, and everyday practices as studied through household-level or ethnographic methods. The thesis occasionally draws on such work, but does not replicate it. The contribution made here is therefore complementary rather than comprehensive: it adds a narrative and justice-oriented perspective to existing technical and economic analyses, but cannot substitute for them.

In sum, the limitations of project design, positionality, data and conceptual framing mean that the thesis offers one situated account of how UK NZT narratives are articulated and contested among a particular set of expert stakeholders at a particular moment. The findings should be interpreted as indicative rather than exhaustive. At the same time, these constraints are themselves revealing: they echo the very tensions the thesis describes between consensus and diversity, technocratic control and plural participation, and narrow problem-solving and broader agenda-widening. The final section turns to how these insights might inform further research and recommendations for governing Net Zero in a context of enduring narrative plurality.

6.4 Further Research and Recommendations

This final section looks ahead. It identifies priorities for further research that follow from the thesis, and offers some tentative recommendations for transition governance in the UK. The emphasis is on how institutions might work with, rather than against, enduring narrative plurality and wickedness.

6.4.a Priorities for Further Research

(i) Test Wicked Narratives

The axes and four-fold narrative typology developed in Chapter 4, and the meta-narrative concepts of Wicked Narratives and Transition Artefacts in Chapter 5, were constructed for a specific expert, UK-focused dataset. A first research priority is to test their usefulness elsewhere. Three extensions could include:

- Applying the axes and narrative types to parliamentary debates, media coverage, corporate strategy documents, or local authority plans would show whether similar configurations arise beyond the DNZ workshops, or whether different coalitions and tensions come to the fore.
- The thesis analysed elite expert discourse. Parallel narrative studies with residents in retrofit programmes, workers in high-carbon sectors, or community energy groups would help to understand how NZT is narrated from a contrasting angle, and how these narratives interact with, or resist, expert framings.
- Cross-national comparisons, particularly with countries facing different political and socio-economic conditions, would help to identify which aspects of the wicked NZT narrative are shared, and which are specific to the UK's institutions, geography and political economy.

In each case, Wicked Narratives and Transition Artefacts could be used as heuristics: to trace how multiple, overlapping narratives become focused around particular objects (e.g. cars, boilers, airports, land-use regimes), and to explore how those artefacts might instead be used to open up debate.

(ii) Complementarities between technocratic and holistic approaches

The thesis has highlighted tensions between technocratic and holistic/participatory framings, but also suggested that these are not simply opposed. Further work is needed on where genuine complementarities exist, and how they can be institutionalised. Two potential strands:

- Process design research. Comparative studies of policy processes that combine expert modelling (e.g. system dynamics, energy system optimisation) with structured public or stakeholder deliberation could help to identify which design features actually improve both perceived legitimacy and policy robustness. This might include "twin-track" arrangements where citizens' assemblies or stakeholder panels shape goals and constraints, and technocratic bodies then explore feasible pathways within those boundaries, with iterative feedback between them.
- Institutional roles and capacities. Research on boundary organisations and intermediaries (including regulators, advisory bodies, and arms-length delivery organisations like LCCC and NESO) could examine what capacities they need to translate between technocratic and participatory logics. For example, what skills, mandates and accountability structures allow such organisations to hold open multiple framings rather than defaulting to narrow problem definitions?

(iii) Consensus, agenda-widening and funder logics

Chapter 3 and the limitations section documented a tension at the heart of the DNZ project: between UKRI's interest in "actionable knowledge" and stakeholder/academic interest in agenda-widening and inclusion. This tension is far from unique to DNZ, and warrants systematic study. Future research could examine:

- How different projects negotiate this trade-off in practice, including when and how "wider agendas" are dropped, backgrounded, or translated into funder-friendly outputs.
- Alternative models of research commissioning, in which calls and evaluation criteria explicitly value both synthesis and contestation. For example, requiring funded consortia to deliver not only recommendations but also a reflexive account of what had to be excluded or simplified to make those recommendations possible.
- The effects of different governance arrangements for research projects (e.g. advisory boards, stakeholder steering groups, co-governed agendas) on the balance between consensus-building and diversity.

These strands could help funders and research teams to design processes that are honest about trade-offs between closure and openness, rather than assuming that both can be fully achieved at once.

(iv) Coalitions across narratives

Chapter 5 suggested that there are overlaps between the four narratives, across at least just transitions, legitimacy, and pragmatism, that may sustain cross-narrative coalitions. A further priority is to move from analytic identification of these overlaps to empirical study of coalition-building. Key questions include:

- Under what conditions do actors aligned with different narratives (e.g. Ecomodern and Justice) form coalitions around particular Transition Artefacts such as retrofit programmes, heat networks or sustainable aviation fuels?
- What kinds of framing work, brokerage and compromise are involved in these coalitions, and how stable are they over time?

- How do such coalitions handle internal disagreement about growth, demand reduction or ownership without collapsing?

Here, Wicked Narratives and Transition Artefacts could be used to design and evaluate experimental coalitions: for example, by bringing together actors with explicitly different framings around a specific artefact (say, a local heat network) and tracking how narratives evolve as they negotiate concrete design and governance choices.

(v) Democratic innovations to surface trade-offs

Finally, the thesis argued that democratic reform is needed not simply to communicate Net Zero, but to surface and negotiate trade-offs in a more explicit and legitimate way. Further research may valuably explore which democratic innovations are most appropriate for different domains of NZT, and how they interact with existing institutions. Potential lines of inquiry include:

- Evaluating citizens' assemblies, citizens' juries and deliberative polls focused on specific Transition Artefacts (e.g. road-pricing, aviation demand, hydrogen in homes), and comparing them with more conventional consultation.
- Studying how local area energy planning, now being taken forward by NESO and distribution network operators, can be designed to include structured deliberation about competing objectives (cost, reliability, justice, local economic development) rather than treating "the public" as a homogeneous acceptance problem.
- Exploring hybrid models in which elected representatives, experts and lay citizens share decision authority on particular issues, and assessing how this affects both substantive outcomes and perceptions of fairness.

In each case, the aim would be to move beyond generic endorsements of participation toward empirically grounded guidance on when, and how, different democratic tools help to address the wickedness of NZT rather than adding further complexity.

6.4.b Recommendations for Transition Governance

On the governance side, the thesis does not offer a blueprint for NZT in the UK. However, the analysis supports several tentative recommendations for how UK institutions might better navigate a plural, contested transition.

(i) Use narratives and axes as diagnostic tools

First, policy makers and intermediaries could use the axes and narratives developed here as diagnostic devices rather than as academic abstractions. Before launching major strategies or programmes, departments such as DESNZ and DfT, and bodies like LCCC and NESO, could ask:

- Which narrative logics are we implicitly relying on (e.g. technocratic continuity, growth-oriented ecomodernism, justice-centred disruption)?
- Which axes are being suppressed (e.g. equity, participation, demand reduction), and with what potential political and social consequences?
- Which Transition Artefacts (for example, the gas grid, airports, large-scale renewables, or retrofit schemes) are likely to become focal points for conflict, and how might their design be adjusted to acknowledge and negotiate that in advance?

Such diagnostics would not remove conflict, but they could make it more transparent, giving scope to plan for contestation rather than treating it as a surprising failure of communication.

(ii) Design for technocratic–holistic complementarity

Second, governance arrangements should be designed to make better use of complementarities between technocratic and participatory approaches. In practice, this might mean:

- Twin-track processes, in which expert bodies are tasked with mapping feasible pathways under a range of constraints, while deliberative forums (citizens' assemblies, stakeholder panels) define or revise those constraints and assess the acceptability of different trade-offs.
- Iterative loops between these tracks, so that model outputs are returned to deliberative bodies for scrutiny, rather than presented as fixed answers.
- Boundary-spanning roles within organisations (e.g. in regulators, system operators, or arm's-length bodies) mandated to integrate social science, public engagement and technical analysis, rather than treating them as separate workstreams.

These arrangements accept that not all decisions can be fully participatory, but they seek to ensure that technocratic work is shaped by, and accountable to, plural values rather than insulated from them.

(iii) Re-balancing research and innovation governance

Third, funders and research programme designers might adjust their practices to reflect the tensions, but also the opportunities identified in this thesis. Possible steps include:

- Requiring large transition-oriented projects to produce not only recommendations, but explicit reflection on what framings and agendas were excluded in order to reach those recommendations.
- Supporting paired projects, where one side focuses on synthesis and policy advice, and the other focuses on critical, agenda-widening analysis of the same issue. For example, this thesis focused on agenda-widening, while the DNZ project, while moving to agenda-widening, still attempted to provide policy advice in its synthesis report. Ultimately however, this relationship and distinction in aims may have been more valuable if made more explicit.
- Revisiting metrics and KPIs in innovation funding so they reward and support goal reorientation. It is worth noting that UKRI did support the alteration of course for the DNZ project.

(iv) Working with Transition Artefacts as sites of coalition and contestation

Fourth, practitioners could treat Transition Artefacts as deliberate focal points for coalition-building rather than as neutral project outputs. For example:

- Designing retrofit schemes, hydrogen pilots or aviation measures with explicit attention to how they will be narrated by different coalitions, and building in mechanisms for affected groups to shape design and benefit sharing.
- Using specific artefacts, such as the future of the gas grid, airport expansion constraints, or local transport plans, as the focus of deliberative forums that bring together actors from different narratives to negotiate decisions.

Here, the expectation should not be consensus, but good enough settlements that are revisitable, transparent about trade-offs, and attentive to distributional impacts.

(v) Democratic reforms to surface, not hide, trade-offs

Finally, the rise of net zero scepticism and populist backlash suggests that attempts to depoliticise NZT are becoming less tenable. Rather than presenting Net Zero as a purely technical inevitability, UK institutions may need to foreground the political choices involved. This could include:

- Establishing regular, structured deliberative processes at national and local levels that focus on specific trade-offs (for example, between energy prices, speed of decarbonisation and equity), with clear links to formal decision-making.
- Creating transparent redistributive mechanisms around particularly contentious Transition Artefacts (e.g. road-pricing, airport capacity, changes to the gas grid), so that those who bear more of the costs see corresponding benefits.
- Strengthening local governance roles in areas such as heat and transport planning, where place-based knowledge is critical, while ensuring that national frameworks support rather than override local experimentation.

These measures would not eliminate conflict; indeed, they would likely make disagreement more visible. But they could also reduce the space for Net Zero to be mobilised as an abstract target onto which wider grievances are projected, by making clearer who decides, on what basis, and with what consequences. Taken together, these research priorities and governance recommendations reflect the central claim of the thesis: that the UK's Net Zero Transition is best understood not as a single, linear project, but as an ongoing narrative struggle over what counts as feasible, fair and legitimate futures. Working with this struggle, rather than seeking to close it down, may offer the most realistic route to a transition that is both effective and just.

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