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PUBLICS [RE/MIS/NOT] PRESENTED

THE ROLE OF IMAGINED PUBLICS IN LEGITIMATION OF TRANSITION EXPECTATIONS



Toyah Rodhouse

Publics [re/mis/not] presented

The role of imagined publics in legitimation of transition expectations

Lessons from governance of gas & gas infrastructure in the Dutch energy transition

Keywords: legitimacy of transitions; expectations; imagined publics; energy transition governance; energy justice;

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The role of imagined publics in legitimation of transition expectations

Lessons from governance of gas & gas infrastructure in the Dutch energy transition

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chair of the Board for Doctorates

to be defended publicly on Monday 6 January 2025 at15:00 o'clock

by

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SUMMARY

Samenvatting

Governance van energie transities wordt gekarakteriseerd en gedreven door een groot aantal, zeer uiteenlopende en vaak met elkaar concurrerende verwachtingen. In dit proefschrift roep ik op tot meer aandacht voor de legitimiteit van dergelijke transitieverwachtingen. Dit is in de eerste plaats nodig omdat transitieverwachtingen gevormd, geadopteerd, en nagestreefd worden in vaak gepolitiseerde maar zelden gedemocratiseerde processen, waarin sommige actoren hun verwachtingen wel groots gedeeld zien worden en andere niet. In de tweede plaats is deze aandacht wenselijk omdat transitieverwachtingen over het algemeen een significante maar zeer ongelijke impact beloven te hebben op verschillende maatschappelijke groepen, of publieken, in transities. Dientengevolge raken transitieverwachtingen vaak aan zaken als in- en uitsluiting, rechtvaardigheid en onrechtvaardigheid, en macht en machteloosheid. Om deze twee redenen kunnen zowel transitieverwachtingen zelf als de besluitvormingsprocessen waarin ze hun werk doen leiden tot (percepties van) illegitimiteit.

Voor een succesvolle en legitieme energietransitie is het essentieel dat we leren begrijpen hoe governance met deze mogelijke zorgen en bezwaren omtrent de legitimiteit van transitie verwachtingen om kan gaan. Hiervoor hebben we ook een beter begrip nodig van de manieren waarop governance actoren legitimiteit voor (hun) verwachtingen claimen – dat wil zeggen, van processen en activiteiten van legitimering. In de studies die in dit proefschrift zijn gebundeld, onderzoek ik daarom hoe governance actoren de legitimiteit van hun verwachtingen construeren en claimen. Ook onderzoek ik de interacties, conflicten en dilemma's die ontstaan tussen en rond transitieverwachtingen terwijl deze worden gelegitimeerd en nagestreefd. Een belangrijke bevinding van mijn onderzoek is dat actoren de legitimiteit van transitieverwachtingen construeren op basis van bepaalde verbeelde publieken voor wie deze verwachtingen van betekenis geacht worden te zijn. Gesteund door zowel theoretische als empirische inzichten, ontwikkel ik vervolgens op basis van deze bevinding een conceptueel begrip van legitimiteit als een gecoproduceerde relatie tussen (technologische,

organisatorische) verwachtingen en hun gecoproduceerde, verbeelde publieken (zie hoofdstukken 2 en 7).

Dit proefschrift is gebaseerd op vier empirische onderzoeken, waarvoor data zijn verzameld met verschillende onderzoeksmethoden in drie verschillende governance contexten voor gas en gasinfrastructuur in de Nederlandse energietransitie. Ten eerste heb ik een Q-methodologische studie uitgevoerd naar de governance van de Nederlandse warmtetransitie om de hier aanwezige brede diversiteit aan verbeelde publieken in kaart te brengen (zie hoofdstuk 3). Ik heb vijf publieksbeelden gevonden:

1. Betekenisvolle deelname aan een diverse samenleving
2. Sterke en enthousiaste gemeenschappen lopen voorop
3. NIMBYs en maatschappelijk conflict als bedreiging voor de transitie
4. Collectivisme en kwetsbare groepen die gevaar lopen in de transitie
5. Het ontzorgen van individuele gebruiker-consumenten in de transitie

Elk van deze publieksbeelden construeert en portretteert op unieke wijze publieke identiteit en verantwoordelijkheid in transities. Ik heb in deze studie ook geëxploreerd hoe deze constructies worden gebruikt om bepaalde de rollen en verplichtingen van zowel publieken als van andere actoren in de warmtetransitie te rechtvaardigen of te legitimeren.

Ten tweede heb ik een kwalitatieve inhoudsanalyse uitgevoerd van 21 visiedocumenten om een dieper en rijker inzicht te krijgen in hoe beelden van het publiek worden gecoproduceerd met technologische, organisatorische en socio-economische transitieverwachtingen in visies voor de Nederlandse waterstoftransitie (hoofdstuk 4). Op basis van de analyse concludeer ik dat publieken, in hun verschillende rollen en samenstellingen en met hun uiteenlopende eisen, niet altijd afdoende worden erkend of correct worden vertegenwoordigd in de Nederlandse waterstofvisies. Onvolledige of zelfs afwezige publieksbeelden worden gecoproduceerd met nogal technocratische, centralistische en grote-schaal voorkeuren voor technologieontwikkeling en -adoptie. Aan de bestudeerde waterstofvisies lijkt een nauw begrip van publieke belangen en de mogelijkheden voor publieke betrokkenheid bij de waterstoftransitie ten grondslag te liggen. Het incorrect of zelfs helemaal niet

erkennen van maatschappelijke diversiteit is onrechtvaardig en kan in de toekomst leiden tot verdere distributieve en procedurele onrechtvaardigheid.

Een van de conclusies van hoofdstuk 4 is dat de governance van de Nederlandse waterstoftransitie gesloten lijkt. Slechts een beperkte groep van actoren heeft de mogelijkheid om (publieken en rechtvaardigheid voor hen in) waterstofvisies vorm te geven. Er lijkt in governance geen bewustzijn van de mogelijke rechtvaardigheidskwesties in de toekomstige waterstoftransitie, en ook is er geen reflectie op de versimpelde constructie van publieken in deze toekomst. Ten slotte lijkt governance niet of slechts beperkt te reageren op de veranderende maatschappelijke dynamiek, verwachtingen en waarden.

Zowel het ondemocratische en weinig responsieve karakter van visievorming in governance van de waterstoftransitie als de potentiële onrechtvaardigheden die ontstaan wanneer waterstofvisies worden uitgevoerd kunnen leiden tot (percepties van) illegitimiteit. Dit roept de vraag op, of governance van verwachtingen zodanig georganiseerd kan worden dat dergelijke illegitimiteit voorkomen kan worden.

Om een beter begrip te krijgen van hoe governance te organiseren voor meer legitimiteit van verwachtingen, concentreerde ik mij in de volgende twee empirische studies zich op de interacties, conflicten en dilemma's die ontstaan tussen diverse (netwerken van) transitieverwachtingen in transitiebestuur.

In hoofdstuk 5 bestudeerde ik hoe verwachtingen over maatschappelijke waarde co-creatie zich ontwikkelden in GZI Next, een co-creatief project in Emmen, Nederland, waarin de locatie van een oude gaszuiveringsinstallatie werd her-ontwikkeld tot een energiehub. In de loop van de projectontwikkeling bestonden er zeven verschillende en soms tegenstrijdige verwachtingen naast elkaar over welke maatschappelijke waarde het project zou moeten nastreven, en hoe. Met behulp van observaties, interviews en een documentanalyse identificeerde ik drie verwachtingsconflicten en beschreef ik hoe deze conflict aangepakt werden (of juist niet) om tot een samenhangende en gedeelde co-creatieaanpak te komen. De resultaten tonen aan dat, hoewel de samenwerkende projectontwikkelaars bewust tot doelstelling hadden open te willen staan voor diverse waarde verwachtingen, de posities en invloed van vaak commerciële actoren in het project leidend bleken voor de performance van vaak nauwe verwachtingen van maatschappelijke

waarde op kritieke momenten in de projectontwikkeling. Dit kon onder andere, doordat er in het project geen duidelijke governance regels of kaders waren opgesteld voor het bespreken en adresseren van verwachtingsconflicten.

In hoofdstuk 6 heb ik wederom gebruik gemaakt van de casus van GZI Next om legitimiteitsuitdagingen van co-creatieve herontwikkelingsprojecten in fossiel-industriële regio's voor de betrokken regionale overheden te identificeren. Ik heb zes legitimiteitsuitdagingen gevonden, waaronder de noodzaak om een brug te slaan tussen uiteenlopende opvattingen over legitimiteit (die ook voortbouwen op verschillende publieksbeelden), issues rondom publieke verantwoordelijkheid en moeilijkheden bij het claimen van het recht op een rechtvaardige transitie.

Een van de belangrijkste inzichten in dit proefschrift is dat zorgen over de legitimiteit van transitieverwachtingen ontstaan, wanneer deze verwachtingen gecoproduceerd worden met bevooroordeelde, onherkenbare, onrechtvaardige en niet representatieve publieksbeelden. Naast het eerder genoemde nieuwe theoretische perspectief op legitimiteit als coproductie, biedt dit proefschrift daarom ook concrete aanbevelingen voor governance actoren om te komen tot meer wenselijke en maatschappelijk gedragen publieksbeelden.

Summary

Transition governance is driven by diverse and often competing expectations. In this dissertation, I develop an informed argument for increased attention to the legitimacy of such expectations. This is needed, firstly, because transition expectations emerge and compete with each other in oftentimes politicised yet rarely democratised processes, in which ultimately some (actors') expectations become shared and performed while others are not. Secondly, because transition expectations generally promise a significant but unequal impact on societal groups, or publics in transitions. Consequently, expectations oftentimes touch upon matters of in- and exclusion, justice and injustice, power and disempowerment in transitions. For these reasons, both transition expectations and the governance processes in which they emerge and do their work can lead to (perceptions of) illegitimacy.

We need to understand how governance can cope with and address this in ways that truly increase the legitimacy of transitions. For this, we also need a better understanding of how governance actors work to establish the legitimacy of (their) expectations – i.e., of the legitimation of transition expectations. In the studies bundled in this dissertation, I therefore investigate how governance actors construct and produce legitimacy of their expectations and observe the interactions, conflicts and dilemmas that emerge between and around transition expectations as they are being legitimized and performed. I find that actors construct the legitimacy of transition expectations on the basis of certain *imagined publics* to whom these expectations are assumed to be of consequence. Supported by both theoretical and empirical insights, I continue to build the case for understanding legitimacy as a coproduced relationship between (technological, organisational) expectations and these imagined publics (see Chapters 2 & 7).

This dissertation is based on four empirical studies, for which data was collected with different research methods in three different governance settings for gas & gas infrastructure in the Dutch energy transition. Firstly, I carried out a Q methodological study in governance of the Dutch heat transition to identify the

broad diversity of publics that is imagined here around energy system change (see Chapter 3). I found five imaginaries:

1. Meaningful participation in a diverse society
2. Strong and enthusiastic communities in the lead
3. NIMBYs, social contestation and the threat to decarbonisation
4. Collectivism & vulnerable groups at risk, and,
5. Unburdening individual user-consumers in the transition

Each of these imaginary presents public identity, agency and responsibility in transitions in distinctive ways. I explored how these constructions are used to justify or legitimize roles and obligations for publics as well of other actors in the heat transition.

Secondly, I undertook a qualitative content analysis of 21 vision documents for the Dutch hydrogen transition to get a deeper and richer understanding of how imagined publics become coproduced with technological, organisational, and socio-economic transition expectations in governance (Chapter 4). Based on the analysis, I conclude that publics, in their various roles and compositions and with their diverse demands, are not always acknowledged nor correctly represented in Dutch hydrogen visions, resulting in rather technocratic, centralised and large-scale preferences for technology development and implementation, and narrow understandings of public interests and opportunities for involvement in the hydrogen transition. Non-recognition and misrecognition of publics is unjust and can result in further distributive and procedural justice issues when these recognition injustices become performed in and through policy, technology, and infrastructure development and implementation.

One of the conclusions of Chapter 4 is that governance of the Dutch hydrogen transition seems rather closed down, with only a limited group of actors having the opportunity to give shape to (publics and justice understandings in) hydrogen visions. Governance seems almost unaware of justice issues in the future hydrogen transition, seems unreflexively engaged with the narrow construction of public identities in this future, and lastly, seems quite unresponsive to changing societal dynamics, expectations, and values.

Both the rather undemocratic and unresponsive character of vision formation around hydrogen and the potential injustices that arise in and from hydrogen visions can lead to (perceptions of) illegitimacy. Amongst others, this draws attention to how governance the expectations is organised. To gain a richer understanding of how to construct and organise for legitimacy in the governance of expectations, the next two empirical studies focused on the interactions, conflicts and dilemmas that emerge between diverse (webs of) transition expectations in transition governance.

In Chapter 5, I studied how expectations of societal value co-creation evolved and became performed in GZI Next, a co-creative project in Emmen, the Netherlands, in which the site of an old gas purification plant was redeveloped into an energy hub. Over the course of project development, seven different and sometimes conflicting expectations co-existed of the site's societal value potential. Drawing on observations, interviews, and document analysis, I described three expectational conflicts and the developers' efforts to address these to come to a coherent and shared co-creation approach. The results indicate that the project developers made a purposeful attempt at being open to diverse value expectations. Yet, in the absence of clear governance frameworks and rules for addressing expectational conflicts, actor positions and influence continue to drive the performance of somewhat narrow expectations of publics and their value demands and interests at critical moments in project development.

In Chapter 6, I drew on the same case of GZI Next to identify critical legitimacy challenges of co-creative asset redevelopment in fossil-industrial regions for the involved regional governments. I found six such challenges: 1) striking a balance between addressing financial and human resource constraints and managing concerns for private interference; 2) bridging differences in cultures, preferences, and legitimacy concerns; 3) clarifying and managing role expectations; 4) managing emerging intra-organisational conflicts of interest; 5) overcoming difficulties in successfully claiming the right to a just transition; and 6) ensuring accountability in the face of often (intangible and indirect) regional value.

Amongst the key insights in this dissertation is that major legitimacy concerns emerge when transition expectations are coproduced with biased, narrow, unrecognisable, or misrepresentative imagined publics. In addition to the novel

theoretical perspective on legitimacy as coproduction, this dissertation provides concrete guidance and recommendations to transition governance actors to strengthen the legitimacy of their expectations by addressing these (unjust) misrepresentation issues.

CHAPTER 1

Introduction to Publics [re/mis/not] presented

1. Introduction to Publics [re/mis/not] presented

1.1 The politics and publics of transition expectations

Modern-day energy transitions[1] revolve around expectations. Quite literally, all that is intentionally done in these transitions is driven and justified by expectations of the possible outcomes of our actions and behaviours, as much as of the serious consequences that may follow from our inactions. Most prominent in this regard are expectations of the severity of global warming, of course. With advancing insight, most of us now expect that global warming will exceed 1.5°C during the 21st century and consider it increasingly likely that it will exceed 2°C some time beyond 2100. This, we expect, will have catastrophic consequences for life on earth (IPCC, 2023). With what can only be described as optimism, many of us believe that there is still a small window of opportunity to avert too disastrous outcomes. That is, we may be able to limit severe climate change, but only if we make deep, rapid, and sustained reductions in our greenhouse gas emissions in the coming two decades (IPCC, 2023).

These sort of expectations of climate change and its mitigation explain *why* we undertake efforts to reduce carbon dioxide emissions – or CO_2, a greenhouse gas that is particularly potent but only because it is emitted in such large volumes during the production of fossil fuel-based energy – and seek to bring about a transition towards more sustainable, carbon-neutral energy systems. *How* we should act in this transition is also the subject of expectations, or perhaps more aptly, is subjected to expectations. Expecting is what we do when we believe that

[1] Modern-day energy transitions are understood here as intentional processes of structural change in socio-technical energy systems, of which the aim is to fully replace carbon dioxide-emitting modes of energy provision with low-carbon or even renewable energy ones. This materialises through simultaneous and sequential, fragmented yet coordinated (inter)actions to shift the use of technologies and infrastructures, institutions, and socio-economic practices and behaviours over a prolonged period of time, generally spanning decades (Meadowcroft, 2009).

the use of digital technologies in existing energy systems will be the key to integrating more renewables, improving the reliability of power grids, and reducing the costs of energy. Likewise, expecting is thinking that hydrogen will be critical to system resilience and security in the future due to its storage and transport capacity and variable production and use options. Expecting is believing that transitions can only succeed if we drastically change our behaviours and consumption patterns, that is, how (much) we use and consume energy. As a last example, expecting is what we do when we believe that this energy transition will 'democratise energy' and enable increasing (economic and political) public participation in the energy sector.

These seemingly so likely expectations drive transitions, and they are unavoidably political and public. Firstly, because these kinds of expectations emerge, evolve, and do their work in inherently politicised governance processes. Governance of transitions[2] entails a multitude of actors with different interests, insights, beliefs, and preferences. Not surprisingly, these differences give birth to a variety of expectations – in other settings rather catchily described as *"a sea of expectations"* (Van Lente, 2012) – none of which are complete, accurate, or fully stable, and quite some of which are incompatible and conflicting. How governance actors navigate this sea – decisive or doubting, united or in conflict, successful or unsuccessful – in large determines how energy transitions unfold, and new systems take shape (Ballo, 2015; Delina & Janetos, 2018; Veenman et al., 2019). Navigation involves lobbying and negotiation, may entail deliberating, and will always include selecting and adopting from amongst many expectations some that will become shared and formalised in governance. Obviously, this is a deeply political process, in which not only the question of *which* expectations become adopted is relevant, but also the questions of *whose* expectations and *with what consequences* (Delina & Janetos, 2018). The stakes in this politicised game are high: actors who see their expectations being chosen and shared (over those of other actors) ultimately get

[2] Energy transition governance is understood as the whole of interactions amongst government, business, science, civil society and others taking place to realise energy transitions, including the formulation and application of principles guiding those interactions and care for institutions that enable them (Kooiman et al., 2008, p. 2).

to give shape to how different groups in (future) society get to engage with energy, have access to it, make use of it, make money from it, or make sacrifices for it. Simply put, expectations are about power and influence: *"who or what owns the future – this capacity to own futures being central in how power works"* (Urry, 2016, p. 11).

Both because transition expectations are inherently about power, and because they propose to significantly impact – *even shape* – society and its ability to safeguard what it values, it is critical that transition expectations are considered legitimate. In this dissertation, legitimacy is a (shared) belief in the rightfulness of exercising authority over others via expectations that impact these others. Such a shared belief in the legitimacy of expectations is formed on the basis of various grounds. Not in the least, one could argue that the governance settings and processes in which transition expectations are formed, adopted, used, defended, and performed need to be legitimate for these expectations to be considered legitimate as well. Establishing legitimate governance processes for energy transitions is not easy, however. As said, modern-day transition governance is characterised by the involvement of a plurality of actors such as businesses, NGOs, research institutes, and other organisations, who share roles and responsibilities at all levels of the energy system. Rather than representing a constituency, these actors tend to present and lobby for their own expectations of 'desirable' transitions. All the while, citizens are rarely granted equal access to these governance processes, despite recent efforts to increase citizen participation in transition governance. Nor are citizens always transparently supplied with insights in how decisions in these processes are made. Furthermore, when dominant and shared expectations are the outcome of interactions between many actors and their expectations, it is hard to establish who can be held accountable for what. In other words, *"Energy futures are being decided but by whom, and how do those who will be affected in society hold someone accountable, when both decision making processes and decisions themselves appear to be so fuzzy and fluid?"* (Sareen, 2020, p. 10). It would thus seem that transition expectations are oftentimes produced and performed in governance processes characterised by a so-called *democratic deficit* (Hendriks, 2008; De Geus et al., 2022), which is a major issue for the legitimacy of transition expectations.

Other grounds for the legitimacy of expectations are based less on the processes and procedures in which they are produced, and more on what they are proposing or promising (Beckert, 2020). Looking at expectations in transitions, it is striking that many promise a significant impact on society, whether they do so through the promotion of new technologies to use, new rules to obey, new ways of working to follow, or new behaviours to adopt. Oftentimes, of course, this is all assumed to result in a positive impact for society-at-large or for the particular groups targeted and in scope. However, expectations for renewable and sustainable technologies, projects, practices, and behaviours generally also require sacrifices and trade-offs. When performed[3], such expectations can have negative consequences for some groups in society. Perhaps somewhat counterintuitively, even the non-performance of expectations can harm some groups more than others – for example, when governments back out of previously given support and commitments towards certain technologies, fuels or energy carriers, on the basis of which prosumers, energy communities, entrepreneurs, large corporations, and other parties in transitions had already made significant investments (Lazou, 2023). Hence, expectations affect people, can even cause harm, and generally do so in different ways. As such, they have the potential to create (perceptions of) inequality and injustice and drive feelings of illegitimacy (Jenkins, Sovacool, & McCauley, 2018; Jenkins, et al., 2021; Sareen, 2020).

Perceived illegitimacy of transition expectations poses a serious and possibly paralyzing threat to the timely execution of energy transitions (Sareen, 2020), not least because it will likely – and rightly so – lead to protest and resistance. If we want to mitigate climate change according to plan – in fact, faster than planned following recent insights from the sixth synthesis report of the International Panel on Climate Change (IPCC, 2023) – we need to understand how governance can cope with and address such concerns effectively and in ways that truly increase the legitimacy of energy transitions. For this, we also need more insights in the

[3] Simply put, performance of expectations is about actors undertaking actions to realise positive expectations or to prevent overly negative expectations from coming true.

(conscious as much as unconscious) efforts of governance actors to establish the legitimacy of (their) expectations, i.e., in the legitimation of transition expectations.

Legitimacy and legitimation of expectations in transition governance is what I am concerned with in this dissertation. With my research, I am trying to contribute knowledge on, insights in, and recommendations for a more legitimate energy transition. I do this by investigating how governance actors construct legitimacy for their expectations, and by observing the interactions, conflicts and dilemmas that emerge between and around often diverse transition expectations as they are being legitimized and performed.[4]

Supported by theoretical and empirical insights I will build the case for understanding legitimacy as a coproduced relationship between (technological, societal, organisational) transition expectations and the similarly expected publics that will, in one way or the other, be implicated by (the performance of) these expectations. In other words, I will argue that legitimacy of transition expectations is constructed on the basis of *imagined publics*[5] to whom these expectations are assumed to be of consequence. While I will elaborate on this theoretical argument in more detail in Chapter 2, the gist of it is as follows: expectations are never formed in isolation. They are not standalones. Instead, they are always part of a wider assemblage of physical-material, socio-economic and institutional expectations –

[4] In all honesty, I rather inductively came to understand the process that I was studying as legitimation of expectations. Initially, my PhD research revolved around the question, how imagined publics were drawn on in energy governance in relation to energy futures. It was only over time that I developed a tangible idea about the concrete nature of the relationship between publics and future orientations such as expectations, and that I decided to label this relationship legitimacy. Hence, the concepts of legitimacy and legitimation may not always appear prominently in at least some of the empirical chapters, although the concepts of and relationships between (imagined) publics, expectations, and transitions do, of course. To prevent the undoubtedly few readers of this dissertation from having to go through the same long, burdensome, and inductive thought process, I have written a theoretical perspective in which I summarize my *stream of consciousness*, as it were, on legitimacy of expectations over the recent years.

[5] Imagined publics are subjective social representations that build upon all sorts of assumptions of the values, identities, abilities, knowledges, behaviours, responsibilities of particular groups of people (Rodhouse et al., 2021, p. 2).

an assemblage to which I will refer in the next chapter as an expectational web – that not only proposes certain scientific and technological (or other) solutions in transitions, but also produces the publics and values that justify or necessitate these solutions (Jasanoff & Kim, 2009; Chilvers & Pallett, 2018; Longhurst & Chilvers, 2019). Consequently, such webs of expectations are ingrained with certain understandings and ideas of legitimacy, which can be captured and understood by studying the coproduction of expectations for particular transition solutions and their imagined publics (Welsh & Wynne, 2013; Wynne, 2016).

1.2 Relevance of research

Interestingly, despite the importance and urgency of a legitimate energy transition, the conceptual relationship between legitimacy and the expectations that drive these transitions is relatively underexplored in Transition Studies, Political Studies, Public Administration and Science and Technology in Society Studies, to name but a few disciplines in which one would expect attention to these issues.[6] A notable exception is the increasing attention in legal and moral philosophy circles to *legitimate expectations* (Meyer & Sanklecha, 2014; Meyer & Truccone-Borgogno, 2022; Lazou, 2023). This literature is peripherally relevant, yet generally focuses on the potential harm caused to firms and corporations in transitions by unexpectedly fickle governments. This is a narrow private and legal understanding of legitimacy, while both the social issue at stake here and the understanding of legitimacy applied in this dissertation is much broader.

One theory that might be expected to have inspired its followers to have formulated a comprehensive conceptual perspective on the legitimacy of expectations is the *Sociology of Expectations* (Brown & Michael, 2003; Borup et al., 2006; Van Lente, 2012). This theory describes the dynamic development of technological expectations as fundamentally generative of (socio-)technical and scientific

[6] Even though many related themes, trends, and concepts such as social acceptability, social conflicts, and socio-technical imaginaries have gained considerable attention in energy transition studies in the recent decades.

activity. Research carried out from this perspective highlights that technological expectations can grant legitimacy to governance actors (Borup et al., 2006), yet the reverse, that is, the necessity of technological expectations being seen as sufficiently legitimate for actors to adopt, promote and perform them, is less well-studied. One inspiring study in this respect was carried out by Markard, Wirth, & Truffer (2016), who focused on *technological legitimacy*. The notion of technological legitimacy is now giving rise to a strand of work on how technologies become framed as (il)legitimate, how such frames may evolve over time, and may differ across space and time (Genus & Iskandarova, 2020; Van Der Velden et al., 2023; Schneider & Rinscheid, 2024). This emerging body of work underscores the need for more attention to the legitimacy of expectations, especially when these expectations concern sensitive, new, and potentially disruptive technology. It also calls for more thorough conceptualisations and understandings of legitimacy in relation to emerging or envisioned technological artefacts and systems.

A last strand of scientific work in which we would expect legitimacy of expectations to form an important and indispensable theme is the research on *socio-technical imaginaries*. Indeed, this work focuses on many related concepts and patterns, such as how certain imaginaries – e.g., coproduced expectations of society, science, knowledge, and technology that form a somewhat coherent image or vision of the future – come to perform particular socio-technical systems. This literature also zooms in on the processes of contestation, challenge and conflict in which incumbent actors try to defend so-far dominant imaginaries that serve and perform their interests while being challenged by counter-hegemonic actors trying to replace these imaginaries with their own (Jasanoff & Kim, 2009; Jasanoff & Kim, 2013; Delina & Janetos, 2018; Simmet, 2018). However, despite that both the successful contestation and the performance of imaginaries requires establishing (il)legitimacy, there are few, if any, conceptual studies in this tradition that have explicitly put legitimacy and legitimation front and centre.

The empirically grounded conceptualisation of legitimacy as coproduction developed in this dissertation contributes to these literatures. It also offers a new perspective on legitimacy that can inspire governance actors to rethink their oftentimes automatic assumptions on (the role of society in) a legitimate transition.

1.3 Research context: gas and gas infrastructure in the Dutch transition

The empirical data on which I build this perspective has been collected in the context of decision making on gases and gas infrastructure in governance of the Dutch energy transition.

1.3.1 Sixty years of natural gas in the Netherlands: from lifeblood to dirty fossil fuel

With some flair for dramatics, one could say that natural gas has been the lifeblood of Dutch society for the last six decades. Disregarding 2022, a year in which Dutch natural gas demand was anomalously low as a consequence of the European energy crisis, the Netherlands consistently covers around 40% of its total annual energy consumption with natural gas. This by far surpasses the average share of natural gas in energy consumption of the rest of Europe, which typically fluctuates around 25% (e.g., being 26.7% in 2021) (PBL, 2021; International Energy Agency, 2024).

Hence, and this time without intended dramatics, it seems fair to say that the Netherlands is excessively reliant on natural gas. This rather unique dependency on natural gas is intricately linked to the discovery of huge domestic gas reserves in Groningen in 1959, also known as the Slochteren deposit. This discovery provided the Netherlands with an abundantly available, versatile, and cost-effective energy source, fuelling the country's rapidly growing post-war economy. In the subsequent decades, natural gas became widely used in various sectors and functionalities, not in the least in heavy industry, electricity generation, and residential heating (Correljé et al., 2003).

Sixty years of exploitation of the Slochteren reserves and other deposits has brought significant social and economic advantages to the Netherlands. Extraction has yielded 2,246 billion cubic meters of natural gas and has generated 363 billion euros for the Dutch State Treasury (Parlementaire enquêtecommissie aardgaswinning Groningen, 2023). These funds have been pivotal in supporting various social amenities and public infrastructure projects (Correljé et al., 2003). Additionally, the use of natural gas has notably improved quality of life for households. Until recently, therefore, natural gas enjoyed widespread acceptance in the Netherlands, with minimal concerns or opposition: natural gas and its

extraction were regarded "*beyond reproach*" (van Dokkum et al., 2023) and synonymous with "*returns to be proud of and few issues to oppose*" (Van der Steen et al., 2013, p. 4). In the absence of 'issues to oppose', the gas sector was long able to operate in a technocratic and rather depoliticized manner (Correljé, 2018).

This has changed considerably in the last two decades, in which the negative impacts of gas extraction from the Slochteren reserves have become undeniable in Groningen. Substantial extraction of gas has led to reduced pressure in the gas field, causing compaction of its sandstone reservoir, whereupon the consequential activation of faults in this layer induced increasingly frequent and intense earthquakes. The earthquake in Huizinge on August 16, 2012, marked a turning point in public awareness, registering 3.6 on the Richter scale and causing obvious damage to houses and other buildings. Not awaiting the insights of studies on the potential risks and consequences of large-scale gas extraction from the field, the State decided to increase production in 2013, sparking significant societal unrest. Not in the least, perceptions were that involved parties, and most particularly the government and the NAM, lacked care for residents' concerns, interests and needs (Bakema et al., 2018). Procedural choices in the following years, such as the untransparent and lengthy procedures for the repair of damages, the reinforcement of houses, and the compensation of the costs thereof led to years of increasingly hostile protests against further gas extraction in Groningen. In 2018, not quite coincidentally following upon another major earthquake in Zeerijp, the State announced plans to incrementally lower production from the Groningen field towards complete cessation by 2025. While symbolically significant, this decision has not provided full closure to residents in Groningen, who continue to face lingering earthquakes. Moreover, many damage claims remain unresolved, only one-third of the necessary building reinforcements have been completed, and residents report stress and health issues stemming from years of feeling unsafe and unheard by involved parties, particularly the government (Parlementaire enquêtecommissie aardgaswinning Groningen, 2023).

The impact of 'Groningen' on Dutch perceptions of natural gas is significant, yet it is not the sole reason for the now increasingly observable negative evaluation of natural gas in the country. Between 2010 and 2024, more widespread concerns and objections against other natural gas producing activities have emerged.

Amongst others, proposals for unconventional gas activities (i.e., shale gas) in the Netherlands were shut down after safety and health concerns drove considerable local resistance (Cuppen et al., 2019). Plans for small gas fields in sensitive and vulnerable nature areas like the Wadden region were equally met with (local) hostility.

In addition to these issues around domestic production of natural gas, concerns have arisen on the demand side as well. The Russian attack in Ukraine in 2022, and the subsequent European energy crisis of 2022/2023 have spurred awareness of the Dutch excessive dependence on natural gas. The fact that substantial amounts of natural gas must now be purchased elsewhere, at high prices and at least partially from countries with non-western values, principles and alliances, is viewed particularly negatively. Energy security and affordability have gained significant political and social attention as these aspects no longer seem self-evident (TenneT, 2022; Nationaal Plan Energiesysteem, 2023). Part of the commitment to greater energy security is reducing dependence on natural gas, including by replacing it with other domestically produced forms of renewable energy and heat.

Last but not least, all this has also coincided with an increasing recognition of the role of fossil fuels in climate change. Narratives portraying natural gas as the cleanest fossil fuel, or even transition fuel, have waned in the public and political discourse (Boot, 2022). Instead, the growing consensus seems to be that natural gas is a polluting fossil fuel that needs to be phased out as soon as possible (Correljé, 2018). All these dynamics highlight that a reshuffling is taking place in thinking about *which public values* ought to be prioritized in gas policy in the Netherlands, as well as *how*, with different energy sources, technologies and (institutional) systems potentially playing a role. This reshuffling is ongoing – though it safe to say that those with a preference for reducing the role of natural gas in the Dutch energy system have gained a foothold.

1.3.2 Opening up for Paris, Groningen, and Ukraine

For the sake of 'Paris, Groningen, and Ukraine'[7], reducing natural gas consumption has become one of the spearheads of Dutch energy transition policy (Nationaal Plan Energiesysteem, 2023). In 2023, the Dutch government formally committed to "*minimize the use of fossil carbon carriers, such as natural gas and oil towards 2050, and explore what it takes to become a fossil-free society*" as well as to "*a responsible phasing out of fossil fuel chains*" (Nationaal Plan Energiesysteem, 2023, p. 32). This all marks a significant shift from previous policy. The 2013 Energy Accord, for example, focused primarily on increasing renewable energy capacity and not so much on decarbonisation (Boot, 2022). And while the 2019 Climate Agreement quite prominently emphasized decarbonisation, as a climate related ambition document it also stood out for not systematically tackling the issue of phasing out fossil fuels[8]. Quite telling, for example, was that targets for reducing the use of fossil fuels in industry, agriculture and horticulture remained implicit at best, even though the Agreement aimed for full carbon-neutrality in 2050 (Boot, 2022). In essence, this has meant that some leeway and flexibility remained, not only in terms of the timeline of carbon reductions in these sectors, but also in terms of the continued use of fossil fuels, for example in combination with CCC(US), a process in which $C0_2$ is captured during combustion, possibly used and otherwise stored in underground caverns and reservoirs.

The future for (natural) gas in the Netherlands has effectively been challenged and opened up by all these developments and course changes. A multitude of actors are now bringing in new expectations of, among other things, how long the Netherlands will continue to need (large amounts of) natural gas, how it should organise the procurement of this natural gas and from who it should be bought, which alternatives for natural gas should be adopted in what sort of functionalities, and what should happen in the future with the extensive and still valuable Dutch

[7] This is a variation on one of the frequently heard slogans in the public debate around 2018, *"for Groningen and the climate!",* with which protestors against continued gas extraction promoted the phasing out of natural gas extraction in the Netherlands.
[8] The Climate Agreement did set goals for phasing out natural gas in electricity generation and, most prominently, in the built environment.

natural gas assets and infrastructures. Different ideas have arisen regarding the kinds of alternatives that can viably, and cost efficiently, replace natural gas in different functionalities. This is particularly true for sustainable gases. There is a broad estimate of how much of the current gas users can shift to electricity for heating purposes, and how many may still require some form of 'molecules', for example in the form of green or blue hydrogen, green gas/biogas, or other synthetic gases. The availability of these clean gases for the Netherlands remains uncertain, however, and hinges upon the Dutch ability to develop and expand import capacity for these new energy carriers as well as on its own domestic production capabilities for these gases (Boot, 2022; Arkhipov-Goyal, et al., 2023). The pace at which natural gas usage can be reduced also remains the subject of diverging expectations. While the use of natural gas in both the built environment and electricity production may be significantly decreased by 2040, this does not seem to be the case for industrial use. Moreover, phasing out natural gas must align with introducing low-to-no-carbon energy alternatives to ensure a balance between energy supply and demand, also because these alternatives may need to rely on the same infrastructures. For instance, there is potential for re-using (offshore) gas fields and pipes for transporting and storing CO_2 or hydrogen, but this requires much coordination over time and continued maintenance of these assets despite their anticipated decreased use for natural gas transport in the coming years.

Summarizing, current day governance of gas & gas infrastructure in the Dutch energy transition is characterised by uncertainty and complexity. Not only are there many technological and economic (im-)possibilities to consider, but there are also normatively diverse standpoints on gas, social conflicts and (geo)political dynamics that complicate decision making. It is in this context of uncertainty, conflict, and plurality that incumbent expectations have become challenged. New expectations have arisen, forming new waves in the *sea of expectations* in governance. How governance will deal with these waves – and the underlying power struggles, conflicts of interests, and legitimacy concerns for which they are indicative – will determine the role of gases and gas infrastructures in the Dutch energy transition. That is precisely why this governance context is extremely interesting for my research – and also, of course, why this research holds much practical relevance for governance actors navigating this governance context.

1.4 Research design

1.4.1 Research questions and methods

The aim of my research is to explain how imagined publics are created in legitimation of (webs of) expectations in governance of gas & gas infrastructure in the Dutch energy transition. The main research question is:

How are imagined publics coproduced with transition expectations in governance of gas & gas infrastructures in the Dutch energy transition, and what consequences does this have for the legitimacy of this transition?

This question is answered in five parts, each led by its own sub-question[9].

The first sub-question is, *'How to conceptualise legitimacy of transition expectations?'***.** This question is addressed by contemplating and synthesizing relevant theoretical insights on expectations, legitimacy and legitimation, imagined publics, and coproduction.

Imagined publics are front and centre in the resultant conceptualisation of the legitimacy of transition expectations. In the second and third sub-questions, which are of an empirical nature, I therefore focus on understanding how imagined publics are (co-)produced in governance of gas & gas infrastructure in the Netherlands.

The second sub-question is, **'***What are the diverse imagined publics in governance of the Dutch heat transition*?'.[10] To gain a better and empirically grounded

[9] Author contributions were similar for all research parts, and were as follows T.S.G.H. Rodhouse: Conceptualization, Methodology, Investigation, Analysis, Data curation, Software, Writing – original draft, Writing – review & editing. E.H.W.J. Cuppen: Funding acquisition, Project administration, Supervision, Conceptualization, Validation, Writing – review & editing. A.F. Correljé: Funding acquisition, Supervision, Writing – review & editing, Validation. U. Pesch: Supervision, Writing – review & editing, Validation.

[10] The Dutch heat transition concerns the introduction of low-carbon heat systems in Dutch heat provision, primarily in the built environment and industry, with the aim to incrementally reduce natural gas use towards (near-)zero in 2050.

understanding of the diversity of publics imagined in governance, I apply Q methodology. Q methodology is often used to measure shared subjective perspectives, not in the least in governance settings. In a Q interview, interviewees are asked to sort an exhaustive set of statements on a particular topic (e.g., assumptions on publics in the heat transition) relative to each other, based on their own underlying logics, experiences, sentiments, and ways of seeing. The result is a Q sort: a sorted set of statements that can be statistically compared with the Q sorts of other participants. Factor analysis results in meta-perspectives of imagined publics that are shared by groups of governance actors in the Dutch heat transition. In this study, I find five separate imaginaries. Interestingly, rather exploratively, I also find that these imaginaries are coproduced with expectations for different roles and responsibilities in transitions.

In the next part of research, I more explicitly aim to understand how the coproduction of imagined publics and expectations takes place. I look at how imagined publics are coproduced with technological, organisational, and socio-economic transition expectations in hydrogen visions. The third research question is, *'How are imagined publics coproduced in and with visions for the Dutch hydrogen transition, and with what consequences?*'.[11]

By doing a qualitative content analysis of hydrogen vision documents for the Netherlands, I identify how publics are presented (and sometimes absented) in envisioned hydrogen production, transport, and use configurations to legitimize techno-organisational solutions. The extent to which this kind of legitimation will be successful depends on whether imagined publics in these visions are (perceived as) recognisable and just, not in the least by real-life publics. In other words, for the legitimacy of visions of future energy systems, it is essential that such visions are aligned with commonly accepted moral and ethical standards, and

[11] The Dutch hydrogen transition is largely driven by the decision to significantly reduce natural gas use towards 2050 in the Netherlands. It primarily revolves around the replacement of natural gas in industrial processes with hydrogen, while other still more uncertain hydrogen applications in transport, electricity provision and the built environment are also explored. Hydrogen adoption may facilitate the reuse of parts of the extensive Dutch gas transport infrastructure.

fairly incorporate the interests, values, and identities of publics[12]. That is why I explicitly explore the potential consequences of imagined publics in hydrogen visions in terms of justice in this research step.

One of the conclusions of this research step is that governance of the Dutch hydrogen transition seems rather closed down (Stirling, 2008), with only a limited group of actors having the opportunity to give shape to (publics and justice understandings in) hydrogen visions. This seems to result in a set of rather homogenous hydrogen visions, in which a limited number of publics is stereotypically misrepresented or not represented at all. This has serious justice consequences. As an effect, it is far from unequivocal that the performance of current hydrogen visions will ultimately contribute to more fair and equitable energy systems.

This conclusion raises important questions for the legitimacy of expectations in governance of transitions too. Governance seems almost unaware of justice issues in the future hydrogen transition, seems unreflexively engaged with the narrow construction of public identities in this future, and lastly, seems quite unresponsive to changing societal dynamics, expectations, and values. Hence, if unaddressed, the hydrogen transition faces serious legitimacy issues.

How can we open up governance to avoid such narrow webs of expectations in which publics and their interests are misrepresented or not represented at all? How can governance actors be more open for, guided by, and responsive to diverse and dynamic imaginations of publics and their interests? In short, how can governance actors increase the legitimacy of governance of expectations? All these questions draw attention to the (design of) governance of transition expectations.

To gain a richer understanding of the type of legitimacy issues that are at play in the governance of expectations, the latter two empirical research parts focus on the

[12] In this dissertation, I align with scholars who consider justice prerequisite for legitimacy (see, for example Rawls, 2009). In this tradition, societies are seen to self-organise, amongst others by installing and accepting authority of governments, because they strive for more just and fair societies. Legitimacy is then about the appropriateness and effectiveness of the actors, processes and objects applied to achieve more just and fair societies.

interactions, conflicts and dilemmas that emerge between diverse (webs of) transition expectations in transition governance. In the next research part I investigate how expectations evolve, interact, and conflict over time in co-creative project governance. The fourth research question is: '*How do expectations of societal value co-creation*[13] *evolve and become performed in co-creative gas asset redevelopment?*'.

To capture the dynamic evolution of expectational conflicts in co-creative project development, I set up a longitudinal case study research in which one case is studied in great detail over a longer period of time. The case in question is GZI Next, a gas infrastructure redevelopment project that is experimental both because it aims to develop new and innovative asset reuse models and because it pilots with regional co-creation. Methods applied to identify expectational conflicts over time are observations, interviews, and document analysis.

The results of the case show that co-creative redevelopment is characterised by the continuous co-evolution of multiple and conflicting expectations of the project, and that these expectations are closely tied to the developers' imagined publics. The project developers make conscious attempts to integrate several of these expectations to enhance legitimacy of the project. That is, they purposefully want to be open to the possibility that redevelopment can and should create value for different publics in diverse ways. The developers do this, among other things, by consciously inviting new parties with new expectations to co-creative redevelopment. Applaudable as these attempts at openness are, my observation is that narrow expectations of publics and their interests often remain dominant at critical moments in project development because governance of expectational conflicts is insufficiently thought through.

Co-creative asset redevelopment is at the same time an example of an experiment in governance and of the performance of expectations on how energy transitions

[13] Societal value co-creation entails a collaborative process in which two or more change agents with different backgrounds and interests exchange competences, perspectives, knowledge, and other resources with the aim of developing new innovative solutions – technological, social, organisational, or otherwise – with societal relevance (Rodhouse et al., 2023).

can be legitimately organised in traditional fossil-industrial regions. In other words, it is a trial-and-error attempt at inclusive, societally meaningful, and legitimate re-use, in which inclusion, societal relevance and legitimacy are all subject to different expectations of the co-creators and surrounding parties. As such, it is not surprising that co-creators run into legitimacy challenges while redeveloping.

In the fourth and final empirical sub-study in this dissertation I more explicitly focus on these challenges. That is, whereas the third paper focused on (managing) expectational conflicts as they emerge in project governance, in this final paper I more specifically zoom in on the challenges that regional governments encounter when performing co-creative redevelopment. Possibly more severely than other parties involved, governments are seen to be responsible for legitimacy in and of co-creative redevelopment, not in the least by ensuring that such projects also deliver clear and tangible societal value in addition to merely commercial value for the business developers. As such, these governments are more often attuned to the social demands, expectations, and preconditions for the legitimacy of such projects than other co-creators. Moreover, they also must deal with the ways in which co-creative redevelopment projects with fossil industrial parties interact with existing political legitimacies.

The fifth research question is thus: *'what challenges arise for regional governments when engaging in co-creative gas infrastructure redevelopment projects, and how to address these challenges to enhance the legitimacy of such projects?'.* In answering this sub-question, I use the data and insights gathered in the same case as elaborated under sub-question 4.

1.4.2 Reflections on research design

The above-described research approach is based on a holistic understanding of webs of expectations in transition governance. This involves studying webs of expectations as systems with unique qualities, interrelations, underlying rationalities, and development patterns. It also means that I aim to make sense of webs of expectations as inherent part of the transition settings in which they arise, interact with other webs of expectations, and evolve, and to interpret expectations based on the function and influence that they seem to have in that setting (Diesing,1971/2017). Quintessential is that such a research approach is aimed at

understanding expectations *from within* their context (Diesing, 1971/2017; Martin, 2018).

The research orientation towards holism has affected my research design in three ways. Firstly, I have chosen an inductive approach to data collection. Secondly, I have used methodologies that help to identify, capture, and describe (diverse) situated and subjective understandings of a particular topic. And thirdly, I have strategically selected three different system parts within the wider system of the governance on gas & gas infrastructure in the Dutch energy transition to compare and contrast relevant themes and patterns in how publics are imagined in the legitimation of transition expectations.

Firstly, I have looked at the imagined publics that are held by *governance actors in the heat transition* (sub-question 2, answered in Chapter 3). Secondly, I have explored coproduction of publics with transition expectations *in formalised visions for the Dutch hydrogen transition* (sub-question 3, answered in Chapter 4). And lastly, I have investigated how coproduction of expectations takes places in interactive legitimation of *co-creative gas asset redevelopment projects* (sub-questions 4 and 5, answered in Chapters 5 and 6). With this selection of these system parts I have been able to collect data for three different governance settings. Combined, these studies also cover different governance stages (i.e., imagination vs. implementation, anticipation vs. performance), various levels (i.e., national vs. regional), and different transition foci (heat, hydrogen, assets and infrastructure redevelopment) for expectations in governance of gas & gas infrastructure in the Dutch energy transition. All in all, this research design enables me to study how the legitimacy of expectations is constructed on the basis of imagined publics in transition governance in a very detailed and situated fashion, as well as to identify patterns that seem to apply across settings, levels and foci and that could thus form the basis of more generic theory development about the legitimacy of (transition) expectations.

Figure 1 shows the overall research design.

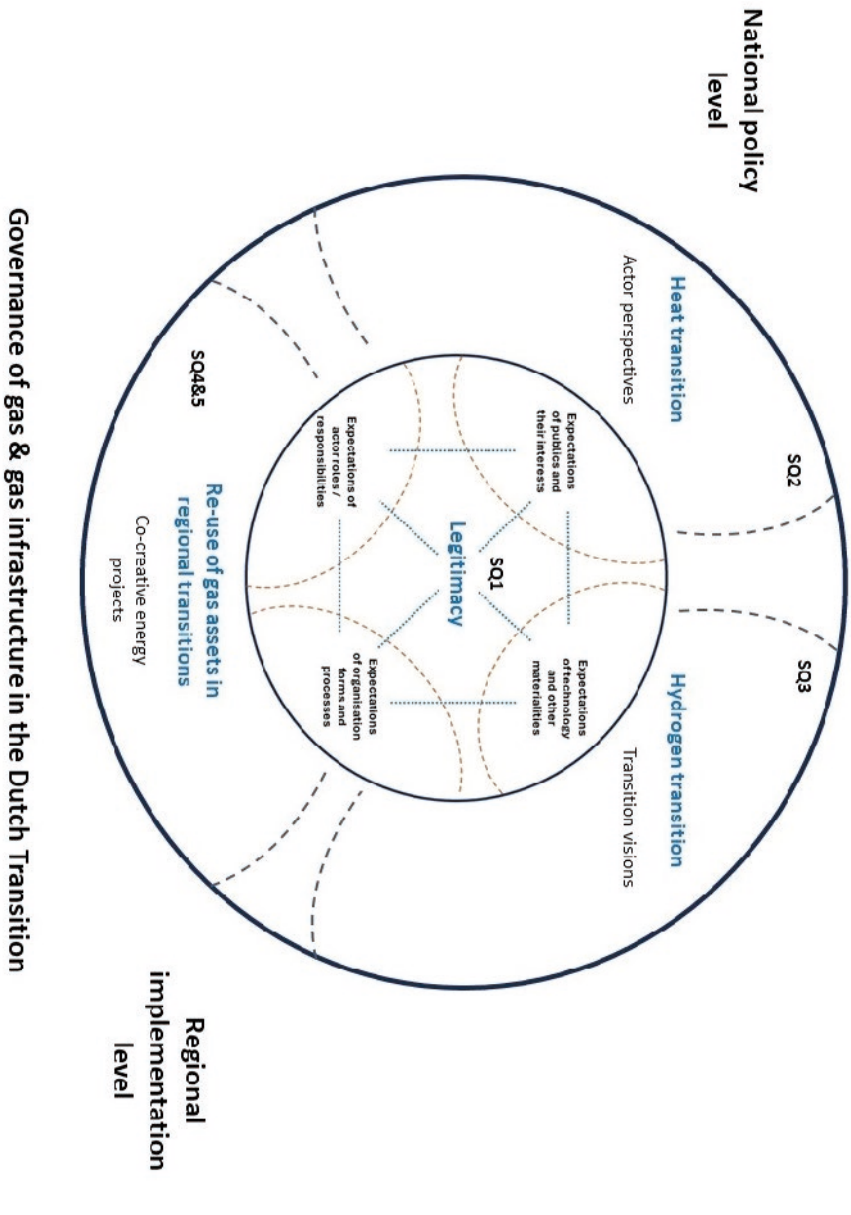


Figure 1. Research design

1.5 Dissertation outline

Research question	System (part)	Chapter	Methods
SQ1: How to conceptualise the legitimacy of transition expectations?	Webs of expectations	2	Literature study
SQ2: What are the diverse imagined publics in governance of the Dutch heat transition?	Heat transition / Actors	3	Q methodology
SQ3: How are imagined publics coproduced in and with visions for the Dutch hydrogen transition, and to what effect?	Hydrogen transition / Visions	4	Qualitative Content Analysis
SQ4: How do expectations of societal value co-creation evolve and become performed in co-creative gas asset redevelopment?	Fossil-industrial regions / Co-creative asset redevelopment projects	5	Single case study
SQ5: What challenges arise for regional governments when engaging in co-creative gas infrastructure redevelopment projects, and how to address these challenges to enhance the legitimacy of such projects?	Fossil-industrial regions / Co-creative asset redevelopment projects	6	Single case study
MRQ: How are imagined publics coproduced with transition expectations in governance of gas & gas infrastructures in the Dutch energy transition, and what consequences does this have for the legitimacy of is transition?	Webs of expectations in transition governance	7	Conclusions

CHAPTER 2

Theoretical perspective on Publics [re/mis/not] presented

Abstract

In this chapter, I develop a conceptual understanding of the legitimacy of transition expectations. Synthesizing literature from different disciplinary fields and theoretical understandings, I elaborate on the nature of transition expectations and establish several reasons why such expectations require legitimacy.

Since transition expectations require legitimacy, governance actors must engage in legitimation. In this chapter, I will argue that such legitimation necessarily involves coproducing *imagined publics* in and around expectations – that is, in their efforts to establish a claim on legitimacy, governance actors will have to imagine multiple and relational publics and have to justify the promised and intended effects of their expectations on these publics. I introduce the concepts of *degrees and publicness* and *imagined public identities* to clarify how governance actors establish (relationships between) imagined publics and their interests in efforts to legitimize the technological, societal, and organisational solutions ingrained in transition expectations.

2. Theoretical perspective on Publics [re/mis/not] presented

2.1 Expectations in transitions

For six years, I studied expectations in energy transition governance. As I have noticed when trying to explain my research interests during those years, expectations are a somewhat intangible and fuzzy research topic for many, including practitioners, policymakers, project developers and others active in transitions. While not often said aloud, I frequently sensed that expectations were hardly seen as a clear and justifiable research topic, especially considering the often-major barriers, dilemmas, and challenges that these actors faced while trying to execute the transition. The issue seemed to lie as much with the ambiguous nature of expectations – "*what is it exactly, that you study?"* – as in the often not directly perceived practical relevance of the study of expectations for transition governance – *"and why would you study that?"*.

In this chapter, I will attempt to address the puzzlement with my research interest. I will elaborate on the nature of expectations in more detail and reflect on their functionality in transition governance. I will discuss two critical functions performed by expectations in governance: transition expectations assist information processing and sensemaking; and, these expectations are performative. Through these functions, expectations prove not only highly influential for how transitions unfold, but they also trigger a political dynamic in which various actors attempt to establish symbolic dominance of (their own) expectations. Both because of these political dynamics and because expectations promise a major impact on publics and their ability to safeguard what they find important, is why I will argue that these expectations require (public) legitimacy. Subsequently, I will elaborate on the ways in which governance actors try to establish the legitimacy of their expectations. Legitimacy of expectations becomes claimed through the coproduction of multiple and relational *imagined publics* with expectations.

2.1.1 The ambiguous nature of expectations in transition governance

On the surface, defining expectations is not that hard. For example, one of the most cited articles on the nature, relevance, and development of (technological) expectations, written by Mads Borup, Nik Brown, Kornelia Konrad and Harro van Lente rather straightforwardly defines expectations *"as the state of looking forward",* or as *"pre-existing states"* of future situations (Borup et al., 2006, p. 286). The relative straightforwardness of this definition is deceptive, however. This becomes clear when one starts to consider the many things that would fall within this definition and thus would be conceivable as 'expectation' – even though they would all be vastly different things. Firstly, we could differentiate between private expectations, held by individuals and not necessarily communicated with others, and collective expectations, communicated and shared amongst groups of actors in science, technology, commercial and policy circles (Berkhout, 2006, p. 301). Private and collective expectations are different in terms of their relevance for and impact on decision making, and the investigation of those diverse types of expectations would require different methods as well. Similar caveats arise when considering other differences in expectations. Amongst others, expectations:

"May be positive (promises) and negative, and will vary in level, content, and modality. The level of expectations may range from encompassing, abstract sketches of the future (macro) to detailed elements (micro). In terms of content, expectations may concern technical, commercial or societal aspects, and probably be a mix of these. And the modalities may range from taken for granted statements that do not meet any resistance, to meticulously organised arguments to counteract foreseen rebuttals" (Van Lente, 2012, pp. 772-773).

Especially in inherently future-oriented processes such as energy transition governance, it would thus seem that all that is discussed is expectational, and all that is produced – technologies, institutions, behaviours, and so forth – is inscribed with these expectations (Berkhout, 2006; Bijker & Law, 1994). Since almost everything in energy transition governance can be characterised as 'expectational', it is hardly surprising that the policymakers, project developers, and other practitioners that I spoke to over the years struggled to immediately grasp my research on expectations in transitions.

Indeed, expectations are ambiguous due to their sheer diversity. This ambiguity is accepted in transition governance. Governance actors generally do not attempt to unravel and understand the (webs of) expectations that underlie their preferences and decisions on the design of technology and infrastructure, laws and legislations, and governance and organisation in transitions. Instead, webs of material, institutional and societal expectations, also known as visions, futures or socio-technical imaginaries (Berkhout, 2006; Jasanoff, 2015; Ballo, 2015), are rather tactically treated as self-evident and rarely consciously reflected upon. Governance takes place within these webs of coproduced expectations, which become a seamless and inseparable part of decision making processes.

That is all the more reason to expose these (webs of) expectations though. Not in the least, because the expectations so automatically ingrained in critical decisions rarely turn out to be accurate predictors of future states. Most of us will recognise this from our own personal experience with our mostly private expectations. More often than not do expectations lead us to disappointment. The realisation that most expectations fail us is supported by scientific literature (Brown & Michael, 2003; Borup et al., 2006; Pinquart et al., 2021). Expectations, especially those that pertain to innovation for change, can be desperately optimistic, *"hyperbolic"* and full of inflated promise (Borup et al., 2006, p. 286). For example, estimates of the potential of new energy technologies and carriers to contribute to the cost-effective decarbonisation of energy provision are often overly positive (Kriechbaum et al., 2021). A well-known example in this regard is hydrogen and hydrogen technology like fuel cells and electrolysers, the development of which has been characterised by various 'hype cycles' over the last few decades. In these cycles, extremely hopeful expectations were repeatedly discredited by disappointing technological results and a lack of economic competitiveness with other energy technologies (Bakker, 2010; Alkemade & Suurs, 2012; Budde, 2015). Considering these past hype cycles, it is not surprising that the most recent upsurge in political commitments to hydrogen, and the accompanying exponential growth in hydrogen investments, is viewed with some scepticism. Is the hydrogen path that the Netherlands, Germany, and the United Kingdom, amongst others, are now so excitedly on truly the road to a decarbonised and secure energy system? Or, is it yet another (quite expensive) ticket to disillusionment? While it is too early to draw any meaningful conclusions, so far it does seem that the fruits of all the commitments,

funds and efforts fed into the hydrogen dream seem less rich and sweet as hoped. The end of 2023/start of 2024 saw yet another drop in the stock value of hydrogen-related companies, not in the least because the production side remains considerably more expensive than hoped. Not completely unrelated, also the user side continues to lag behind, seemingly far from eager to adopt hydrogen and hydrogen technology in light of current (geo)economic and political uncertainty (het Financieele Dagblad, 2024; Arkhipov-Goyal, et al., 2023).

Expectations also fail us by being overly pessimistic. This is regularly the case when expectations concern other actors in transition governance. A great example is how oil and gas companies are often perceived as unethical organisations whose main concern amidst a massive and unprecedented climate crisis seems to be the maximisation of profits from producing and selling polluting fossil fuels (Hofmeister, 2011). When given the opportunity, these oil and gas companies will try and sabotage any real efforts at climate change mitigation, or so is the expectation. Oil, gas, and other fossil energy companies are seen as part of the problem and are not expected to also be part of the solution. Viewed through the pejorative lens of these expectations, fossil energy companies are typically deemed unfit to contribute to energy transitions. Pessimistic expectations can precipitate demands for exclusion. Illustrative is the recent exclusionary appeal made by Dutch climate activists at the address of Dutch universities, who were urged to sever their affiliations with the fossil industry. This would effectively expel oil, gas, and other fossil energy companies from the scientific research community.

This process, set in motion in and through pessimistic expectations, has also been referred to as the "*vilification of oil and other energy companies*" (Hofmeister, 2011, p. 5) or, from my personal experience, *"shell-shaming"*. Characterising and excluding fossil industrial companies as villains does little to further the search for realistic and feasible renewable energy solutions. Indeed, while it is inarguable that many fossil energy companies have done major wrongs in the (recent) past, it is also undeniable that these companies are the owners of invaluable knowledge, energy assets and facilities needed for a successful transition. Moreover, at least some of these companies have diversified their activities and are now the biggest private investors in renewable energy, amongst others in the Netherlands (SEO Economisch Onderzoek, 2022). That does not excuse oil, gas, and energy

companies from their past and sometimes current wrongs. Nor does it imply that all reservations about the motives and strategies of these companies should be discarded. It does, however, highlight that pessimistic imaginaries are too narrow and unnuanced, that oil, gas and energy companies cannot all be tarred with the same brush, and that the categorical exclusion of all these companies from the governance of (science in) transitions could have very negative consequences for how these transitions can unfold.

Another well-known and well-studied illustration of exaggeratedly negative expectations of 'others' comes from the realm of project development and is captured by the term NIMBY: Not in My Backyard. This term is used to describe outspoken community members who, while generally in favour of renewable energy, are rejecting and resisting proposed renewable energy projects in their living environment (Wolsink, 2006). The term is pejorative in that it tends to be used to reduce these community members to little more than "*irrational, selfish and obstructive individuals who fear change and stand in the way of essential developments*" and as "*parochial individuals who place the protection of their individual interests above the common good*" (Burningham et al., 2015, p. 247). A large body of work, built up over decades, has concluded that expecting NIMBYs in project development is an example of counterproductive and inaccurate anticipation (Wolsink, 2000, 2006; Bell et al., 2013). The empirical reality is that only few community members would self-identify with NIMBYism. Rather, community members seem driven to engage with renewable energy projects in their living environment by their intention to safeguard or realise a wide range of political, social and environmental values, not in the least those directly relating to their sense of place, technology, democracy and community (Devine-Wright, 2011; Burningham et al. , 2015). Moreover, the attitudes, decisions and behaviours of policymakers, planners, and project developers have proven equally relevant in explaining how societal engagement with energy projects unfolds, particularly with regard to how these actors choose to involve and include community members in critical decisions in siting and technological design (Van de Grift & Cuppen, 2022).

As we now have more sophisticated, empirically grounded, and reflexive explanations of community reactions to renewable energy projects, one would expect the rapid abandonment of incorrect expectations underlying NIMBYism.

Unfortunately – yet interestingly – this does not always seem to be happening. Over time, NIMBY expectations have proven particularly hard to debunk and remain persistent in the mindsets of at least some policy makers, planners, project developers, and even scientists (Wolsink, 2012; Heidenreich, 2018; Rodhouse et al., 2021).

Why do certain expectations exhibit exceptional durability, even in the face of contradictory evidence, while others are rather easily discredited and altered or replaced by (better) alternatives? For instance, what accounts for the persistence of NIMBY expectations? How is it that there continues to be a group of policy makers, planners, project developers, and scientists who do not appear *a priori* receptive to diversity and nuance in local views on potential new wind turbine parks, high-voltage lines, or bio-digestion plants, but instead, seems to prepare for the worst before even communicating with communities on plans and intentions?

2.1.2 The functionality of expectations

So, why do certain expectations exhibit exceptional durability? The answer is relatively simple. These expectations are functional. Expectations – even those that are uniquely incorrect[14] – can perform a large number of functions in governance and organisation, and as long as they perform those functions well, there will be an unconscious preference or conscious effort to keep them in place. Two functions seem particularly relevant to the durability of expectations: firstly, expectations facilitate and simplify sensemaking and secondly, expectations are performative.

2.1.2.1 Sensemaking as a function of expectations

Expectations are functional in information processing and sensemaking (Berkhout, 2006; Weick et al., 2005). Webs of expectations, such as visions, futures and imaginaries are, as it were, spun between an outside world in which things happen and in which information is produced, and a shared inside world in which

[14] John Maynard Keynes once stated that expectations can never be "*uniquely correct*" because existing knowledge is simply insufficient to assess and mathematically calculate all risks and factors involved (Keynes, 1964, p. 147). I consider uniquely incorrect expectations those that we can assess as inaccurate based on existing knowledge.

information is interpreted and (re)actions are formulated by recipients of information – in this case, governance actors in energy transitions. The continuous stream of information produced in the outside world must travel through these webs of expectations to reach its recipients. Not all information will pass through; some information will get caught in the sticky threads of the web. That information, considered irrelevant and inapplicable, seen as repetitive and more of the same (Keynes, 1964) or, rather contrastingly, evaluated as atypical, unique, and once-in-a-lifetime (Schütz, 1962), is of little consequence to prevalent expectations and is thus blocked out. In this way, webs of expectations work as filters that reduce the continuous flow of information from the outside world. In that sense, webs of expectations function quite like familiar concepts such as sensemaking devices (Wright, 2005; Weick et al., 2005), (interpretive) frames (Shön & Rein, 1994; Creed et al., 2002; Beckert, 2016), frames of reference (Schütz, 1962), schemata (Berkhout, 2006), perspectives (Cuppen, 2009; Ligtvoet, et al., 2016) or social representations (Howarth, 2006; Batel et al., 2016). While this is critical – after all, humans are by no means capable of anticipating all that could possibly happen – it is also dangerous. One could say *a way of expecting is a way of not expecting*[15]. Expectations are able to filter out the exact information that could lead to their own disconfirmation and replacement by more accurate anticipations, and this leaves actors open and vulnerable to unexpected and not necessarily positive disturbances (Bénabou & Tirole, 2016).

Not all webs of expectations are equally strong in maintaining biases by filtering out critical information. One of the factors that plays a role in this regard is the setting in which expectations circulate and become shared. Indeed, some governance settings seem more inducive of reassessment and reinterpretation of expectations than others. Settings in which expectations display more abrupt expectational dynamics are those that stimulate or even demand the continuous production of novel data, knowledge, and experiences. Hence, expectations that circulate in the vibrant world of innovation are comparatively quick to be discredited and replaced – though not unlikely to resurge again in slightly different forms with new insights

[15] Based on Gianfranco Poggi, *"a way of seeing is a way of not seeing"* (Poggi, 1965, p. 284).

and technological possibilities, changed economic circumstances, more dire societal urgency, or a combination of the above (Bakker, 2010; Kriechbaum, Posch, & Hauswiesner, 2021). In contrast, in settings in which new information is rare and the involvement of new actors with possibly different demands and understandings even rarer, expectations tend to be much harder to debunk. These are often highly institutionalized and strictly regulated settings, for example, governance settings that concern decision making on established and well-proven energy technologies and infrastructures (Sovacool, et al., 2020).

Of further relevance here is who produces what sort of information in and outside of governance. Indeed, information recipients have all sorts of expectations and ideas about how and by whom relevant information is produced. These expectations help to distinguish between authoritative sources such as universities, applied research institutes, consultants, and industry peers, and less authoritative sources using less replicable and rigorous, but often more situated methods, such as concerned citizens. The first type of information is often deemed reliable while the second type should be taken with a pinch of salt, or so is the perception (Wynne, 2006; Wynne, 2016). This kind of distinction between sources of information is another reduction mechanism that facilitates effective sensemaking. Yet, it heightens the risk that information that could debunk incorrect expectations is filtered out. Furthermore, distinguishing between, and choosing to (not) include particular knowledge sources also relates to questions of power and exclusion and thus highlights that the filtering function of expectations in sensemaking is intrinsically political (Stirling, 2008; Wynne, 2016).

In short, only information that is seemingly authoritative and pertinent to held expectations passes through the web and reaches its recipients. When passing through webs of expectations, information is transformed into meaning. Expectations, themselves rooted in prior knowledge and experiences, give meaning to previously meaningless and multi-interpretable information. It is thus through webs of expectations that information is interpreted, made sense of, given its meaning, and categorised as either aligning with, or deviating from prevalent expectations. It is also in this stage that information is either problematised or not. That is, webs of expectations help assess whether what is happening does in any way influence the likelihood or even the desirability of realising envisioned futures.

It is in this element of anticipation that webs of expectations differ from the earlier mentioned concepts of perspectives and frames, among others.

Webs of expectations are largely shared resources, available to those who have access to the (interactions in) governance settings in which they are formulated and developed. Although each governance actor will have his or her own web of expectations, this web will only partially consist of his or her private expectations. Many of the threads woven into these webs will be made up of shared expectations that connect recipients with each other. Thus, sensemaking through webs of expectations is always and inevitably a shared exercise (Berkhout, 2006) and consequently, will also be interactive (Weick et al., 2005).

2.1.2.2 Performativity as a function of expectations

So far, I have discussed how the role and function of expectations in sensemaking contributes to their durability. Expectations have other functionalities too that help understand their durability, the most relevant is their performativity (Butler, 1993; Law & Singleton, 2000; Callon, 2007).

Expectations are not *what ifs* (Van Lente, 2012). They involve a strong belief that things can, and even will, come about in a particular way and order. Such strong beliefs instil *"confidence and provokes actors to act (...) as if the future were going to develop in the way they assume it will, and as if an object had the qualities symbolically ascribed to it"* (Beckert, 2016, pp. 9-10). In other words, expectations are *as ifs* that help actors take action directed at a narrowly expected outcome. Such actions include, amongst many others, investing in research, development and innovation (of renewable or carbon-neutral technologies); starting new partnerships; drawing up new plans, strategies and policies (for energy transitions); reorienting resources from conventional (fossil) business activities towards new and emerging (renewable) markets and products; and participating in co-creative exercises or information evenings about proposed renewable energy projects (Borup et al., 2006; Raven et al., 2009).

These activities, while diverse, are all examples of *mobilised action*. Inarguably, these are also all examples of *directed and coordinated action*. Expectations induce actors to collaboratively carry out and align actions with the aim to affect the future, in which they often succeed, albeit not necessarily in the way they had

hoped for (Beckert, 2016). This is referred to as the performativity of expectations (Law & Singleton, 2000; Callon, 2007; Jasanoff, 2015).

Only expectations that make sense to us will prompt us to action. Sensemaking precedes performativity just as much as the performance of expectations produces information and subsequently informs sensemaking. This relationship between sensemaking and performativity through expectations, where sensemaking precedes as well as follows the performance of expectations, is eloquently described by Michel Callon, amongst others in his well-known reflections on the modern-day economy.

" This world (...) lives its life; the numerous forces comprising and organizing it make it evolve. One day comes economics. Concretely: one day come Aristotle and Xenophon. Exploiting accumulated experience, existing discourses, and notions patiently built up, they reveal (...) in this very real but not yet economized world, the main themes, discontinuities, gradients of resistance, divides, and interstices that they play with and compose. They think they see the forms of what they call oikonomia. They build statements, give examples, draw conclusions, and make recommendations. The quality of this work of explicitation is measured by its capacity to convince, that is, to define the right themes and to play with them in the right way. That's the stroke of genius. The explicitation has been successful. The economy starts to exist as a distinct object, because Aristotle and Xenophon knew how to divide up, reassemble, and cluster the plasma surrounding them. Of course, there were forces, entities, organized matter from which the work of economics, carried out intelligently and pragmatically, was able to produce entities. But the economy is born as an economy, by the grace of these well-adjusted discourses. Afterwards, it's another story, that of performation: the object and its discourse are bound together for better or for worse. Their histories become indissoluble" (Callon, 2009, pp. 20-21). [16]

[16] Callon himself felt that the concept of performativity had been so frequently misunderstood and even misused that he decided to abandon it altogether and reintroduce the idea under a new term called 'performation'. The concept coined by Callon to describe

More compactly, one could say that:

"sensemaking is first and foremost about the question: How does something come to be an event (...)? Second, sensemaking is about the question: What does an event mean? In the context of everyday life, when people confront something unintelligible and ask, 'what's the story here?' their question has the force of bringing an event into existence. When people then ask 'now what should I do?' this added question has the force of bringing meaning into existence, meaning that they hope is stable enough for them to act into the future, continue to act, and to have the sense that they remain in touch with the continuing flow of experience." (Weick et al., 2005, p. 410).

Credible meanings are a prerequisite and consequence of performativity of expectations. Yet, there are also other factors that influence whether expectations become performed. Oomen et al. (2022) identify three additional factors. First is affect - actors take anticipatory actions and perform expectations if these expectations evoke a strong emotional reaction, for example fear or hope (also see the work of Adam & Groves (2011) on emotional relations with the future, Keynes on 'animal spirits' that work to counter paralyzing fear for worst-possible-outcomes (1964), and Bénabou and Tirole (2016) on (affective) motives for subjective cognition). Secondly is culture - actors take anticipatory actions and perform expectations if these expectations align with culturally established and taken for granted meanings, values, ethics and social identities (also see Douglas (1986) on the role of institutions, Taylor (2004) on social imaginaries, Weber on the empathetic imagination (1978a), Berkhout on norms and values in visions (2006), and Rosanvallon on trust in continued legitimacy as an 'invisible institution' (2008)). Lastly, they highlight the role of materiality - actors take anticipatory actions and perform expectations if these expectations include and build on

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a process very much alike sensemaking is 'explicitation' (Callon, 2009). While the terms used in this quote are thus different, Callon refers to the same processes as discussed in this section.

existing capacities of bodies, nature, and technology (see also Urry (2012) on materialities and futures).

We are invested in the expectations that we perform. This applies in two ways. The simple interpretation is that we put money and effort into enacting expectations. If we were to let go of these expectations we would, at least to some extent, have to accept some unrecoverable or sunk costs, a prospect that most of us find difficult to accept (Gowdy, 2008). The more intricate interpretation is that we are emotionally, culturally, and materially invested in (positive) performative expectations. These expectations capture, allure, and seduce us by showing us those facets of ourselves, our nature and technology, and our culture and society that we value and appreciate. Expectations show us all that, not *as is*, but *as if,* meaning, they show us a better[17] and seemingly so attainable, even likely, future reality (Jasanoff, 2015). This is particularly hard to resist or let go off – which is the second reason why expectations can oftentimes prove particularly durable.

For instance, when we examine the web of expectations spun to create and sustain the impression of NIMBY opposition to renewable energy projects, it becomes evident that there are multifaceted expectations underlying and legitimizing the portrayal of community members as irrational and egoïstic protestors. This specific intricate web of expectations encompasses a range of beliefs and anticipations, including some related to the need to combat climate change. It encompasses expectations of project developers who are struggling to implement 'clean' energy technology for the 'good' of society – and with that, also expectations about society and what is presumed good for it. It also consists of expectations of developers operating well within the bounds of the law, yet still encountering persistent hostilities. Last but surely not least, there are expectations about a large majority of the local community that is tolerant of project development but is being silenced by a loud minority who tries to impose their voice and undermine (representative) decision making (Rodhouse et al., 2021). The fact that many of these expectations relate to the project developers' identities, their roles and responsibilities in, and

[17] Or worse, of course, which is equally difficult to ignore.

cultural understandings and aspirations for society seems an important reason why NIMBY frames prove particularly performative and persistent.

Again, not all expectations are equally performative. We are not equally invested in all expectations, nor are we all necessarily invested in the same expectations. Some expectations more accurately build on our existing knowledge and thus seem more credible. Some appeal to our feelings better, or fit better with our perceptions of, for example, desirable technological progress, than others. Some expectations will appeal to more, and more diverse, actors. These will attract more and diverse resources and can become more performative than expectations that only appeal to fewer or more homogenous groups of actors (Berkhout, 2006).

The more expectations become performed, the more they become durable. There are various reasons for this, not in the least, the unwillingness of actors to lose face once certain commitments are made, the inability to change course in rigid and time-sensitive policy and investment processes, and the lock-ins created by institutions, technologies and infrastructures, which can bound the possibilities and impossibilities in transitions for years or even decades to come (Berti & Levidow, 2014; Sovacool, et al., 2020).

In summary, expectations in transitions are durable because they are functional; they do important things in governance. Precisely because expectations are very functional – in other words, *influential* – in energy transitions, it is essential to place them at the centre of analysis. We can only understand why transitions unfold the way they do by investigating how prevalent webs of expectations drive transition governance, by assessing what information is filtered in and out by these webs, and what happens – expectedly and unexpectedly – when these webs of expectations are performed (Beck et al., 2021).

2.2 The legitimacy of expectations

The functionality of expectations in transition governance – not in the least, the fact that such expectations have the rather elusive political ability to filter out information and its sources as well as exclude and foreclose other(s') futures when being performed – also serves as a reason to think about the legitimacy of such

expectations. The often automatic processes through which futures are adopted and performed, and the issues with accountability that arise in and from such processes, carry significant political ramifications. Closely tied to this is the fact that expectations often promise – and perform – a major impact on society and the various publics distinguishable in it. In other words: transition expectations are generally characterised by a high degree of publicness, and therefore, should necessarily acquire a certain level of legitimacy. That is to say that expectations must somehow become democratised despite the rarely fully democratic processes in which they are formed. I will develop this line of argumentation further in the following section.

2.2.1 The publicness of expectations

Energy transition governance is characterised by a large diversity of expectations. Unfortunately, the harsh reality of energy transitions is that there are limited resources and opportunities to realise these. After all, performing expectations is costly. Moreover, actions that may contribute to the realisation of one expectation may very well limit opportunities to realise other expectations, especially when expectations are conflicting.

Expectational plurality results in inevitable trade-offs. Such trade-offs require the relative ordering of expectations based on their perceived importance and desirability, in other words, prioritising and preferring some expectations over others based on what these expectations promise to do for society in terms of, for example, economic growth, affordability, security of supply, procedural and distributive justice, and so forth. Prioritizing expectations in energy transitions is an inherently dynamic, volatile and political process that will generally be characterized by dilemmas, (normative) uncertainties, conflicts and resistance (Cuppen, 2018; Melnyk, 2022; Van Uffelen et al., 2024). After all, prioritizing one (group's) expectation may well result in the abandonment or foreclosure of other (groups') expectations. Proposals for the development of largescale onshore wind turbine parks, for instance, are often justified because of the necessity of carbon emissions reduction in energy provision. The expectation is that an increase in renewable energy can and will reduce dependency on and use of fossil energy sources. Yet, dependent on where they are installed, such onshore wind turbine parks can also have very negative impacts on landscape aesthetics, local

biodiversity, and even people's health. For that reason, some governance actors and (local) communities might prefer different futures for carbon neutrality that build upon different technological and geographic solutions.

Each performative activity in energy transitions is preceded by a – conscious or unconscious, biased or unbiased – comparative assessment and relative ordering of the credibility and desirability of different futures. Precisely because such assessments never lead to universally desirable and uncontested transition solutions, there must be a widely shared belief that they are made to uphold or contribute to a collective or general public interest. For example, despite the anticipated harmful effects, plans and proposals for largescale onshore wind development could still be perceived as legitimate if such parks more meaningfully (promise to) contribute to the aims, goals, values and interests of society at large than alternative expectations (Moore, 2012; Habermas, 1973).

Whether prevailing priorities in and of transition expectations are perceived as legitimate is not necessarily contingent on the substantial qualities of the expectations itself – arguably, such qualities do not even exist outside of their evaluation (Callon, 2021) – but instead seems to be based on the ways in which these expectations become interpreted and prioritised in specific situations, around particular issues, and for different group(s) of people in transitions. In this, the scale, size and identity of the groups of people that seem to have certain interests in an expectation is highly relevant. More accurately I could say that the *degrees of publicness* are critical for believed legitimacy of expectations in transitions (Pesch, 2019).

2.2.2.1 Degrees of publicness

The *degree of publicness* refers to the extent to which certain interests, values, acts, issues, and indeed, expectations, can be characterized as 'public'. There are various ways to understand and define publicness. For instance, some rather influential ideologies like economic liberalism assume the existence of a hard line between the 'public' and 'non-public' or private. 'Public', in this regard, is that what the State and other governmental agencies ought to take care of, while 'private' pertains to the efforts of individuals, primarily in markets (as well as in other

domains of social life) as they freely create (or destroy) and capture (or loose) value for themselves.

Much critique can and is recently raised on this rather narrow – and worryingly performative – understanding of publicness (Bozeman & Johnson, 2015; Fukumoto & Bozeman, 2019). The empirical reality of the current network(ed) society is that public interests are often realised or safeguarded with the help of numerous private parties (Brandsen et al., 2018; Osborne et al., 2022). These private parties are not only increasingly invited to step into the public domain but are also very much expected to do so and, in the process, accept their share of responsibility for the address of grand societal challenges or missions (Hekkert et al., 2020; Isaksen et al., 2022). Moreover, public agencies increasingly participate in business or innovation ecosystems, in which they help co-create private value in addition to realizing their own goals (Mazzucato & Robinson, 2018), not in the least in the context of climate change and energy transitions (Speich & Ulli-Beer, 2023).

Hence, instead of creating and employing a strong dialectical distinction between public and private based entirely on the "*doers of deeds*" (Dewey, 2016, p. 69), scholars across disciplines embrace an alternative approach to identifying matters of public or private concern based on a public-private continuum. In this approach, issues simultaneously have different *degrees of publicness and privateness* (Bozeman & Moulton, 2011; Moore, 2012). Amongst others inspired by John Dewey, it is also increasingly common to consider the people who are positively or negatively affected by the *"deeds"* as characteristic for the degree of publicness (Dewey, 2016). I too will let myself be inspired by John Dewey who explained the essence of privateness and publicness as follows:

"*We take then our point of departure from the objective fact that human acts have consequences upon others, that some of these consequences are perceived, and that their perception leads to subsequent efforts to control action so as to secure some consequences and avoid others. Following this clew, we are led to remark that the consequences are of two kinds, those which affect the persons directly engaged in a transaction and those which affect others beyond those immediately concerned. In this distinction we find the germ of the distinction between the private and the public. (...) When A and B carry on a conversation together the action is a trans-action: both are concerned in it; its results pass, as it were, across*

from one to the other. One or other or both may be helped or harmed thereby. But presumably, the consequences of advantage and injury do not extend beyond A and B; the activity lies between them; it is private. Yet if it is found that the consequences of conversation extend beyond the two directly concerned, that they affect the welfare of many others, the act acquired a public capacity, whether the conversation be carried out by a kind and his prime minister or by Catilina and a fellow conspirator or by merchants planning to monopolize a market" (Dewey, 2016, pp. 66-67).

If the effects of actors' (trans-)actions only affect their own well-being, they can be considered private. However, when these actions have an effect on (groups of) others, they can incrementally be considered more public (Moore, 2012), regardless of whether they were carried out by governments, businesses or other parties, by one actor or by a whole network of actors.

It may be obvious that transition expectations are often characterised by *a really or potentially* high degree of publicness. That is, even if an expectation is considered a shared idea without its own material significance or presence (yet), it still proposes activities that will have a more or less positive, yet significant, effect on oftentimes quite large groups of others.

The degree of publicness of transition expectations has consequences for the legitimacy of the decision making on them. Considering that people are each other's moral equals (Fraser, 2005); that they thus have an inherent right to self-determination and should never be involuntarily subjected to the pervasive effects of decision making beyond their own control (Näsström, 2011); and that through that right, they also have the right to justification (i.e., the right to ask for and challenge reasons for why impactful activities are carried out in a particular way) (Rawls, 2009; Forst, 2014); it follows that decision making on expectations with a high degree of publicness would necessarily have to involve those to be affected by them, either through representation or direct participation (Eckersley, 2003; Fraser,

2005; Dewey, 2016)[18]. The bottom line is that transition expectations that promise a considerable impact on groups of people in society can only become performed legitimately when they are consented to by the people who will be affected[19]. With this I do not mean to say that all those to be affected must reach a complete consensus. They must, however, to a large degree, share the belief that decision making on potentially impactful transition activities takes place in legitimate processes in which their interests are appropriately included and considered, and of which the outcome is justified *only* by having been agreed on in those processes (Hendriks, 2008).

Although this makes intuitive sense, a problem arises when talking about the necessary consent of affected publics in and around future plans. Those who may benefit or suffer from activities suggested in expectations will rarely be aware of what proposedly awaits them in the future. Consequently, they often cannot be recognized as a 'public' around expectations, especially if such expectations are not yet being performed. Only when people perceive the consequences of something for their lives will they recognise a shared interest with those who perceive those consequences in the same way they do, indeed, those who are affected largely in the same way that they are (Dewey, 2016; Marres, 2005).

Interestingly, although the precursors of publics – individuals, still unaware that they have a shared and characterising interest with others – can be quite oblivious to expectations, this does not apply to those who create, nurture, promote and ultimately work to perform expectations in energy transitions, of course. These

[18] In this dissertation, I align the increasingly popular notion of legitimacy based on the *all-affected principle* – all those affected by a decision ought to have a say in its making – in which publics are considered continuously emergent, and not with more traditional understandings of legitimacy based on the *all-subjected principle*, which assumes the pre-existence of a clearly delineated public consisting of all those subjected to the power of the State.

[19] I also align with scholars who consider justice prerequisite for legitimacy (see, for example Rawls, 2009). In this tradition, societies are seen to self-organise, amongst others by installing and accepting authority of governments, because they strive for more just and fair societies**.** Legitimacy, in that respect, is about the appropriateness and effectiveness of the actors, processes and objects applied to achieve more just and fair societies.

expecting others – let me introduce them as the previously mentioned governance actors in transitions – have in fact already *expected* at least some of the consequences, risks, and trade-offs of performance of their expectations. They will not have done this completely, and as with any anticipatory attempt, there will be many unexpected events, developments and new circumstances that will significantly meddle with foreseen consequences. Nevertheless, governance actors will generally have a sense of the degree of publicness of their expectations. They will also recognise, either at a conscious or unconscious level, that expectations with a high degree of publicness will warrant legitimacy. That is to say that these governance actors sense that they will have to convince implicated publics of the rightfulness of the claims on authority, public resources and normative justness that they make in and for their expectations. This is evident, amongst others, from the observation that these actors actively engage in the *legitimation* of their expectations.

Legitimation, or efforts to establish a broad belief in the legitimacy of (ones') expectations[20], will generally involve appealing to multiple and diverse grounds for legitimacy. For instance, governance actors can aim to establish the legality of their expectations by highlighting how well these expectations align with (the spirit of the) laws and legislations (i.e., the *legal or regulative ground for legitimacy*). Despite that such reference to laws and legislations helps improve predictability and accountability (Rothstein, 2012), I would argue this is still by far the weakest ground of legitimacy for expectations in transitions. Legislation and regulation are famous for their reactive rather than proactive nature, and thus, emergent public interests will rarely be formally institutionalized, especially in transitions characterised by change and newness (Hajer, 2003). Hence, claiming legitimacy for expectations in transitions by appealing to legal grounds will rarely be effective on its own. The same can be said of making claims on *cognitive legitimacy* grounds; cognitive legitimacy refers to the degree to which an entity is known, understood and taken

[20] This phrasing was inspired by Max Weber's work on authority and legitimacy (1978b), in which the concept of *legitimätsglaube* serves to explain why people voluntarily accept the exercise of authority by others over them in the (unavoidable) absence of objective standards and measurements for, or proof of legitimacy.

for granted (Scott, 2008; Markard, Wirth, & Truffer, 2016). Here too, claiming the right to do something based on an expected continuance of the current situation, or, because one always had that right in the past, will not rarely fail to resonate in transitions to which a call for change is innate.

More powerfully, governance actors can legitimize their expectations by highlighting how well these expectations align with the ambitions, goals, interests, and values of political and societal representatives; even more authoritative, of course, would be to claim to be endorsed by these parties in transitions (i.e., *the socio-political ground for legitimacy*), or to have included (the interests of) these parties in the creation of expectations (*socio-procedural legitimacy*, also known as *input legitimacy* (Scharpf, 1999)). Equally important for legitimacy is to clarify how requirements for transparency, recognisability, and accountability are met so that publics can be confident in the integrity, quality and representativeness of the governance processes in which transition expectations are formed (also known as *throughput and feedback legitimacy*) (Schmidt, 2013; Van der Steen et al., 2021). More technocratic, yet not necessarily less used or less successful, would be to claim legitimacy based on the expected effectiveness of proposed solutions or by establishing the superior expertise or professionalism of those actors who are supposed to carry out these proposed solutions (i.e., *the efficacy ground for legitimacy* (Rose, 1993; Weber, 1978b), *also known as utilitarian legitimacy* (Rosanvallon, 2008) *or output legitimacy* (Scharpf, 1999)). Last but not least, arguably most powerful would be to establish a claim on legitimacy based on the moral rightness of expectations. Legitimate expectations must aim to contribute to the realisation of shared values or, at the highest level, to a more just society (i.e., *the substantive, normative and moral grounds for legitimacy* (Rosanvallon, 2008; Rawls, 2009)).

Governance actors attempt to legitimize their expectations by appealing to these different grounds. Arguably, these are not objective, hard categories that are always and fully to be met – although, of course, when certain grounds are clearly not met, it is easier to challenge the legitimacy of transition expectations. In legitimation, rather than checking the boxes, actors attempt to construct legitimacy based on combinations of these grounds. In fact, oftentimes governance actors will draw on some of these grounds to justify not (fully) complying with other grounds. An

obvious example is how actors regularly lobby for changes to restrictive legislation and regulations in energy transitions, using the moral rightness of (rapid) CO_2 reduction as a basis for the legitimacy of their expectations for new and innovative energy solutions despite that these expectations do not comply with established legal and regulatory rules. Another example is how a growing group of advocates call for the local and cooperative organisation of energy supply, even though the participants of cooperatives will often have less knowledge of, experience with, and resources for energy production. This is legitimized by claiming that the traditional systems of energy supply, and the incumbent parties herein, have too long maintained an unfair distribution of benefits and burdens around energy production and supply. Here too, the 'moral high ground' is used to claim legitimacy, even though other legitimacy grounds are not, or not fully, met.

Research into how governance actors establish claims on these grounds to legitimize (technology and technological) expectations is growing (Markard, Wirth, & Truffer, 2016; Genus & Iskandarova, 2020; Van Der Velden, Dessein, Klerkx, & Debruyne, 2023; Schneider & Rinscheid, 2024). So far, however, researchers have paid little attention to the ways in which the subjects in and around these expectations are drawn up while making claims to these sort of legitimacy grounds. Nevertheless, this is an essential part of legitimation. Legitimacy claims are made to convince; that means that there is an intended recipient who needs convincing – someone who may be called a legitimizing audience – and who is to accept (or reject) and believe (or question) the made claims. In other words, all legitimacy claims, made on whatever grounds imaginable, must be based on some kind of intuitive understanding of the relevant legitimizing audience and what it finds important. In the context of energy transitions, these legitimizing audiences may be other governance actors, but also quite often will be society in its varied facets and with its different publics.

Of course, convincing 'publics' of the legitimacy of ideas, proposals and expectations can be problematic. A major issue here is that real-life publics often do not actually exist yet around such expectations, as mentioned earlier. Publics are called into being by the issues that emerge in the performance of expectations (Marres, 2005; Dewey, 2016). Hence, governance actors can do little but rely on

imagined publics[21] as proxy representatives of yet-to-emerge real-life publics in decision making. Legitimation of expectations thus involves drawing on imagined (indeed, expected) publics and their interests, characterizing them and clarifying how they are represented in webs of expectations that project technological, institutional, and social solutions for transitions. Whether legitimation is successful depends on how well these imaginaries resonate with real-life publics, as and when they emerge – their emergence, of course, often a direct consequence or performance of this imagining, as eloquently put by Michael Warner:

"... all discourse or performance addressed to a public must characterize the world in which it attempts to circulate, projecting for that world a concrete and livable shape, and attempting to realize that world through address. (...). Its circulatory fate is the realization of that world. Public discourse says not only: 'Let a public exist', but: 'Let it have this character, speak this way, see the world in this way'. It then goes out in search of confirmation that such a public exists, with greater or lesser success – success being further attempts to cite, circulate, and realize the world-understanding it articulates. Run it up the flagpole, and see who salutes. Put on a show, and see who shows up." (Warner, 2002, pp. 81-82).

Using imagined publics as proxy representatives is tricky and can lead to opposition when such imaginings do not resonate with emergent publics; injustice and illegitimacy can easily arise, especially when publics are imagined in stereotypical, pejorative terms (Schneider & Ingram, 1993; Howarth, 2006; Wynne, 2016; Young, 1990), or when the (artificial) boundaries that are supposedly delineating a public are drawn in such a way that some affected people become excluded from decision making (Fraser, 2005; Pesch, 2019; Young, 1990). These aspects therefore warrant extra attention when considering the legitimacy of transition expectations.

[21] Imagined publics are subjective social representations that build upon all sorts of expectations of the values, identities, abilities, knowledges, behaviours, responsibilities of particular groups of people (Rodhouse, Pesch, Cuppen, & Correljé, 2021, p. 2).

2.2.2.2 Imagined publics and their characteristic identities

To understand legitimation of expectations in transitions, it is helpful to think about how imagined publics become established. *Imagined publics* are often more or less artificially based on some particular characteristics that typify and distinguish them from other (imagined) publics. Alternatively, I could say that publics become imagined on the basis of one or few commonalities that the assumed members of these publics are thought to share. Imagining publics therefore involves grouping or categorising otherwise heterogenous people into a somewhat homogenous 'public', whose imagined identity is directly tied to the categories with which it is established.

"The logic of identity denies or represses difference. (…) The logic of identity flees from the sensuous particularity of experience, with its ambiguities, and seeks to generate stable categories. Through the logic of identity thought aims to master that sensuous heterogeneous embodiment by bringing the object fully under a concept (…) through the logic of identity thought seeks to bring everything under control, to eliminate uncertainty and unpredictability (…). The logic of identity also seeks to reduce the plurality of particular subjects, their bodily, perspectival experience, to a unity, by measuring them against the unvarying standard of universal reason. The irony of the logic of identity is that by seeking to reduce the differently similar to the same, it turns the merely different into the absolutely other. It inevitably generates dichotomy instead of unity, because the move to bring particulars under a universal category creates a distinction between inside and outside. Since each particular entity or situation has both similarities and differences with other particular entities or situations, and they are neither completely identical nor absolutely other, the urge to bring them into unity under a category or principle necessarily entails expelling some of the properties of the entities or situations (Young, 1990, p. 4: 3).

Identity-defining categories or public characteristics in energy transitions can relate to the specific territories, geographic areas, regions or even administrative levels that publics are assumed to inhabit (Pesch, 2019). For example, an often-made distinguishment is between publics that are imagined to exist at local, national, or even supra-national levels – which by no coincidence mirrors existing administrative levels. Other more geographically informed public characteristics emerge from the boundary drawn between the urban and the rural or the distinction

between those who live 'close to' impactful activities, and those who do not (Pesch, 2019).

Imagined publics in transitions may also be typified by certain political, socio-cultural, and economic characteristics. For example, typical commonalities that are used to distinguish publics are political affiliation, where different publics are imagined to exist at the left-wing/socialist and right-wing/liberal end of the political spectrum, and (socio-)economic status, where publics with higher incomes and levels of education are generally distinguished from publics with lower incomes or levels of education. Less often studied but increasingly relevant in the context of climate change and energy transitions are imagined publics along the temporal scale of the elderly, the young, and the future generation.

The characteristics that are attributed to imagined publics have a major influence on the type of things that members of these publics are seen to value, need and demand. They also have implications for how, where and when these publics are expected to want to engage with energy transitions and give voice to their demands (Schneider & Ingram, 1993; Soutar & Mitchell, 2018; Pesch, 2019).

Legitimation of expectations of technological, institutional, and social solutions in transitions will generally involve expecting and comparing multiple imagined publics. Proposed transition solutions are often legitimised by prioritising the interests of some of these publics over others. Particularly relevant seems to be the imagination of 'the public', an entity that theoretically encompasses all citizens in a certain society and allows for claims on collective interests (Bowers & Iwi, 1993; see also Habermas, 1973 on generalizable interests). The powerful use of the public works to emphasize a sense of social totality that oftentimes results in the underappreciation of other publics: *"...whenever one is addressed as the public, the others are assumed not to matter"* (Warner, 2002, p. 49). Not surprisingly, therefore, the construction of social totalities is an often used and well resonating strategy in the legitimation of proposed technologies, infrastructures, policies, processes, behaviours and so forth; it allows for labelling certain values and interests as common or collective, and for prioritising these over non-collective or particular values and interests. In conceptual terms, we could say that expectations become more easily considered legitimate if they prioritise the interests of publics-in-general *(PiGs)* over those of publics-in-particular *(PiPs)*

(Schneider & Ingram, 1993; Michael, 2009; Habermas, 1973). Considering the power of the general, the collective, the universally applicable to legitimize expectations, it may not be surprising that 'the collective interest', also known as 'the common good', is the subject of intense political struggle (Rosanvallon, 2008) in energy transitions. That is to say, there are many different ways to frame and claim the collective interest in and through transition expectations, and governance actors are continuously engaged in the struggle over who is allowed to define it – without ever being able to fully privatize it, however (Rosanvallon, 2008; Delina & Janetos, 2018). This is the inherent tension of the general public: it must be non-particular. After all, its power in legitimation is fully based on the fact that a few cannot confiscate it. Yet, the partial ways in which the *PIG* and its values becomes defined and prioritised, at least temporarily, through power, conflict, and ultimately discursive dominance, most certainly can work to further particular interests (Habermas, 1973).

The reverse, that is, prioritising the interests of *PiPs* over those of *PiGs* in expectations, will be considered legitimate only under exceptional circumstances – that is, only in situations in which the prioritisation of collective interests would result in (gross) future injustice to particular publics. This sort of legitimacy frame, which effectively favours particular interest groups over the general public in the name of fairness, echoes what is known as the Rawlsian difference principle (Rawls, 2009). Inequalities may be created, and some groups may be advantaged over others, but only if and as long as this serves to the greatest advantage of those who are least advantaged. This relates to restorative justice as well, or the idea that inequalities established in the past and persisting to this day must be corrected. Of course, there is a compelling case to see fairness and restorative justice as ultimately in the interest of the public in general. Allowing gross injustice against one *particular public* to persist, to see it as legitimate because it serves a collective interest, would open up other *particular publics* to similarly gross injustices legitimated through the collective interest as well. Effectively, it would open up everyone to such gross injustice. This thus constitutes a very slippery slope, especially in light of the often obscured yet critical power struggles through which the collective interest becomes established. Quite opposite to how once the collective interest is claimed and defined, its assumed universal nature makes invisible the underlying secular power struggles that have gone into its definitions,

in this form of legitimation it is more commonplace to explicate and make visible the prioritisation of particular group interests. Part of this has to involve, of course, claiming that such prioritisation is legitimate because it helps restore the necessary coherency that makes a general public (Rosanvallon, 2008).

Hence, both strategies – prioritizing the values of the *PiG* or those of a *PiP* in exceptional circumstance – can successfully be applied to legitimise transition expectations, as both can resonate with and be accepted by different (emergent) publics and other legitimizing audiences in transitions. However, acceptance of and belief in these legitimacy claims will largely depend on the context in which these prioritisations are made. This includes the pre-existing socio-political and socio-economic relationships between publics and with government/governance. A belief in such claims will also very much depend on the recognisability of imagined publics and the perceived justice of prioritising one of these publics over others. When imagined publics are not recognisable to others (for example, due to underlying biases or stereotypes), or when the prioritisation of one public over another is perceived as unfair, legitimacy issues arise. In such instances, others can call into question made legitimacy claims by offering alternative conceptualisations of publics, their nature, and their interests (i.e., presenting *counterpublics* (Asen, 2002; Warner, 2002) which generally also serve to legitimize alternative transition expectations for different organizational structures, technologies, behaviours, and solutions.

2.3 Chapter wrap-up

In this chapter, I introduced various reasons why transition expectations require legitimacy: transition expectations are functional and as such are very influential in transition governance. Moreover, transition expectations will affect publics and their ability to safeguard what they value in the future, and they will likely do so in differentiated ways. Because transition expectations need to be legitimate, governance actors must engage in legitimation of (their) expectations. They can do so by drawing on different grounds of legitimacy, but as I have argued in this chapter, they will also always have to democratise their expectations by imagining or co-producing publics with and around these expectations. Legitimation will

generally involve producing multiple imagined publics and public interests, of which one is (framed as) legitimately prioritised over others, not rarely based on underlying justice principles. In the subsequent chapters I will share the empirical grounds and insights on which this perspective is based, while building towards the theoretical proposition to understand legitimacy as a relational coproduction between imagined publics and expectations.

CHAPTER 3

Public agency and responsibility in energy governance: a Q study on diverse imagined publics in the Dutch heat transition

Abstract

In Energy Social Science (ESS), the concept of imagined publics describes how energy actors perceive societal groups around new energy technologies. These perceptions often rely on deficit assumptions, portraying publics as unknowledgeable, incapable, or unwilling participants in governance. While insightful, such deficit-based explanations overlook the diversity of publics imagined in energy transitions. This paper presents the results of a Q-study identifying five distinct imaginaries in the Dutch heat transition:

1. Meaningful participation in a diverse society
2. Strong and enthusiastic communities leading the way
3. NIMBYs, social contestation, and decarbonization risks
4. Collectivism and vulnerable groups at risk
5. Unburdening individual user-consumers

Each imaginary reflects unique assumptions about public agency, responsibility, and governance, shaping roles and obligations for both publics and other actors in the heat transition. A key contribution is our exploration of imaginaries as interactive, holistic, and contextual. This approach reveals critical social, ethical, and political tensions and trade-offs, offering deeper insights into the complexities of energy system change.

3. Public agency and responsibility in energy governance: a Q study on diverse imagined publics in the Dutch heat transition[22]

3.1 Introduction: Imagined publics in the Dutch heat transition

The decarbonisation of heating in the built environment sparks much debate, amongst others because it will have far-reaching impacts on citizens and their ways of living. Some of the measures proposed require people to proactively change their behaviours, renovate and insulate their homes, and invest in alternative heat technologies (Backhaus, 2019; López-Bernabé et al., 2020; Jansma et al., 2020; Sovacool et al., 2021); and whereas fossil fuel-based heat systems have proven to be comfortably reliable, flexible, affordable and almost effortless, alternative heat technologies are often far less familiar, come with higher capital costs, and may not necessarily provide similar thermal comfort levels (Sovacool et al., 2021; Sovacool & Martiskainen, 2020). Therefore, whether people will be supportive of, and willing to contribute to, decarbonisation of household heating is far from certain.

That is why in many countries, and on the European level, citizen inclusion in innovation, decision making and implementation is lauded as a way to arrive at more accepted heat decarbonisation measures (Morton et al., 2020; Sovacool & Martiskainen, 2020; Directorate-General for Research and Innovation, 2018). Besides instrumental motivations there is a strong normative-democratic appeal to include citizens (Hendriks, 2008). Responsibilities in governance of heat transitions in the built environment are progressively shared by more and diverse actors, such as governments, housing corporations, homeowner associations,

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energy companies, and grid operators - yet not all of them are publicly answerable for their actions. Granting citizens a seat and say in decision making on alternative infrastructural, technological, and economic heat solutions could help (re)establish a form of democratic legitimacy by enabling trust, transparency, and accountability (Hendriks, 2008).

While the relevance of including citizens in heat transitions is clear, the notion – both in terms of what it means and how to do it – remains ambiguous. Like in other energy transitions, there are diverging views on the types of roles, responsibilities and mandates that are appropriate for citizens (Hodson & Marvin, 2011; Wolsink, 2011; Devine-Wright, 2011; Hendriks, 2009; Chilvers & Longhurst, 2016; Skjølsvold et al., 2018). These contesting views are often underlined by vastly different evaluations of people's needs, values, wants, motivations, skills, and capabilities (Cherry et al., 2017; López-Bernabé et al., 2020; Jansma et al., 2020). In Energy Social Science (ESS), such views on citizens and citizen inclusion are studied by use of the concept of *imagined publics* (Walker et al. 2010; Marris, 2015; Welsh & Wynne, 2013): subjective social representations that build upon all sorts of assumptions and beliefs about the identities, abilities, knowledges, behaviours, and responsibilities of a particular group of people.

The existence of imagined publics in transition governance is not necessarily problematic or even avoidable. After all, such representations are prerequisite for all technological and societal innovation and change (Akrich, 1995; Jasanoff & Kim, 2009). However, imagined publics become problematic when they build upon simplistic and stereotypical biases that result in misrecognition, misrepresentation, and the unequal imposition of barriers to people's access to, and voice in, decision making (Howarth et al., 2014). Concerning decision making on energy, researchers have found that governance actors often imagine publics around renewable energy projects or technologies to be unknowledgeable, ignorant, irrational, incapable, unwilling, unresponsive, or irresponsible agents who are de facto against development, and have concluded that such deficit assumptions can result in closed down public engagement design (Barnett et al., 2012; Burningham et al., 2015; Devine-Wright, 2011; Cass & Walker, 2009; Wolsink, 2006). This is the case, for example, when the primary aim of citizen inclusion becomes to educate 'the public', or, when public meetings are

deliberately kept small and exclusive to prevent offering protesting voices a podium to promote their objections (Barnett et al., 2012; Burningham et al., 2015).

So far, ESS research has particularly problematized the existence and performativity of these deficits-based imaginaries. Recently, however, calls for more scrutiny and reflexivity towards diverse sorts of imagined publics have emerged (Chilvers & Pallett, 2018; Chilvers & Longhurst, 2016; Skjølsvold et al., 2018). Driven by social constructivist and relational notions, the core argument for this is that citizen inclusion and exclusion are never dichotomous or discrete concepts. Instead, each public imaginary co-constructs and enacts technologies, infrastructures, institutions, publics, power, and understandings of inclusive governance in unique ways (Chilvers & Longhurst, 2016; Skjølsvold et al., 2018). In that way, an imagined public is always part of a wider technical-institutional arrangement in which (some) publics are recognised, acknowledged, and involved in particular ways and for particular reasons, while others are not (Chilvers et al., 2018). To understand the many ways in which citizen inclusion is defined, justified, and enacted in transitions, new empirical research on imagined publics would necessarily have to engage with the co-constructive workings of diverse imaginaries (Chilvers & Longhurst, 2016).

In this paper we answer the above call by empirically mapping the diverse and co-existing imagined publics present in governance of the Dutch heat transition.

3.1.1 The Dutch heat transition

In the Netherlands, residential heat demand is largely met by use of natural gas, not in the least made possible by the country's abundant natural gas reserves in Groningen (Correljé, 2018). After the discovery of these considerable reserves in the late 1950s, the Dutch government and the natural gas industry (represented by Shell and Exxon) quickly negotiated the terms of natural gas development and distribution – which resulted in a relatively closed-down, technocratic, and top-down gas regime that remained in place for decades. Part of the agreement entailed establishing a relatively large and stable residential demand for Groningen gas; hence, within a matter of years, a nation-wide and fine-grained gas network was rolled out that connected nearly all Dutch households and provided them with affordable, clean, and almost invisibly supplied Groningen gas (Correljé, 2018).

Even today, more than 90% of Dutch households still depend on natural gas for space heating, hot water, and cooking. Nowadays, however, this strong dependence – and arguably, lock-in – on natural gas is considered problematic for two reasons. Firstly, climate change considerations have brought about discussions on the desirability of natural gas use for low temperature heating (Ministerie van Economische Zaken, 2016; Green Deal Aardgasvrije Wijken, 2018). Secondly, after decades of gas extraction in Groningen, the region has been confronted with the frequent occurrence of extraction-induced earthquakes. These have raised concerns around safety and wellbeing, as well as demands for procedural justice, recognition, and fairer compensation by the residents of the area. After years of social unrest, the Dutch government recently decided to gradually shut down production in Groningen towards zero in 2030 (Backhaus, 2019).

Both trends resulted in the ambition to decarbonise residential heating and replace natural gas in the built environment towards 2050 (Klimaatakkoord, 2019). The replacement of natural gas by alternative heat sources and infrastructures in the built environment is now referred to as the heat transition (Scholte et al., 2020). Citizen inclusion is considered prerequisite for support and success of this transition (Klimaatakkoord, 2019), which is one of the key motivations for organising this transition locally and giving municipalities great responsibilities in coordinating, liaising, and executing the incremental phase out of natural gas.

Despite the importance given to citizen inclusion in the heat transition, municipalities have been given very few legal mandates and procedural guidelines to support them in their task (Jansma et al., 2020), and so far, it has proven difficult to get different groups of citizens actively engaged in planning and execution phases of the heat transition (Scholte et al., 2020; Buitelaar & Heeger, 2018). A further complication is that it is not only residents, tenants, and homeowners who need to be properly included; the heat transition requires yet untried forms of collaboration with other municipalities, provinces, grid operators, heat suppliers, energy companies, technology developers, home owner associations and housing corporations – who all have different interests and responsibilities, are faced with unique uncertainties, and hold different viewpoints on the best way to engage and approach citizens in it (Buitelaar & Heeger, 2018). All in all, what citizen inclusion

is, and what forms it should take in the Dutch heat transition, is far from unambiguous.

So far, these different viewpoints on citizens and their role in the transition have received little attention both in research and in governance of the Dutch heat transition. Instead, research has aimed to identify groups of citizens, or segments, that share some values and motivational drivers and should thus be approached in certain ways (see, for example, Scholte et al., 2020; Jansma et al., 2020; De Koning et al., 2020). Such research is relevant but does start from the assumption that the main determinants of whether and how inclusion works are some characteristics of citizens. It overlooks the ways in which governance actors' subjective imagined publics pre-select and pre-scope participants and procedures in attempts to realise more inclusive governance.

3.1.2 Societal and scientific contributions

With this research, we highlight the existing subjectivities that colour the ways in which governance actors perceive and approach citizens in the Dutch heat transition. By drawing attention to the present epistemic and normative differences, we contribute to the start of a broader societal debate about what citizen inclusion is, and ought to be, in the context of this transition. This is especially relevant right now, as this is the moment that attempts are made, both locally and nationally, to develop clear procedures and guidelines on how to engage with citizens on phasing out natural gas (see, for example, PAW, 2020). This research highlights the need for a debate on the underlying assumptions that are to guide, and potentially close down, such procedures and guidelines.

Our scientific contribution is twofold. Firstly, we move beyond deficit assumptions and dichotomous understandings of inclusion in making sense of the political normativities that characterize imagined publics. Instead, we focus on how each imagined public uniquely constructs particular roles for publics. With 'role' is meant a shared understanding of an actor's position within a system as characterised by a set of activities, attitudes, and responsibilities (based on the work done by Wittmayer et al., 2017, p. 49). Built on assumptions regarding people's agentic abilities and responsibilities, public role constructions help understand how publics are positioned in relation to other actors, technology,

infrastructure, and system change. The second contribution is that we introduce Q methodology to empirically capture imagined publics. This comes with two advantages: firstly, the methodology allows for the identification of diverse subjectivities in governance, and secondly, it enables a holistic approach (Stephenson, 1968; Brown, 1980). The findings of our study – five different imaginaries of publics in the Dutch heat transition – set themselves apart from other studies by their variety (amongst others, we found two yet underexplored imaginaries), their unique embeddedness in the Dutch context, and the ways in which co-constructive relations between publics, institutions, technologies, and infrastructures are holistically captured.

In the remainder of this paper, we define the concept of imagined publics (2.1), review the most common imagined publics (2.2), and propose a reconceptualisation of imagined publics and their underlying assumptions (2.3). In section 3, we introduce Q-methodology to capture imagined publics and we present the five resultant imaginaries in section 4. In the discussion, public agency, responsibility, and role constructions in imagined publics are compared, including how these work to establish different understandings of inclusion in energy transition governance (section 5). In section 6, we discuss scientific and societal contributions and point towards future research opportunities.

3.2 Imagined publics in the literature: an overview

3.2.1 What are imagined publics?

Imagined publics are social representations of groups of citizens (Maranta et al., 2003; Batel & Devine-Wright, 2015) that are shared and enacted by actors in governance networks (Marris, 2015; Welsh & Wynne, 2013). They are subjective products of social knowledge (Maranta et al., 2003) and as such, build upon all sorts of assumptions and beliefs about the identities, abilities, knowledges, behaviours, and responsibilities of people making up a public.

Imagined publics are produced and productive through linguistic, symbolic, and visual means (Arruda, 2015; Moscovici, 1990). That is, they are constructed, negotiated, and entrenched via interaction: when publics ‘present’ themselves

around energy projects, in media reports or stories of peers (Walker et al., 2010), governance actors collectively make sense of these presentations. The act of sensemaking involves drawing upon existing experiences – using knowledge schemata such as categorisations to anchor public presentations to that what is already known. In this process, publics become at least partially re-presented (Batel et al., 2016). Imagined publics emerge as somewhat static knowledge schemata that are continuously drawn upon to represent real-life publics.

Once shared and agreed on, imagined publics can be particularly powerful – sometimes even more powerful than the real-life citizens they supposedly represent (Walker et al., 2010; Cherry et al., 2017). They help shape actors' expectations of how decision making will evolve. Amongst others, imagined publics help anticipate public attitudes and behaviours around a proposed policy or project (Walker et al., 2010), decide on appropriate actions, strategies, and engagement formats (Walker et al., 2010), and influence infrastructural and technological requirements and deliverables (Akrich, 1995).

Imagined publics become problematic when they build upon and reinforce simplified and stereotypical biases towards certain groups or individuals. Taken-for-granted yet incorrect imagined publics can cause governance actors to misrecognise, misrepresent or even exclude certain groups and individuals from decision making (Howarth et al., 2014). While this often stimulates alternative and countering representations to arise, these are not always recognised nor evaluated as equally 'true' in governance, especially when imagined publics function to protect and justify incumbent interests (Stirling, 2008). Therefore, exploring diversity of imagined publics is particularly relevant to understand political and epistemic power dynamics in governance (Batel et al., 2016; Chilvers & Pallett, 2018).

3.2.2 Commonly studied imagined publics

This section summarizes the most studied imagined publics in technology and energy governance, based on a review of existing literature[23]. Imagined publics are primarily studied in three scholarly fields: *Science and Technology Studies* (STS), *Public Understanding of Science* (PUS), and *Energy Social Science* (ESS). Within these fields, 'the general public', 'the local community', and 'the individual user-consumer' are often recognised. More recent and emerging imagined publics, particularly in and around energy, are 'the prosumer' and 'the energy citizen'.

3.2.2.1 The imagined general public

'The general public' is an imagined societal collective consisting of 'lay people' or generalized imagined lay persons (Maranta et al., 2003). Since the 1950s/1960s, three different imaginaries of the general public have prevailed in western technoscientific circles. Firstly, around the 1950s, technoscientific experts considered science an elitist epistemic realm, of which the public had no understanding, nor interest or place in. It was expected to 'comply passively and gratefully with the policy decision making of those who know best' (Welsh & Wynne, 2013, p. 561). Scientific illiteracy of lay people became problematic when new technologies such as nuclear energy and synthetic biology were met with irrational public resistance (Welsh & Wynne, 2013). The public had evolved into an 'incipient threat to the (...) science-led agenda of innovations' (Welsh & Wynne, 2013, p. 561) – which could be mitigated, as was the assumption, with better science education and 'selling science' more properly (Bauer et al., 2007). After 9/11, strict surveillance and policing became considered necessary to control a 'highly politicised' and dangerous public. No longer was the threat incipient: 'pre-

[23] An open search was conducted in Scopus, Web of Science (core collection) and Google Scholar using search words as "imagined publics", "Social imaginaries" and "Social representations publics" in combination with "Energy", "Technology", and "Governance". Search results were limited by focusing on publications after 2000 – although publications published before 2000 were included in subsequent snowballing selection if a reading of materials showed these publications to be core to the development of the concept. Close to 100 articles were included in the review.

existing imaginaries of anti-science publics were extended and intensified as publics resisting established technoscience policies were cast as extremist threats to social order' (Welsh & Wynne, 2013, p. 561).

Over time, outspoken critique on the deficits-based and blame-infused assumptions underlying these imaginaries arose from within PUS and STS (Lewenstein, 2003). Wynne scrutinized the deficit model of public understanding of science and problematized how these assumptions allowed governing elites to deny responsibility for flawed and failing science-society relationships (Wynne, 2006; Wynne, 2007; Wynne, 2016). Scholarly interest reoriented towards more participatory public engagement with science. It remains contested whether this new focus on participation is indeed based on other than deficit assumptions, or whether it provides a more obscured way of excluding resisting publics from decision making (Wynne, 2007; de Saille, 2015).

3.2.2.2 The imagined (local) community

Around infrastructure development, scholarly attention has gone out to another imagined public, namely 'the local community' (Cass & Walker, 2009; Cass et al., 2010; Barnett et al., 2012). In project development circles, 'communities' are considered neighbours with whom one must learn to live together. These neighbours quickly become an implementation barrier when they start to express their discontent with elements of the project. This is particularly true for a small yet outspoken group, labelled NIMBYs (Barnett et al., 2012). Not-in-my-backyard protestors are seen to lack understanding, information and experience; they are driven primarily by self-interest and are de facto against any development in their direct environment; they have trust issues towards developers; their behaviour is rooted in emotion and irrationality; and, their actions are harmful for the collective or public interest (Cass & Walker, 2009; Cass et al., 2010; Barnett et al., 2012; Devine-Wright, 2011; Burningham et al., 2015). In short, NIMBYism builds upon a range of deficit assumptions (Burningham et al., 2015). Despite that research has shown that the NIMBY image of the public is self-enforcing, marginalising and even destructive, it has proven hard to replace in energy governance circles (Wolsink, 2006; Devine-Wright, 2011).

3.2.2.3 The imagined user-consumer

A third commonly studied imaginary is the user-consumer of a technology or resource (Akrich, 1995; Skjølsvold & Lindkvist, 2015; Ryghaug & Toftaker, 2016). Even more so than the other imagined publics, the user-consumer is part of a wider socio-technical configuration (Walker & Cass, 2007; Devine-Wright, 2012; Soutar & Mitchell, 2018). Historical accounts of energy provision in western societies, for example, describe how for a large part of the twentieth century, energy was considered a public utility. It was produced, distributed, and supplied by state-owned organisations to passive user-consumers who were 'separated from, and minimally engaged in, energy systems over and above pressing a light switch' (Devine-Wright, 2012, p. 68). This was justified by all sorts of deficits that pertained to user-consumers, such as a lack of appropriate interest and knowledge, irrationality, and a missing sense of environmental and social responsibility (Devine-Wright, 2012). With notions of liberalisation and institutional reform, a different user-consumer, who was slightly more active, emerged. This user-consumer had a desire for (some) free choice. He or she followed market logics and wanted to choose between energy providers based on price considerations (Walker & Cass, 2007).

3.2.2.4 Emerging imagined publics in energy governance

The recent shift towards decentralised production co-emerges with another, more encouraging user imaginary: that of the 'prosumer' (Walker & Cass, 2007). Contrary to its predecessors, the prosumer is an active, tech-savvy, and flexible enabler of decentralised renewable energy provision (Goulden et al., 2014; Ryghaug & Toftaker, 2016; Skjølsvold et al., 2018). Simultaneously, a more political alternative representation of the public has emerged with the notion of 'energy citizenship' (Devine-Wright, 2012; Ryghaug et al., 2018; Lennon, et al., 2020). Like the prosumer, the energy citizen is an active enabler of renewable energy realisation; in addition, energy citizens are considered politically aware, motivated, and concerned and want to realise a system with equitable rights and responsibilities across society (Devine-Wright, 2012).

These newer imagined publics are often constituted in and by increasingly fashionable narratives of energy democracy and energy justice (Szulecki, 2018;

Jenkins et al., 2016; Chilvers & Pallett, 2018). While it is assumed that these imaginaries are more encouraging for opening up energy governance to citizens and their viewpoints, they also produce and impose particular issues and identities onto publics and can come to perform the inclusion of some citizens at the expense of others (Chilvers & Longhurst, 2016; Lennon, et al., 2020). In part, this is because these imaginaries also rely on 'residual realist' views of citizen inclusion: 'the who (i.e., public participants) and how (i.e., models of participation and democracy)' are viewed as 'being highly specific, pre-given, external, and naturally occurring categories' (Chilvers & Pallett, 2018, p. 2). The concrete explication of who is to be involved, in what way, and for what sort of outcome results in the automatic exclusion of those who are not necessarily to be involved or are not considered as constructive towards the desired outcome. Hence, even these new imaginaries can result in narrow understanding of citizen inclusion.

In summary, most of the studied imagined publics are based on deficit assumptions. They are problematic for various reasons, not in the least because they are poorly supported by empirical data (Wolsink, 2006; Devine-Wright, 2011). Despite their inaccuracy, these imaginaries continue to be unreflexively drawn upon and reproduced to justify limiting or excluding the voice of citizen in (energy) technology governance (Wynne, 2007; Welsh & Wynne, 2013; Marris, 2015; de Saille, 2015). More recent imaginaries in energy governance seem to rely on more empowering assumptions. However, so far it remains unclear whether these imaginaries will result in more inclusive governance.

3.2.3 Necessary conceptual developments: from deficit assumptions to role constructions

Although an increasingly diverse number of imagined publics are identified in separate studies around energy projects and technologies, there are but few empirical studies that have followed an explicitly relational and systemic scope (for exceptions see Chilvers & Longhurst, 2016; Skjølsvold et al., 2018). Consequently, there are knowledge gaps concerning how diverse imagined publics are co-constructed with institutions, infrastructures, and technologies in transitions; how diverse imagined publics co-evolve and co-exist in transition governance; and how the ongoing political negotiation and interaction between

imaginaries influences how citizen inclusion eventually is performed in various contexts (Chilvers et al., 2018).

A more systemic analysis of imagined publics in transitions requires an alternative conceptualisation that does not focus only on deficits, but on how certain assumptions work to construct roles for publics within energy systems (Walker & Cass, 2007). With 'role' is meant a shared understanding of an actor's activities, attitudes and responsibilities within a social structure or system (based on the work done by Wittmayer et al., 2017, p. 49). Reconceptualising imagined publics as particular role constructions for groups of people in transitions enables a more systemic analysis in at least two ways. Firstly, because roles always concern the workings of an object, process, or system. In that sense, roles are relational: they prescribe activities, attitudes, and responsibilities of actors *in relation to* an object, process or system that needs to function, be maintained, or be changed (Chilvers & Longhurst, 2016). Secondly, because a role also "*always bears a [...] relationship to one or more other roles" – one actor's role is always related to, and constructive of, other actors' roles. Together, roles form so-called role constellations, or "webs of roles, which interact, interrelate, and co-evolve with one another with regard to a specific issue*" (Wittmayer et al., 2017, p. 50).

Public role constructions build upon taken for granted assumptions of people's abilities and willingness to perform the activities and responsibilities that are part of a particular roles. Based on the imagined publics identified in section 2.2, we distinguish three different types of assumptions that are relevant in the construction of public roles. *Epistemic assumptions* are about a public's perceived (in)ability to understand, deliberate, and assess issues correctly. Within this category also fall assumptions about the types of knowledge, research, and information that people are perceived to have access to, believe in, and rely on, in their assessment of a situation. *Action assumptions* concern a public's perceived (in)ability to act upon its intentions effectively. Amongst action assumptions are expectations concerning people's behaviour and responses in particular situations. *Normative assumptions*, then, concern a public's perceived value drivers and principles. Often, normative assumptions include a moral judgment in that they suppose people's (un)willingness to care about the 'right' things and to be a social and moral agent.

Epistemic, action and normative assumptions regard a public's capacity to 'critically shape its responsiveness in problematic situations' (Emirbayer & Mische, 1998, p. 971); that is, its agentic capacity to iterate on past attitudes, actions and practices; to project a variety of alternative future trajectories of action (for the collective); to make practical and normative judgments among these alternatives and to choose the most desirable route for societal change; and to act intentionally in following this desirable route (Emirbayer & Mische, 1998; Pelenc et al., 2013). At the heart of public role constructions in transitions is the interwovenness of agency and responsibility. Assumptions on public agency are influential for the sort of activities and the types of responsibilities that are perceived as reasonable, fair, and suitable for publics in transitions; and, at the same time, it is the shared perception of a collective responsibility for societal change that guides the need for and evaluation of public agency (Pelenc et al., 2013).

The diverse ways in which public agency and responsibility are defined in and by public role constructions set the requirements for various types of relationships with other actants in energy transitions. Zooming in on the constructed relationships between publics and other actants in imaginaries helps overcome dichotomous understandings of inclusion and exclusion. Instead of asking, how imagined publics work to include (some) public groups, a focus on role constructions thus allows researchers to ask, how public roles are made by governance actors to justify particular social and technological structures, procedural formats, and forms of inclusion. Of course, such research questions also require holistic methodologies that can help to meaningfully capture the diverse role co-constructions for publics.

3.3 Methodology

3.3.1 Q methodology

Q is a methodological procedure for the study of subjectivity (Stephenson, 1968). It provides a reproducible measure of individuals' self-referential, holistic viewpoints (Brown, 1980). In Q, participants assemble their viewpoint on a topic by sorting a set of purposefully selected statements. The result is a unique sorting,

or Q-sort, which is further explained by the participant in the sorting interview. Q-sorts can be correlated to identify patterns of shared meaning – or shared perspectives – amongst participants.

A Q-study follows several distinct steps (van de Grift et al., 2020): 1) identification of the concourse; 2) selection of statements; 3) selection of participants; 4) sorting interviews; 5) factor analysis; 6) factor interpretation.

3.3.1.1 Identification of the concourse

The concourse is an exhaustive set of statements about a domain. It is scoped by the research question, in our case, *'what are the diverse publics imagined in governance of the Dutch heat transition?'*. For our concourse, statements by governance actors about attributes, behaviours, roles, and responsibilities of citizens in the heat transition were gathered between June 2017 and June 2018. We relied on a wide range of sources, including media outlets, Ministerial letters to Dutch Parliament, interviews with energy professionals, notes from stakeholder meetings and internal strategy sessions of a Dutch gas company. We collected, inductively labelled, and categorised 457 statements.

3.3.1.2 Q-sample selection

A Q-sample is a selection of statements, which should be balanced and representative for the diversity in the concourse. Each statement in the set should be subjective, clear, and succinct. We moved from our broad concourse to a smaller Q-sample in iterative steps. Firstly, we removed statements with overlapping meaning, and reformulated, merged, and refined statements. Secondly, we designed a sampling grid based on the inductive categories that emerged in concourse identification to ensure our Q-sample was diverse and representative. The Q-sample had to include a balance of unique statements from each of the identified categories. The first selection that was made was discussed within the wider project team to make sure all selected statements were clear, subjective, and uniformly interpretable. We also conducted two pilot interviews to test comprehensiveness and representativeness of the Q-sample. Eventually, we came to a final Q-sample of thirty-eight statements (Appendix A.1).

3.3.1.3 Participant selection

Participant selection in Q involves identifying 'persons who are theoretically relevant to the problem under consideration' (Brown, 1980, p. 192). For our participant selection, we defined governance actors as those actively involved in policy formulation and implementation discussions on phasing out natural gas in the Netherlands.

To identify relevant participants, we made use of two heuristics. At the time of our study, the Dutch government organised multi-actor climate tables to prepare a Dutch Climate Agreement. We made a list of participants who joined tables at which phasing out natural gas in the built environment was discussed. As the climate tables were not fully inclusive, we also relied on media reports to identify underrepresented actors. Amongst others, activist groups protesting continued gas extraction proved not systematically included. We made sure to invite representatives of these groups in our study. From this longlist, twenty participants were selected whom we believed held diverse positions and perspectives. Fifteen participants were willing to participate. Through snowball sampling, we added participants to our P set. After 30 interviews, the evolving P set was compared with the initial longlist, and seven additional participants were invited. Thirty-seven participants took part in our study (Appendix A.2).

3.3.1.4 Q sorting interviews

Data collection in Q takes the form of interviews, during which participants are asked to sort statements. They first do so in three categories (agree, disagree, neutral) and then specify their sorting on a forced-choice, bell-shaped grid (Brown, 1980). Interviews result in two forms of data: quantitative Q-sorts and interview transcripts.

Participants were interviewed in December 2018-July 2019. They were asked to rank statements on a 9-point scale (Fig. 1) based on the question: '*To what extent do you agree with the following statements on citizens and publics in the Dutch heat transition?*'. During and after sorting, participants were asked about the statements placed towards the outer sides of the grid, and other statements they felt particularly strong about. Interviews were transcribed and coded manually.

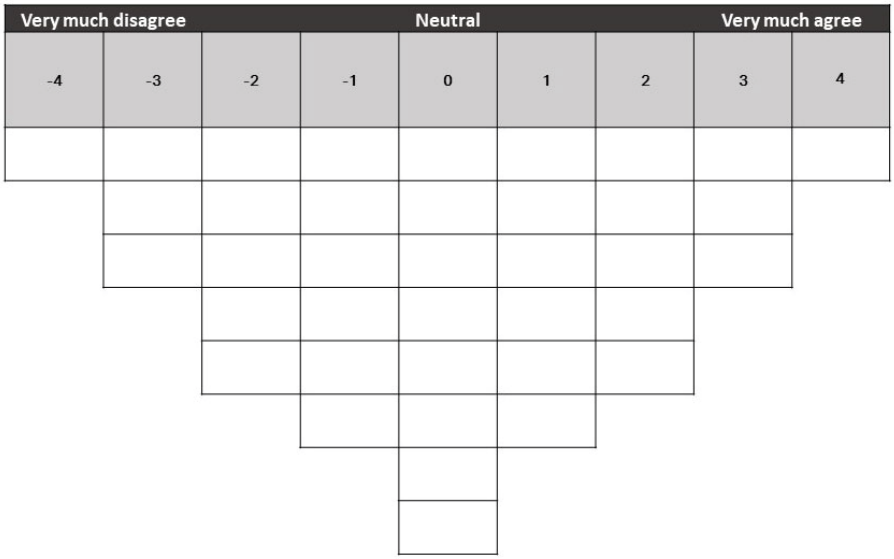


Figure 3.a. Grid used during sorting interviews

3.3.1.5 Factor analysis

Factor extraction in Q is an iterative process, in which factor solutions are theoretically and statistically compared to find the most fitting solution. The analysis starts by correlating Q-sorts (Brown, 1980). Q-sorts that correlate strongly form clusters around a factor. The extent to which a Q-sort is like a factor is given by its factor loading[24], which ranges between -1 and 1. We compared solutions with 3, 4, 5, 6 and 7 factors[25]. Whether a solution was considered fitting depended

[24] Brown, 1980, p. 222. A factor loading is considered significant at $p<0.01$ level, when it exceeds 2.58*SE. SE is calculated by $1/\sqrt{n}$, where n is the number of statements in the q-sample. In our study, a loading was significant at $p<0.01$ level when it was equal or larger than $2.58*(1/\sqrt{38}) = 0.419$. If a Q-sort had a significant factor loading on more than one factor, a minimum difference of one standard error with the second-highest loading was required.

[25] We used the online software package KenQ. KenQ offers Centroid Factor Extraction (CFE) and Principal Component Analysis (PCA), and for each of these options, the choice to apply judgmental or varimax rotation and to flag significant factor loadings automatically or manually.

on the number of unique significant factor loadings[26], the cumulative variance explained[27], and the interpretability of the factor arrays in relation to the interview data[28].

Ultimately, we decided on a PCA solution with 5 factors (Appendices A.1 & A.3). The factors were rotated with varimax first, after which two small manual rotations were undertaken[29]. The solution explains 56% of the variance in the data. 29 of the 37 Q-sorts have a unique significant loading on one of the five factors, and each factor has at least 3 unique significant loadings (Appendix A.3).

3.3.1.6 Factor interpretation

In interpretation, the factor arrays are translated into holistic perspectives. The interview data is indispensable at this stage.

Each array is characterised by defining statements: the statements with the highest and lowest z-scores in a factor, which are positioned on +4, +3, -3 and -4 in the arrays. Sometimes, less saliently ranked statements are still theoretically meaningful. These were included in interpretation. Distinguishing and consensus statements help understand differences and similarities between perspectives. Distinguishing statements are sorted significantly different by participants loading on one factor compared to participants that load on other factors. Consensus statements are sorted similar across all factors. In our study, there were no consensus statements. We have provided an overview of defining and distinguishing statements per factor in the results.

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[26] Factors were accepted if they had at least two unique significant factor loadings. We preferred solutions in which more than 75% of the participants had a unique significant factor loading.

[27] In solutions that explained less than 40% of the cumulative variance, factors became less clear and detailed.

[28] A factor array is based on the weighted z-scores for each statement in a factor - calculated based on all Q-sorts with a unique significant factor loading on that factor.

[29] Components 1 and 2 were manually rotated by 10 degrees. Components 2 and 5 were manually rotated by -7 degrees. Both rotations were carried out based on our interview data.

Factor interpretation resulted in five imaginaries (see section 4). In each imaginary, reference is made to statement numbers and their position in the factor array. Distinguishing statements are identifiable by D or D*. Where quotes are used, participant identifiers are referenced.

3.3.1.7 Methodological limitations

While Q is lauded for its ability to reduce researcher bias by giving participants control over the sorting process, there is still room for researcher subjectivity to influence the study scope and outcomes. This can happen in every step of the methodological procedure but is prevalent in concourse identification and Q-sample selection (Sneegas, 2020). In these phases, statements may be overlooked, deemed irrelevant and (wrongly) excluded from the Q-sample. In this study, a missing statement was identified half-way through the interview process – making it impossible to add it to the sample. 'The neighbourhood as a social unit in the Dutch heat transition' was considered absent by some participants. Considering the importance currently granted to the neighbourhood in participation design, this statement could have added more depth and detail to the results.

Researcher subjectivity can also influence factor extraction and interpretation of the factor arrays, which is why it is considered desirable to share the preliminary interpretation with participants for verification and reflection. While individual sorting patterns were discussed with participants, and results presented to a wide array of actors involved in heat transition governance in the past few months, participants were not involved in factor interpretation. This is another limitation.

3.4 Results: five imaginaries in the Dutch heat transition

3.4.1 Meaningful participation in a diverse society

Eight participants, working for publicly owned organisations such as grid operators (N=5), not-for-profit organisations (N=2), and advisory organisations (N=1) have a unique significant factor loading on factor 1.

According to this imaginary, there is no such thing as 'the public'. Society consists of many co-existing groups that all have different interests, ideas, values, and beliefs (24, +4 D). These groups also have diverse wants, needs and abilities (6, -3 & 17, 0). As one participant explains: *"We're too much looking at inhabitants as a group. While there are vastly different people in that group. There are people that do want, people that don't … some that want to go figure it out by themselves… and some who say: 'I don't care. Just show up when it's ready'. And that variety needs to be accommodated"* [P22].

Diversity poses a challenge for governance actors trying to realise the heat transition. There is no one-size-fits-all solution. Therefore, top-down decision making is impossible. The heat transition takes place on a neighbourhood or municipal level and requires decisions that will directly impact people's living environment and well-being. If you want such decisions to be accepted, you need to include people in decision making. Participation can prevent protest: "*When people start protesting, they often have a good reason to do so. You should have thought about that beforehand (…) it might slow down the transition a bit, but that is not because of the protesting. That is because you did not have your things in order. You didn't think well about… well"* [P23] (8, -4).

Meaningful participation is fostered by early involvement of interested citizens and provision of clear, honest, and transparent information (26, +3 & 27, +3 D*). The latter is particularly important because there is a lot of misinformation being shared on risks, impacts, and desirability of certain energy projects (33, +3). With the right information, participation can work to educate:

"That knowledge development of people, which fits their decision making competences – that just helps you in the discussion. People who now say: 'it must all be low temperature heating'… and we go and say: 'but do you know what that means, in terms of costs?', 'Yes, that's cheaper', they'll answer. No, it is not cheaper. It is more expensive. So, how are we going to do that? (…) That is the nice thing, if a neighbourhood is involved in tackling her own problems. Then they will go do research. And while in the beginning, they may say: 'let's do low temperature', after a couple of months, they'll say: let's not" [P22].

Meaningful participation also requires governance actors to learn and be self-critical towards their procedures and actions. To be able to really listen to, and accommodate, citizens' perspectives, technical experts and energy professionals need to "*deconstruct current silos between professionals and non-professionals"* [P22] and let go of some of their pre-existing deficit assumptions about people. In the end, most citizens will be reasonable, willing to listen and open for dialogue (35, -3).

While in this imaginary, citizen inclusion is considered critical for acceptance, participation is also believed to have its limits (16, +2), especially with respect to coordination and ownership of collective infrastructures (13, -3). Energy infrastructure is a collective good and must be guaranteed by grid operators with appropriate technical expertise and a clear statutory responsibility (18, -2). There is an important role for the Dutch government to own, supervise and decide on (national) energy infrastructure. People sufficiently trust the government to decide for them on these collective infrastructures (34, -1 D*).

Table 3.a. Distinguishing and defining statements of factor 1.

Distinguishing and defining statements factor 1		
Sorted on	#	Statement
		More positively sorted statements
+4 D	24	'The public' does not exist. There is a large diversity of groups in society who all have different interests and ideas.
+3	26	The sooner that people within the environment become involved with plans or projects, the better.
+3 D*	27	Inhabitants want sufficient and clear information. If you explain what is going to happen, you can prevent resistance.
+3	33	Protesting against continued gas extraction is allowed, but you should not spread lies about the risks, or the necessity, of natural gas.
+2	16	There are limits to participation – there are some things, on which citizens simply cannot co-decide.
0	17	There are many energetic, participating inhabitants who like to co-decide.
		More negatively sorted statements
-1 D*	34	Nowadays, a lot of people feel suspicious towards the government and do not trust the decisions it makes for them in relation to energy.
-2	18	Provide citizens with control over budgets and let them handle things themselves.
-3	6	Consumers want to choose and generate their own energy, and, in time, trade it with their neighbours.
-3	13	Ownership of energy sources and infrastructures should lie with citizens.
-3	35	There are a lot of people who do not want to take part in a meaningful dialogue – attempts at that only end in a shouting match.
-4	8	We ought to close the gas tap for a couple of weeks. That would make for a lot less screaming and shouting for the phase out of natural gas.
USL: 8		Explained variance: 14%

3.4.2 Strong and enthusiastic communities in the lead

Six participants have a unique significant loading on factor 2. These participants represent citizen activist groups fighting continued onshore gas extraction (N=2), environmental NGOs lobbying for minimal extraction and use of fossil fuels in the Netherlands (N=2), and governmental bodies involved in overseeing the phase out of natural gas in the built environment (N=2).

In this imaginary, the transition relies on enthusiasm, agency, and sense of collective pride within communities (31, +4 D*). As one interviewee explains: *"I strongly believe in the power of communities. I think communities are the key. You see, they want to go faster, that is noticeable... and if you compare that with other parties, like the Ministry of Economic Affairs and Climate... there is just a mismatch. Because we see a lot of citizen initiatives and energy cooperatives. My hope is that is we are going to become independent of fossil fuels ourselves. That is how you fix the problem. If there is no demand from your own community... You will see, together we can go much faster than the government"* [P3].

People are considered important and valuable agents in the transition (7, +3). There is a lot of social capital (relationships, networks, shared norms, and values) that can be used to carry out the transition (15, +2 D*). People generally have a lot of energy and motivation to develop, adopt, and implement renewable energy alternatives. Indeed, there are many smart, active, and intrinsically driven people who want to get going with the transition (17, +2 D*). They notice that change is needed and are concerned about the earth and quality of life on it, not only now but also for future generations. They feel an urge to preserve and do good within their own spheres of influence.

To reap the benefits of existing social capital and goodwill, it is important to stimulate and financially support citizen collectives in their efforts around renewable energy. With the right support, there are few decisions that cannot be made by people on their own (18, +3 D* & 16, -1 D*).

Not only is the community or local collective considered as key to success in this imaginary, but there is also an explicit contestation of incumbent energy actors. These actors have (too) much to gain from continued production and use of natural

gas and other fossil fuels. They are financially incentivised to keep in place, or even expand, current carbon-based and technocratic forms of energy provision.

Traditional energy policy and project development is drenched with marginalising frames of publics, which are strategically used to disempower societal groups and communities. Instead of listening to people's concerns, these public and private actors create inappropriate and inaccurate labels such as NIMBY (23, 0 D & 10, -3 D & 32, -2) and the 'silent majority' (38, -2). These labels work as cognitive barriers to meaningful participation and help exclude active local community members from formal and legal procedures (35, -3 & 2, -3 D). In other words, these frames allow traditional energy developers to ignore people's emotions, perceptions, arguments, norms, and values and prevent sector reflexivity (8, -4). This is unacceptable.

3.4.3 NIMBYs, social contestation and the threat to decarbonisation

Nine participants have a unique significant loading on factor 3. All these participants have a strong background in, or extensive knowledge of production and distribution of natural gas (N=9). In the context of the energy transition, most of them are currently exploring the role of alternative gases (N=7).

In this imaginary, the main threats to successful decarbonisation are social contestation of critical energy sources, technologies, and projects and distrust towards incumbent gas and energy sector parties.

Not in My Backyard opposition around energy is very real and it is a threat to the energy transition (23, -3 D). Irrespective of the type of project, whether it regards small gas field development or wind energy, *"they will just tell you: 'we don't want it here, fix it elsewhere', that is so symptomatic"* [P25]. NIMBYs polarise decision making on the transition, and not only by the extreme viewpoint that they represent. They make use of and distribute misinformation (33, +3), base themselves on emotions and irrational arguments (32, +2), misinterpret and misperceive safety risks and impacts (36, +3), and are not open for dialogue. *"It might not be lies, but they're not willing to listen to the facts and enter into a discussion. They'll immediately say 'we will continue to litigate because this is unacceptable'"* [P27].

Table 3.b. Distinguishing and defining statements for factor 2

Distinguishing and defining statements factor 2		
Sorted on	#	Statement
		More positively sorted statements
+4 D*	31	To make the transition a success, you need to stimulate a local sense of collective pride for the own sustainable energy provision.
+3 D*	18	Provide citizens with control over budgets and let them handle things themselves.
+3	26	The sooner that people within the environment become involved with plans or projects, the better.
+3	7	The most important stakeholder in the energy transition is the public.
+2 D*	17	There are many energetic, participating inhabitants who like to co-decide.
+2 D*	15	There is sufficient social capital amongst Dutch citizens (relationships, networks, norms and values, commitment to the community, et cetera) to make the local heat transition a success.
0 D	23	The 'not-in-my-backyard' label for involved inhabitants around energy projects is obsolete.
		More negatively sorted statements
-1 D*	16	There are limits to participation – there are some things, on which citizens simply cannot co-decide.
-2	32	People living around energy projects base their opinion of these projects on emotions and mostly irrational arguments.
-2	38	It is completely unknown, who the broader public is to whom we ought to listen. She keeps quiet.
-3	35	There are a lot of people who do not want to take part in a meaningful dialogue – attempts at that only end in a shouting match.
-3 D	10	The whole transition becomes potentially delayed by a small group of protestors at the local level.
-3 D	2	If you want a project to remain unexecuted, add as condition societal support.
-4	8	We ought to close the gas tap for a couple of weeks. That would make for a lot less screaming and shouting for the phase out of natural gas.
USL: 6		Explained variance: 11%

Consequently, energy governance has become complex. Often, there is no local social licence, and it is difficult to establish what is acceptable to people. Decision makers feel torn between the short-term demands of local publics and the need for long-term reliable energy supply for everyone. Unfortunately, most people cannot comprehend this dilemma: they are incapable of grasping the workings of our energy system and the complexity of the transition (9, +2). "*The Dutch are incredibly spoiled with an energy system that has such a high level of reliability and security of supply. (...) that is unique in the world. People don't comprehend the considerable box of activities that is behind it (...) they don't see the economic and societal costs of security of supply. Those are invisible*" [P25]. Hence, people do not realise how reliant they are on natural gas and the gas sector, and instead see 'security of supply' as a disguise for public-private interests. How the media report on these issues is not considered helpful; it portrays an extremely negative image of the natural gas sector (25, +1 D*), while paying little attention to everything the sector provides for. Though you should not actually do it, cutting off gas supply for a couple of weeks would help demonstrate how much society still relies on natural gas, now and in the coming decades (8, +2 D*).

People mistakenly believe that the complete phase out of natural gas should be accomplished in but a few years (5, -2 D). They are frightened and wrongly convinced that high transition costs will befall them. At the same time, many do not feel the urgency of climate change mitigation, nor the need for an energy transition (11, -3). The transition seems an unnecessary unfairness to them, especially as it appears they will have to pay more than industry. Of course, if you know how the economic system works, you realise fairness has little to do with it: in the end, "*citizens always pay via taxes or buying products in which CO_2-reductions are discounted in pricing*" [P35, similar statement P27 and P25] (21, -3 D*). Nevertheless, because of these perceived fairness issues, people now oppose the energy transition at large. By advocating the swift phase out of natural gas, NIMBYs, environmental NGOs and the media have created resistance against decarbonisation.

The way to de-escalate protest, on a local level and at large, is to ensure that there is some form of financial benefit for people – or at least, to make sure that people do not experience financial loss. In the end, people care most about whether and

how the heat transition will affect their wallets and comfort levels (12, +4 & 30, +3). Other measures that will result in more acceptance are "*public-friendly information sharing on permits and procedures"* [P7] and more involvement of citizens in decision making. The latter, however, is easier said than done. There are simply limits to what can reasonably be expected from citizens who lack a systems perspective and technological knowledge. Ownership of energy sources and infrastructure for citizens is, for example, not at all desirable (13, -4) and might lead to *"heated discussions and fights between neighbours"* like in *"Kolkhoz in Russia"* [P7] or *"anarchic Polish collectives*" [P25]. In the end, some form of centralised coordination remains necessary. How to ensure societal acceptance for those top-down decisions is a key challenge.

3.4.4 Collectivism & vulnerable groups at risk

Three participants have a unique significant loading on factor 4. They are all planning the phase out of natural gas in the built environment (N=3).

In this imaginary, a collective approach is a prerequisite for an efficient, affordable, and fair transition, even though it may sometimes be at odds with free choice and individual or local group interests (19, +3 D).

"We all realise that you get in together, or you don't do it. Because it... it is such a big transition of course. And there are big interests involved. And big risks. If you act as a collective... you don't leave all these risks to be carried alone by the individual... you can also better seize the opportunities that come along (...) And I realise that if it's not the task itself [decarbonisation] that is central, but the 'we decide for ourselves' attitude that may come with decentralisation and local ownership... well, then self-interest might prevail. Then local ownership may become a threat" [P31].

Table 3.c. Distinguishing and defining statements factor 3.

Distinguishing and defining statements factor 3		
Sorted on	#	Statement
		More positively sorted statements
+4	12	Societal support for the heat transition is determined by its impact on people's wallet.
+3	33	Protesting against continued gas extraction is allowed, but you should not spread lies about the risks, or the necessity, of natural gas.
+3	36	Safety should be dominant in considerations for energy extraction, however, a difference must be made between real safety risks and safety perceptions of local inhabitants.
+3	30	People mostly want to be taken care of and be supplied with easy and affordable energy.
+2	9	The average person will not be able to understand the complexity of the energy transition.
+2 D*	8	We ought to close the gas tap for a couple of weeks. That would make for a lot less screaming and shouting for the phase out of natural gas.
+2	32	People living around energy projects base their opinion of these projects on emotions and mostly irrational arguments.
+2	37	For those living around energy project, financial gain – i.e. have a share in the profits – is important.
+1 D*	25	People are presented with a considerably distorted and negative image of the fossil industry by the media.
		More negatively sorted statements
-2	4	Citizens understand that the costs of phasing out natural gas cannot be borne only by the government, and that they themselves will have to wage in too.
-2 D	5	Citizens are convinced that natural gas will remain available for a while longer.
-3	11	The urgency of the energy transition is broadly felt within society.
-3 D*	21	It is not fair, that the majority of the transition bill is to be paid by households.
-3 D*	23	The 'not-in-my-backyard' label for involved inhabitants around energy projects is obsolete.
-4	13	Ownership of energy sources and infrastructures should lie with citizens.
USL: 9		Explained variance: 14%

Phasing out natural gas in the built environment comes with a lot of financial risks. There is a large group of people who cannot carry these risks on their own. These are financially and socially vulnerable households (14, +4, D*) that have little savings or assets (if any) and earn a minimum wage. Often, these people do not have a strong social network to rely on, and they lack applicable knowledge and organisational capacity. As it is, these households have their own short-term concerns, for example, how to pay their rent or mortgage for the coming month. It would be unfair and socially unacceptable to expect these households to pay a high transition bill (21, +3 & 12, +3).

Acceptable decarbonisation involves exploring and preferring the most cost-efficient options. There are two important measurements: firstly, an option is desirable if it comes with the lowest possible societal costs. Secondly, it is desirable if it applies the 'not-more-than-usual' (NMDA) principle, which implies that the individual costs of alternative heat should not exceed the costs a household would have borne, were it using natural gas. Based on these standards, collective solutions like heating grids are often preferable above more expensive individual options: these solutions have the advantage of scale and provide in people's demand for easy and affordable heat (30, +2).

However, such solutions potentially impose limits on citizens' opportunities to choose for energy and heat on their own terms (16, +2): "*We're trying to make a deal for a heating grid for 30,000 to 35,000 households. And a collective approach makes it possible. But that does mean, that if people say... 'but I don't want a heating grid'... well, sorry. It's going to be a heating grid, or else you don't have heat."* [P31].

Collectivism involves coordinated decision making, with parties in charge that can decide for everyone. Because of the complexity of the task, it is considered undesirable to give citizens this responsibility (13, -4 & 18, -3). Many of the issues at stake are highly technical and require expert knowledge; there are difficult financial choices and trade-offs to be made; and there are always socio-political tensions as some people will not get what they want, will not be happy about it, and will try to delay the process (10, +1 D*). That is why we need public decision makers with a formal mandate, such as government officials, grid operators, and housing corporations, to make the tough trade-offs on everyone's behalf (29, +2

D*). Their challenge is to find a way to make these decisions acceptable for those whose wants clash with collective needs. This requires proper information sharing and consultation and openness and transparency on why certain trade-offs are made.

Table 3.d. Distinguishing and defining statements for factor 4.

Distinguishing and defining statements factor 4		
Sorted on	#	Statement
		More positively sorted statements
+4 D*	14	There is a large, vulnerable group of people that cannot participate in the heat transition.
+3	21	It is not fair, that the majority of the transition bill is to be paid by households.
+3 D	19	The collective interest of all Dutch citizens is more important than the interests of local groups in the energy transition.
+3	12	Societal support for the heat transition is determined by its impact on people's wallet.
+2	30	People mostly want to be taken care of and be supplied with easy and affordable energy.
+2 D*	29	People might not want it, but large-scale energy generation must be developed irrespective of the consequences for our landscape.
+2	16	There are limits to participation – there are some things, on which citizens simply cannot co-decide.
+1 D*	10	The whole transition becomes potentially delayed by a small group of protestors at the local level.
		More negatively sorted statements
-1 D*	7	The most important stakeholder in the energy transition is the public.
-2 D*	26	The sooner that people within the environment become involved with plans or projects, the better.
-3	25	People are presented with a considerably distorted and negative image of the fossil industry by the media.
-3	11	The urgency of the energy transition is broadly felt within society.
-3	18	Provide citizens with control over budgets and let them handle things themselves
-4	13	Ownership of energy sources and infrastructures should lie with citizens
USL: 3		Explained variance: 9%

3.4.5 Unburdening individual user-consumers in the transition

Three participants have a unique significant loading on factor 5. Two of them work for a government organisation (N=2). One participant works for an advisory organisation on citizen participation in the heat transition (N=1).

In this imaginary, success of the heat transition depends on the extent to which individual user-consumers are willing to take up certain behaviours, tasks, and responsibilities.

In the past few decades, the State has increasingly retracted and delegated responsibilities to citizens. This has had several economic advantages, such as more individual choice and cost reductions in provision of collective goods. Politically, delegating responsibilities to citizens has helped to address societal suspicion of, and unease with, top-down governmental decision making (34, +3):

"*There are a lot of things that the government just does not do for you anymore. It no longer takes care of your health insurance, to name an example. While the situation used to be that... we used to have a collective health care funds, and it was really the government who took care of these things. And that was not a big success in all cases. So... there is some responsibility [for citizens]. And I think that you will ultimately also get more social support, this way. If the government is to say: 'we are taking away natural gas, and you are all going to be connected to a heating grid...', I think they have something to explain then"* [P24].

In the transition too, citizens are made partially responsible for realising decarbonisation, which is appropriate. After all, many of the measures that need to be executed pertain to the private domain. These activities involve individual investments in home insulation, renovation, and renewable energy technology, or require consumer choices for certain energy providers. They '*take place behind the front door'*, a domain where the government cannot unilaterally enforce its plans and policies (20, -4 D*).

The biggest challenge in the transition is to get people to realise that they have a responsibility, and to stimulate them to take appropriate actions. It is most critical that people embrace renewable technologies, products, and services. Without user-consumers enacting the energy transition with their cumulative individual

choices, decarbonisation will fail. It is in that respect, that the Dutch public is the most critical actor in the transition (7, +4).

Unfortunately, people are insufficiently incentivised now. Most people feel comfortable continuing using natural gas because it offers a certain standard of living: it is easy, reliable, and invisible (28, +2 D* & 5, +2 D*). It delivers a great level of comfort while being affordable (30, +3). There are very few viable heat alternatives that can compete on these aspects. The State has the responsibility to incentivize business and user-consumers, financially and otherwise, to become more climate-friendly. Part of this is that they should ensure that mature alternatives for natural gas are developed and brought onto the market, and that everyone has free and equal access to these (14, -2 D*).

In addition, individual user-consumers should be unburdened, so that it becomes easier for them to adjust their consumption patterns and energy behaviours. After all, transitioning requires trade-offs for people. They must invest time, energy, and money in figuring out, implementing, and maintaining their own renewable energy provision. There are very few people who are so driven by green motivations that they are willing to go through all that hassle (6, -3). Indeed, for most people, the benefits of being green and autonomous simply do not outweigh the investments. To nudge these people in the right direction, they must be given hassle-free transition options.

Table 3.e. Distinguishing and defining statements of factor 5.

Distinguishing and defining statements factor 5		
Sorted on	#	Statement
		More positively sorted statements
+4	7	The most important stakeholder in the energy transition is the public.
+3	34	Nowadays, a lot of people feel suspicious towards the government and do not trust the decisions it makes for them in relation to energy.
+3	30	People mostly want to be taken care of and be supplied with easy and affordable energy.
+3	16	There are limits to participation – there are some things, on which citizens simply cannot co-decide.
+2 D*	5	Citizens are convinced that natural gas will remain available for a while longer.
+2 D*	28	People do not have a strong opinion about natural gas. It is so deeply ingrained in our culture, we are so addicted to it, that it has become taken-for-granted.
		More negatively sorted statements
-2 D*	14	There is a large, vulnerable group of people that cannot participate in the heat transition.
-3	25	People are presented with a considerably distorted and negative image of the fossil industry by the media.
-3	8	We ought to close the gas tap for a couple of weeks. That would make for a lot less screaming and shouting for the phase out of natural gas.
-3	6	Consumers want to choose and generate their own energy, and, in time, trade it with their neighbours.
-4 D*	20	It is not the responsibility of citizens to find an alternative for natural gas. If the government closes the gas tap, it should also take care of alternative sources
USL: 3		Explained variance: 8%

3.5 Synthesis

In section 4, we described five different imaginaries of publics and their inclusion in governance of the heat transition. Rather than reflecting on each of these imaginaries separately, in this section we compare the ways in which public agency and responsibility are constructed differently, and how this results in different roles constellations in enactment of the Dutch heat transition. We also reflect on how these role constellations relate to different understandings of citizen inclusion.

3.5.1 Role constructions and public agency & responsibility in transition governance

3.5.1.1 Empowered or vulnerable? Different forms of agency and the matter of inclusion in, or inclusiveness of, transitions

The five imaginaries highlight the co-existence of diverse and contested assumptions regarding public agency in the Dutch heat transition and provide insights into how such constructions help prioritize forms of citizen inclusion.

To varying extents, imaginary 1 (Meaningful public participation in a diverse society) and 2 (Strong and enthusiastic communities in the lead) present empowered citizens who can (co-)decide on energy matters. The imaginaries differ in how they portray citizens as having access to the right information – where the difference is primarily an epistemic one, namely, what sort of 'information' is considered prerequisite for decision making. In imaginary 1, there is a preference for rationality and science-based information, whereas in imaginary 2, the value of emotions, perceptions and the situated experience is embraced. The imaginaries also differ in the ways in which citizens' responsibilities around energy grids are envisioned – whereas in imaginary 1, grid management is explicitly considered a more technocratic activity for trained, knowledgeable, and experienced engineers, imaginary 2 does not touch upon matters of distribution, leaving citizens' roles herein undefined. Either way, both imaginaries are based on more positive epistemic and action assumptions and produce publics as capable and intentional agents in transitions who ought to be given an active role in both decision making and technology implementation.

This is in contrast with how publics are construed in imaginary 4 (Collectivism & vulnerable groups at risk). Even more than well-known NIMBY representations recognisable in imaginary 3 (NIMBYs, social contestation and the threat to decarbonisation), imaginary 4 builds upon a range of epistemic and action deficits that work to reduce the agentic capacity of people. While in imaginary 3, the deficits imagined mostly are mostly epistemic and normative in nature, in imaginary 4 the deficits pertain to the public's ability to act. Some publics are almost considered non-agentic – their assumed financial, social, and educational vulnerabilities are such that active participation in the organisation of the transition is considered nearly impossible. The construction of these publics as passive actors is further reinforced by the characterization of the transition as technical, complex, urgent, sensitive, and high-risk. Consequently, the role foreseen for these vulnerable households is limited: at best, they ought to be transparently informed on decisions made. What is more, more enabled publics who desire more control over their own heat provision may come to pose a challenge for realising collective systems when their individual choices result in the unequal access to, control over, and costs of heat provision. As such, the freedom to choose of these more enabled publics can legitimately be restricted in the name of inclusiveness. In this way, even more agentic publics are granted a limited role in governance.

Hence, in comparing multiple imaginaries, we can observe different public agency constructions that seem to result in different trade-offs being made between inclusion of citizens in realising system change, and inclusiveness of future heat provision.

3.5.1.2 Virtues or obligations? Different forms of public responsibility in transitions

In the presented imaginaries, forward-looking public responsibility in transitions is constructed in ambivalent and diverse ways. Different interpretations of what it means to be responsible for something are applied – which are mostly underlined by different normative assumptions about publics. This is most clear when comparing imaginary 2 (Strong and enthusiastic communities in the lead) and 5 (Unburdening individual user-consumers in the transition) with each other.

In imaginary 2, citizens are the idealistic and creative initiators of change. They are explicitly positioned as frontrunners who voluntarily take their moral responsibility to contribute to climate change mitigation. These publics are imagined to be particularly virtuous and even praiseworthy (Van de Poel et al., 2012). In imaginary 5, an entirely different meaning of responsibility is construed; here, to be responsible does not only refer to the display of appropriate norms, values, and behaviours, it refers "*to hav[ing] an obligation to see to it, that a certain state-of-affairs occurs*" (Van de Poel & Sand, 2018). Within the more liberal market envisioning underlying this imaginary, citizens are considered free and autonomous in the private domain. It is beyond the government's mandate to enforce measures here. This explicit autonomy of citizens within the private domain creates an obligation: citizens are required to change their behaviour and consumption patterns to advance the heat transition. When and where individuals fail to embrace these obligations proactively, facilitation, unburdening and even nudging are justified to steer them in the 'right' direction. This normative 'push', of course, is in direct conflict with the genesis notion of freedom.

In that sense, public responsibility may explicitly become at odds with public agency. Even though citizens are granted an important role in the heat transition, the normative qualities and restrictions that are simultaneously imposed on these roles limit the sort of activities and attitudes citizens can take up, and thus remove some of their agentic abilities (Lennon, et al., 2020).

3.5.1.3 Unresolved tensions: responsibilities of other actors and accountability around mistakes in energy development

Transitions stimulate the collective envisioning of new roles and responsibilities. But collective imagination never starts from scratch: how responsibilities of publics and other parties were lived up to in the past influences how new roles become defined and justified. This is particularly true if there are unresolved issues of recognition and accountability.

This is most evident when comparing imaginaries 2 (Strong and enthusiastic communities in the lead) and 3 (NIMBYs, social contestation and the threat to decarbonisation). These imaginaries propose opposing views on who should *not* oversee the heat transition. In imaginary 3, NIMBY-motivated protestors prioritize

their own gains above the collective interest and slow down the transition that energy actors are working hard on achieving. Their influence on governance should be regulated, controlled, and perhaps even minimalised. In imaginary 2, quite the opposite is visible: there is a strong conviction that incumbent public and private energy developers are self-interested actors, who in the past have prioritized financial gains above safety, well-being, and fairness of local communities. There is also a belief that these parties will try to slow down the transition.

In these imaginaries, there is an almost dichotomous appointment of blame (Van de Poel & Sand, 2018): in both, other parties are envisioned as normatively deficient agents who cannot be trusted to execute critically important activities in the heat transition in a socially responsible manner. At the same time, both imaginaries also contain defensive narratives against being blamed, highlighting the interactive character of imaginaries. The ways in which the NIMBY framing is explicitly rejected and condoned in imaginary 2 is a good example of such a defensive narrative, that builds upon a responsive political awareness or 'meta-knowledge' of the ways in which responsibility in transitions is framed and why (Batel & Devine-Wright, 2020).

Despite their substantial differences, imaginaries 2 and 3 also have something in common: the belief, that the national government should be more accountable for past mistakes and current struggles around energy development. Imaginary 2 calls for a stronger government acknowledgment of the need to make different value assessments around energy development. Illustrative for many who align with this imaginary is how the Dutch national government has been handling the consequences of extraction-induced earthquakes in Groningen. Imaginary 3 similarly shows that the gas sector operates at the frontline of a crisis of accountability in public administration. In this imaginary, the sector provides a critical collective good in a way that is authorised by the national government and conforms to existing laws and regulations. As perceived by the participants, the sector's lost social license is at least partially the responsibility of the Dutch government. In both imaginaries, it is considered prerequisite for any future heat system that the government adheres to, prescribes, and enforces more clear societal standards for energy development.

3.5.2 Relational role constellations and systems of inclusion

The above makes clear that imaginaries contain different constructions of public agency and responsibility and serve to create a variety of roles for publics in transition governance. What is more, these constructions also serve to legitimize roles for a wide range of other energy actants, such as governments, private parties, technologies, and infrastructures. The simplest way to describe the role relations between publics and other actants is by referencing the activities, attitudes, and responsibilities that actants have towards each other (for example, supporting, facilitating, enabling, protecting, caretaking, challenging, hindering, competing) (Wittmayer et al., 2017). Illustrative of this relationality of roles in the found imaginaries is how the government's role and stance towards publics is constructed. In imaginaries where publics are constructed as more agentic, governments are to *facilitate* meaningful participation or to *remove* potential obstacles that prevent citizens to independently develop energy solutions within their homes or communities. In other imaginaries, where publics are either non-agentic or a potential counterforce in the transition, the role of governments is to *decide* on important transition measures in light of societal controversy, to *protect* its citizens, to *enforce* clear rules and regulations, and to make collective value trade-offs that concern the distribution of costs and benefits in the heat transitions.

These role relationships are underlying a variety of institutional and procedural solutions in the heat transition that were also captured in the imaginaries. A good example is the NMDA-principle that is explicitly part of imaginary 4 (Collectivism & vulnerable groups at risk). In essence, the NMDA is a protective measure under the current Heat Law that ensures that households relying on (city) heat grids pay the same price for an amount of heat as households relying on natural gas, put in place to because household-consumers generally do not have the option to choose between different heat alternatives – their role, in that sense, is limited by previously made infrastructural decisions. The NMDA subsequently limits the freedom – and regulates the role – of heat providers to use their own pricing mechanisms.

Interestingly, the new Collective Heat Supply Act (in Dutch: Collectieve Wet Warmtevoorziening) that is to enter into force on January 1, 2022, will abandon the

NMDA-principle as a regulatory pricing mechanism now that natural gas is likely to become scarce in the future and gas prices are expected to rise. Instead of NMDA, cost-based pricing mechanisms are to be adopted (Ministerie van Economische Zaken en Klimaat, 2020b). How to guarantee equal pricing – and thus equal access to heat – across regions and infrastructures is still under discussion. In essence, this discussion involves the national government redefining its own role relationship with its public – i.e., what it means to protect household-consumers– in this heat transition in and through institutional change – i.e. the abandonment of the NMDA-principle – while simultaneously developing new roles and responsibilities for publics, grid operators, heat suppliers and municipalities in experimenting with collective heat sources and infrastructures. While such changes in role constellations are beyond the scope of this article, it would be interesting to observe whether and how the envisioned roles of publics in found imaginaries, and particularly in imaginary 4, evolve with the establishment of these new laws and institutions.

A last point we want to draw attention to is how imagined publics as role constellations come to perform different forms of inclusion in and through technologies and infrastructures (see also Chilvers & Longhurst, 2016; Skjølsvold et al., 2018). Centralised heat solutions and gas grids, which are more often considered desirable by actors aligning to imaginaries 3 (NIMBYs, social contestation and the threat to decarbonisation) and 4 (Collectivism & vulnerable groups at risk), come to perform entirely different, long-term role constellations than small-scale technologies and electricity infrastructures – which are more often mentioned in the context of imaginary 5 (Unburdening individual user-consumers in the transition). Currently, this receives insufficient attention in governance discussions even though there is a broad recognition that future heat provision will be increasingly diversified. It would be interesting if follow-up research would aim to uncover whether indeed, (governance actors involved in) adapting gas or heat infrastructures anticipate a more passive role for people within more top-down coordination, while those focused on electricity infrastructures and technologies in the heat transition foresee more independent and agentic roles for publics in collaborative or even bottom-up coordination structures. The long-terms consequences of such infrastructural differences in anticipations on citizen engagement with heat also deserve more consideration.

3.6 Conclusion

Our Q study showcases the diversity of imagined publics in governance of the Dutch heat transition. We found five distinctive imaginaries. Three of these, 'Strong and enthusiastic communities in the lead' (2), 'NIMBYs, social contestation and the threat to decarbonisation' (3), and 'Unburdening individual user-consumers in the transition' (5) at least partially resonate with imagined publics that have been discussed in the literature (see Section 2). Imaginary 2 presents capable, enthusiastic, and willing community members as key actors in the transition – an image that relates to the 'energy citizen' studied by others (see section 2). Imaginary 3 portrays threatening, irrational, and selfish NIMBYs and a malleable, vulnerable, and unknowledgeable general public. Imaginary 5 assumes individual user-consumers who are insufficiently motivated by environmental values to voluntarily adopt renewable energy technologies.

We also captured two relatively new imaginaries: 'Meaningful participation in a diverse society' (1), in which social plurality of publics is embraced and considered a valuable input for decision making, and 'Collectivism & vulnerable groups at risk' (4), an imaginary in which large groups of socially and financially vulnerable groups justify a top-down governance approach. We believe it has been the use of Q methodology and our focus on system change that has allowed us to chart out these new imaginaries.

Another advantage of the application of Q in this study is that is has enabled the identification of imagined publics as holistic imaginaries instead of as a set of (deficit) assumptions. The imaginaries uncovered in this study show that publics and their identities, attitudes, capabilities, and responsibilities are always co-constructed with issues, other actors, procedures and institutions, infrastructures, and technologies in heat transitions.

In the synthesis of results, co-construction in imaginaries was explored by use of the concepts of roles and role constellations. We looked at how imaginaries construct distinct roles for publics in the heat transition based on assumed public agency and responsibility. Contrasting different public role constructions in imaginaries helped to identify ongoing tensions between citizen inclusion in current governance and inclusiveness of (future) heat provision, and between

individual freedom of choice and societal obligation. We also zoomed in on how assumed public agency and responsibility also come to legitimize roles for other actants in transitions, such as governments, private parties, technologies, and infrastructures.

In analysis, imaginaries were found to be interactive – seeing that some role constellations were at least partially created in direct response to other imaginaries encountered. By exploring this interactivity, past yet unresolved issues of recognition and accountability were identified that continue to influence how new (public) roles in the heat transition are defined and justified.

These aspects were discussed merely in an exploratory manner and more research is needed on the long-term performativity of the found imaginaries on citizen inclusion in the Dutch heat transition. Future research could contribute to better understanding the political power dynamics involved in the construction and performance of imagined publics; for example, are there imaginaries that prevail and are taken-for-granted in current policy debates on the heat transition? Such research would also have to include the political activities that actors engage in to promote and counteract imagined publics over time in transition governance. Furthermore, despite the wider recognisability of some imaginaries, each imaginary contains contextual and time-specific meanings and understandings and is only completely true in its spatial and temporal originality. Comparative case research is needed to validate – or contrast – these insights in other settings.

CHAPTER 4

A new carrier for old assumptions?

Imagined publics and their justice implications for hydrogen development in the Netherlands

Abstract

This paper presents an anticipatory approach to energy justice by focusing on nascent justice implications of imagined publics in transition visions. We test this approach in a case study, building on an interpretive qualitative content analysis of twenty-one vision documents followed by a select number of interviews on the hydrogen transition in the Netherlands. Combining theory and case insights, we develop the thesis that publics, in their various roles and compositions and with their diverse demands, are not always acknowledged nor correctly represented in the Dutch hydrogen transition. Non-recognition and misrecognition of publics in vision documents is problematic and unjust and can result in future distributive and procedural justice issues when these recognition injustices become performed in and through policy, technology, and infrastructure development and implementation. Reflections on the opportunities and risks of this anticipatory approach are provided, and so are recommendations for more just and inclusive (hydrogen) transitions.

4. A new carrier for old assumptions? Imagined publics and their justice implications for hydrogen development in the Netherlands[30]

4.1 Imagined publics in transition visions: tools for identifying nascent justice issues

Justice is a prominent theme in energy policy and governance. A significant number of (inter)governmental organisations have expressed their support for a just and inclusive energy transition (International Labour Organisation, 2015; European Union, 2019; COP26, 2021) in which costs and benefits of energy are fairly shared (i.e., *distributive justice*), diverse societal groups and their rights are recognised and considered (i.e., *justice through recognition),* and citizens are involved and included in energy decision making (i.e., *procedural justice*) (Sovacool & Dworkin, 2015; Jenkins et al., 2016; Correljé, 2021).

High-level support for the *ideal of a just and inclusive energy transition* necessitates *a practical translation of justice* in national transition trajectories and policies (Jenkins et al., 2018). Unfortunately, this practical translation is lagging for several reasons, not in the least because in practice, there often prove to be different, and sometimes even incompatible conceptions of justice, each of which might be morally defensible (Van Uffelen et al., 2024). Alternatively, we could say that the interpretation of what is 'just' is influenced by time and (social) context (Walzer, 1984), as well as by the perspectives that one might have on transitions created by particular technologies, institutions, and actor positions. At any time in transitions, different justice conceptions co-exist. This normative diversity is a cause for normative uncertainty. In light of such uncertainty, translation and implementation

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of justice is far from straightforward (Van Uffelen et al., 2024). This adds to the already uncertain character of transitions. Transitions are carried out based on inherently incomplete future orientations and are thus always exposed and vulnerable to the unexpected. Especially with regard to justice, it is often unclear if and how today's activities will impact (different) people in the future.

Perhaps due to these issues, energy justice research so far has kept a safe distance from engaging with future (in)justices in transitions, with some notable exceptions (see, for example Milchram et al., 2018). Nonetheless, there are increasing calls for a more proactive orientation to justice in transitions (Jenkins et al., 2021; Dillman & Heinonen, 2022). Indeed, as most transitions are currently still in the (early) implementation stage, now is the time at which we can still prevent harm by opting for activities, technologies, and forms of organization that engage actors in (more) just ways and create a (more) fair attribution of transition benefits and burdens across society (Jenkins et al., 2018). There is only a short window of opportunity though, which starts to close once policies, technologies and infrastructures become implemented to solidify the socio-economic functioning of the energy system for decades to come.

A proactive approach to (in)justice in transitions requires insights, frameworks, and instruments for anticipation, reflection and steering on nascent energy justice issues. In this paper, we therefore propose a conceptual advancement to energy justice that provides a more systematic and theoretically grounded approach to anticipating (in)justice in transitions. We do this by introducing theoretical insights on the coproduction of imaginaries in energy justice thinking (Jasanoff, 2015; Ballo, 2015; Chilvers & Longhurst, 2016; Krzywoszynska, et al., 2018; Skjølsvold et al., 2018). More specifically, we argue that nascent (in)justices can be identified in advance by studying the ways in which different imagined publics are coproduced in transition visions.

Transition visions are "*devices for specifying a desired end-state in the form of a particular socio-technical regime (...), supported by an effective 'coalition of the willing', around which processes of technological, institutional, and behavioural change can be guided and motivated*" (Berkhout, 2006, p. 300). Amongst others, such visions include representations of society and what it needs, understands, demands, and accepts in transitions (Jasanoff, 2015; Ballo, 2015; Bergman et al.,

2017; Longhurst & Chilvers, 2019). These assumptions can be studied with the concept of *imagined publics* (Welsh & Wynne, 2013; Barnett et al., 2012; Marris, 2015; Rodhouse et al., 2021), which are policy actors' representations of different publics, including their assumptions about publics' identities, abilities, behaviours, normative preferences, and responsibilities (Rodhouse et al., 2021).

Imagined publics are unavoidable in vision formation and policymaking. Visions in policy are always aimed at bringing about a certain effect for particular (target) populations (Schneider & Ingram, 1993). Nevertheless, imagined publics are not always correct. In fact, they often build on simplistic and stereotypical biases (Howarth et al., 2014). This is problematic, especially if policymakers are only tolerant of some (biased) imagined publics while other (more nuanced or diverse) imaginaries are ignored. The performance of biased imagined publics in and through policy, plans and behaviours can result in harm to and exclusion of societal groups (Schneider & Ingram, 1993; Howarth et al., 2014). It is in this way that imagined publics in transition visions might have significant (future) justice implications. This also has consequences for how real-life publics assess the legitimacy of transitions. Such transitions will not easily be considered legitimate if there is a strong feeling that they will lead to increasing societal exclusion, inequality, and injustice. Public contestation against (imagined publics in) transition visions that are perceived as unjust and illegitimate can make the realisation of transitions more difficult.

For successful climate change mitigation, it is critical to organize transitions in a just and inclusive manner. This starts in the vision phase, with imagining justice in relation to the potential publics that may be implicated in these transitions. In this paper, we therefore study imagined publics in transition visions with the aim of understanding and anticipating the potential energy (in)justices that might arise when such visions become performed. We establish a conceptual relationship between imagined publics and recognition justice, and also explore whether the ways in which publics are (not) recognised could result in future distributive and

procedural injustices[31]. With this, we make two contributions to the energy justice literature. Firstly, exploring how performativity of imagined publics might create future justice issues helps with the development of an anticipatory approach to energy justice. We not only test this approach, but also discuss potential opportunities and risks of this approach. Secondly, by using imagined publics to understand and operationalise recognition (in)justice, we offer new insights in what is arguably the most difficult justice tenet to define, measure and steer on in energy justice (Van Uffelen, 2022).

The case in which we test the potential of this new anticipatory approach is the Dutch hydrogen transition. This transition is inseparably linked to the phase out of natural gas in the Netherlands. For decades, the Netherlands has had access to abundant and affordable natural gas extracted from the Slochteren gas reserves in the North of the Netherlands. Over the years, natural gas has become used on a large scale in heating of the built environment, in industrial processes, and electricity generation, amongst others. The continued use of natural gas in these sectors and activities is no longer self-evident: recent concerns for climate change and extraction-induced earthquakes in the Groningen region have forced the Dutch government to commit to an accelerated phase out of natural gas in the Netherlands. This phase out is complex and requires a reform of existing socio-economic behaviours, institutions and of technical-physical infrastructures (Correljé, 2018).

In this context, hydrogen has emerged as a promising alternative that could at least partially replace natural gas (Ministerie van Economische Zaken & Klimaat, 2020a). Its associated characteristics are that it can be renewably produced and could potentially be used in a wide variety of applications (CIEP, 2019). For the Netherlands in particular, its gaseous form is considered a critical systemic advantage because it justifies the partial reuse of existing natural gas

[31] We do not claim that all procedural and distributive justice issues are derived from recognition injustice. Instead, we argue that there are instances in which institutionalised differences in cultural status and power can come to justify and maintain distributive structures and procedural arrangements.

infrastructure, knowledge, and expertise (Ministerie van Economische Zaken & Klimaat, 2020a).

To explore the conditions of and possibilities for a hydrogen transition the Netherlands, the government has engaged with multiple public and private actors. Many of these have published vision documents, either invited to do so by the government, as a form of research, or, as part of their lobbying activities. These documents specify desired trajectories for the hydrogen transition. The Dutch government has also published its own vision for hydrogen (Ministerie van Economische Zaken & Klimaat, 2020a).

We reviewed and analysed twenty-one of these hydrogen transition vision documents – which we see as explicit expressions of visions that are "*formalised, documented, published and publicised, and, in some sense, intended to have a material effect*" (Longhurst & Chilvers, 2019, p. 976) – and also carried out interviews with governance actors involved in the formulation of these visions. Based on the analysis of this data, we develop the thesis that publics, in their various roles and compositions and with their diverse demands, are not always acknowledged nor correctly represented in visions for the Dutch hydrogen transition. While problematic and unjust on its own, we also identify potential future distributive and procedural justice issues that may follow from misrecognition and non-recognition of publics in hydrogen visions. To help address and prevent further performance of injustice, we provide recommendations to policymakers and other actors in the (Dutch hydrogen) transition.

In the remainder of this article, we define energy justice and establish a conceptual relationship with imagined publics (section 2). Section 3 contains the methodological approach: an interpretive qualitative content analysis of twenty-one vision documents, supported with interviews with visionaries, on the hydrogen transition in the Netherlands. The results of this analysis are presented in section 4. Section 5 elaborates on the justice implications of the found imagined publics provides recommendations for more just and inclusive hydrogen transitions, and section 6 discusses the potentiality of this approach for energy justice literature. In section 7, overarching conclusions are drawn.

4.2 Theoretical approach

4.2.1 Energy justice

Energy justice promotes the universal provision of safe, affordable, and sustainable energy. In this, it encourages the fair treatment and meaningful involvement of all people (Jenkins et al., 2016). A helpful distinction that is often made in the literature is between distributive, procedural and recognition justice.

Distributive justice is concerned with the allocation of the costs and benefits of energy – for example, the risks, impacts and revenues of energy production, the costs of infrastructure development, and access to energy – and with the distribution of responsibilities (Walker, 2009). Procedural justice is concerned with aspects of procedural design that stimulate inclusive and fair (political) participation for all, such as transparency, impartiality, timeliness (i.e. prior to the passage of important decisions and development steps), full information disclosure, accountability, and due process (Sovacool et al., 2016).

The third tenet, recognition justice, refers to the need to acknowledge that there is social, cultural, and institutional precedence that affects the exposure of some groups to the benefits and burdens of energy more than others, and to their ability to influence this (Correljé, 2021). It thus concerns the ways in which different groups in society are recognised and understood as legitimate stakeholders by those in policy and decision making, and in "*institutionalized patterns of cultural value*" such as norms, perspectives, and expectations (Fraser, 2003). Alternatively, one could say that recognition justice refers to social groups and the ways in which pre-existing cultural institutions shape their abilities to participate on par with others in political and socio-economic interaction (Fraser, 2001).

Procedural, distributive and recognition justice are often considered separate categories – that is, at least in the traditional justice literature, recognition justice is seen to correspond to social status, distributive justice to economic class and consequences, and procedural justice to political representation – that each require their own remedies (Fraser & Honneth, 2003; Fraser, 2005). At the same time, influential justice scholars such as Nancy Fraser have argued that these different tenets of justice should be considered as co-fundamental and mutually irreducible (Fraser, 2003). Difficulties to participate on par with others in one

aspect of social life will often translate into or create difficulties in other areas as well. For example, without appropriate political representation, it is particularly difficult to stand up for one's own social and economic interests. Likewise, without recognition it is near impossible to be heard and seen properly in political decision making. In short: injustice reinforces injustice, and as such it rarely remains limited to one particular aspect of social life (Fraser, 2003). Specifically for energy justice, we could see how forced injustices in one tenet could trigger further injustices in other tenets. For example, the unequal sharing of financial benefits from energy projects can reinforce vulnerability of some stakeholders, leaving them with little resources to fight for inclusion and negotiation in their own interests around energy project developments.

4.2.2 Imagined publics and their connection to recognition justice

Imagined publics are social representations of groups of people that are based on (a narrow set of) qualities that are assumed to define or characterise a particular societal group. These qualities can involve their values, beliefs, behaviours, and abilities, amongst others (Rodhouse et al., 2021). Imagined publics are shared and collective, and – often unconsciously – used by actors who try to *do something* in transitions. That is, by actors who advocate for particular future solutions, write and implement policy, innovate, invest in renewable technologies, and collaborate on new projects, to name a few of such doings. All these doings require the anticipation to society and its sub-groups. That is, to the diverse publics that are supposed to be impacted in particular ways, amongst others, because they are to gain access to (more, or more affordable) renewable energy technologies, or because they are going to be affected by plans that require changes to their homes or direct living environment (Walker & Cass, 2007; Barnett et al., 2012; Ballo, 2015; Bergman et al., 2017; Rodhouse et al., 2021).

In their doings, actors take their imagined publics into account. Alternatively, we could say that they develop policies, technologies, and projects for the publics that they imagine. Through this process, imagined publics become ingrained in doings, which subsequently work to perform these particular imagined publics in and through (the workings of) policy, technology, and infrastructure. This can have significant implications for real-life publics and their values (Walker & Cass, 2007; Soutar & Mitchell, 2018; Cuppen, 2022). Amongst others, real-life publics may

either be enabled or limited in how they can engage with energy. One example from an earlier study we conducted to this phenomenon concerns the ways in which governance actors imagine social housing tenants (Rodhouse et al. , 2021). Such tenants were often assumed as being particularly vulnerable, lacking knowledge, money, and social networks to meaningfully participate in transitions. Such assumptions often led governance actors to conclude that such tenants had to be unburdened as much as possible in the decarbonisation of the social housing stock. Amongst others, this required taking responsibilities off their hands, and making important decisions for them instead of with them. While there may be a significant group of tenants who would indeed fit the bill and be happy to be unburdened, the group 'social housing tenants' is much more diverse than this imaginary assumes, with many tenants having important resources, motivations and abilities with which they can contribute to transitions, like having a critical role in their social community. In short, through the performance of narrow imagined publics, actors might impose a pre-constructed status and social identity onto real-life publics – not all of which may recognise themselves in these identities nor be happy with the decisions made for them. Consequently, exposing imagined publics in transitions as early as in vision formation is essential for understanding recognition (in)justice in energy transitions. It provides insight in the status that these imaginaries can accrue in relation to 'real-life' publics and other actors.

There are at least two ways in which we could see imagined publics resulting in recognition injustices. Firstly, and in line with the earlier given example, imagined publics can build upon simplistic, stereotypical, and depreciating biases, portraying publics as an obstacle or as inferior, incompetent, and irrelevant in political and socio-economic interaction (Burningham et al., 2015). Energy research has identified several of such biases against publics in energy governance. Rodhouse et al. (2021) categorise these as epistemic, action, and normative deficits. When a public is seen as epistemically deficient, it is assumed to lack the knowledge and capacity to evaluate and understand the energy system, and (the risks of) key energy technologies and infrastructures. When a public is seen as characterised by action deficits, it is assumed to lack the abilities, tools, and so forth to act in transitions. Lastly, when a public is considered normatively deficient, it is assumed to be primarily concerned with its own individual interests, norms, and values rather than with the collective interest or the greater good. These

kind of biases relate to what is known as misrecognition as disrespect, (Fraser, 2003), ordinary-political misrepresentation (Fraser, 2005) or testimonial injustice (Fricker, 2013) in justice literature.

Secondly, governance can be tolerant of only dominant and institutionalised imagined publics, ignoring or side casting faction imaginaries (Howarth et al., 2014). Here, injustice emerges because publics do not have the same symbolic powers to construct and impose legitimate knowledge, norms, and imaginaries in policymaking as other actors (Fricker, 2013; Howarth et al., 2014). Incumbent energy companies, industry associations and even environmental NGOs tend to have expert status and direct access to policymaking and can participate more fully in the construction of social representations. Publics – as citizens, energy consumers, energy cooperatives, technology protesters, invited participants, or in other roles – lack this status in and access to formal procedures. Consequently, they lack the power to institute socio-political reality in their own terms and to contradict biases that may exist about them. These groups are effectively hidden behind the incorrect imaginaries that are supposed to represent them. In the justice literature, this relates to non-recognition (Fraser, 2003) or hermeneutic injustice (Fricker, 2013).

4.2.3 Coproduction as a building block of an anticipatory approach to justice

So far, the energy justice tenets have largely been investigated independently of each other resulting in a kind of categorization overview of injustices surrounding certain technologies and projects (see, for example, Dillman & Heinonen, 2022). What is still missing – and arguably is critical to come to an anticipatory approach to energy justice - is a theoretical perspective that engages with the co-fundamental character of these tenets (Fraser, 2005). That is, a theoretical approach that recognises that recognition, procedural, and distributive injustice are continuously productive of each other through their performance in particular techno-economic energy regimes. One injustice can create or reinforce another at particular moments in time in system development, but this process may also take place over time as systems continue to develop.

To come to such a perspective, we start by observing the conceptual similarities between Fraser's ideas on the co-fundamental nature of the three justice tenets

(Fraser, 2005) and the coproductionist ideas that are prevalent in the literature on imaginaries emerges. Coproduction refers to the understanding that technological systems are not separate from the social, cultural, political, and economic contexts in which they are developed. Instead, they are co-constructed in and with these contexts (Jasanoff, 2015). From a coproductionist perspective, imagined publics are coproduced with of a wide range of material objects, devices, infrastructure, social practices and behaviours, theoretical and cognitive investments, and forms of organisation. A recent popular frame of coproduction is to think of the ways in which *objects*, such as policies, technologies and infrastructures, are coproduced with *subjects*, such as particular societal groups, and with *organisings*, or the ways in which the latter are supposed to engage with the former (Chilvers & Longhurst, 2016).

Very briefly and undoubtedly with some generalization, the literature on imagined publics states that publics are performed through the (often material) objects and (institutionalized) organizations with which they are coproduced. If these imagined publics are biased or incomplete – that is, if there is misrecognition or non-recognition of publics in the imaginative stage, then the proposition that follows from the above is that these injustices will become coproduced and performed in other elements of the system. The performance of (unjust) imagined publics will lead to specific techno-economic energy regimes in which there are particular opportunities and constraints for real-life publics in how they can engage with energy. Hence, from a coproductionist stance, how energy systems take shape and function either to increase or decrease equality and justice in society is related to the ways in which publics have been recognised as early as in the visionary process.

It is through the mechanism of performativity that recognition injustices can produce additional procedural and distributive injustices. Alternatively, we could say that recognition, procedural, and distributive injustice are coproduced and performed in particular techno-economic energy regimes and that while this coproduction can occur simultaneously, it can also continue over time, with certain recognition injustices producing and performing other harms once imagined publics become part of the system's 'software' (i.e., its rules, regulations, norms, values) and 'hardware' (infrastructures, technologies, and so forth).

Amongst others, this theoretical perspective is helpful in that it allows us to think about justice as coproduced with and performed through technology and other materials – such as hydrogen technology, carriers, and infrastructures (Marres & Lezaun, 2011). Moreover, it also enables us to see justice as a systemic issue that is deeply present in our imaginings of our future, and subsequently performed in diverse ways over time (Jasanoff, 2015). In this way, a coproductionist perspective on energy justice offers opportunities for informed anticipation of future injustices.

4.3 Research approach

Our research approach was two-fold. Firstly, we aimed to identify and distil coproduced imagined publics from hydrogen visions. Our primary data sources were the vision documents, which include position papers and investment agendas, and documents presented as advisory, exploratory, or science-based forecasting studies. In addition, we interviewed various policy actors associated with the studied vision documents to gain a deeper insight into why publics were imagined in a particular way, around particular themes and trends in the hydrogen transition, and to validate the insights from the primary analysis.

4.3.1 Search & sampling strategy for the qualitative content analysis of vision documents

The document search strategy involved multiple steps. Firstly, critical vision documents were identified in conversations with hydrogen experts and in observations in hydrogen-specific industry and actor networks. Secondly, we systematically scanned the homepages of important stakeholders around hydrogen such as industry associations, governments, and the Dutch Innovation programme for green gases. Thirdly, we conducted a targeted Google search using

different combinations of key words[32]. Fourthly, we applied the snowballing technique to references in the found vision documents.

In sampling, the scope was limited to vision documents published in the Netherlands in the period 2017-2020 to include documents that were drawn up in the same zeitgeist and under similar contextual conditions. We excluded documents outlining more generic energy scenario studies, including in our sample only those vision documents that focused on hydrogen and hydrogen infrastructure. In the end, twenty-one vision documents were selected.

The final list is included in the appendices (see Appendix B.1) and includes position papers, government visions, investment agendas, and research and advisory reports from diverse actors. The selected documents differ in length, ranging from 8 to 214 pages, with an average of 56 pages.

4.3.2 Coding, analysis & interpretation of vision documents

The vision documents were analysed in an interpretive qualitative content analysis (QCA). QCA involves the systematic and inductive identification of meaningful categorical themes, patterns and relationships in textual data (Hsieh & Shannon, 2005; Flick, 2013), which are analysed to draw conclusions on the wider (policy) context for which the textual data is representative (White & Marsh, 2006).

Our analysis started with an initial reading of the document sample. Once a general sense of immersion was achieved, the documents were read in-depth and manually coded by use of Atlas.Ti Cloud. Text fragments were given multiple codes – often relating to different elements of the coproduction, i.e., objects, subjects and organisings. The codes were subsequently categorised. Category labels were, amongst others, production methods, application areas, forms of organisation, participation formats, societal values, presence or absence of a public, public

[32] Used key words were “Waterstof” [hydrogen], “Waterstofeconomie” [hydrogen economy], “Nederland” [the Netherlands], Toekomst” [future], “Visie” [vision], “Route” [trajectory] and “Agenda” [agenda].

identity, and assumptions of publics. In coding we were particularly interested in how categories were expressed to relate to each other.

When half of the documents were coded and no new codes, categories or relationships between categories emerged, each code was given a working definition and coding rules. The codes, definitions and coding rules made up the final codebook, which was then used to code the remaining vision documents. Interpretation involved a detailed description of observed patterns and trends, first for the categories separately and then for reoccurring coproductions.

Lastly, we selected coproductions that included an imagined public, or that defensibly concerned issues, technologies, and trends that warrant public involvement. Consequently, we excluded coproductions around the industrial application of hydrogen, hydrogen in heavy and freight transport, and offshore infrastructure development. These were considered functionalities around which the potential for public involvement seemed limited to none.

4.3.3 Reflecting on trends and patterns in interviews

Interviews were held with a number of policy actors involved in hydrogen developments in the Netherlands (N=10)[33]. In these interviews, actors were prompted to reflect on their assumptions around publics in and around the partial replacement of natural gas with hydrogen in the Netherlands. Broader patterns and trends within particular coproductions were also discussed. These interviews served to validate and enrich the insights gained in the qualitative content analysis of the vision documents. See Appendix B.2 for an overview of policy actors interviewed.

[33] These interviews were part of a larger study on the future of gases and gas infrastructure in the Netherlands (N=45). These interviews generally covered a broader range of topics, such as the phase out of natural gas, the development of alternative forms of heat provision, and the introduction of hydrogen to replace natural gas in some functionalities. Interviewed policy actors involved in or associated with visions for hydrogen were asked about the patterns, trends and themes that were identified in the vision documents, with one of the key foci being their assumptions regarding publics in relation to these future visions.

4.4 Results

In the following sections, we describe the diverse coproductions that we identified in the sampled vision documents. We add quotes from the interviews to validate and support the analysis of vision documents. The coproductions identified are organised in three sections: hydrogen production, infrastructure development and hydrogen applications. Together, these three sections cover the breadth of the envisioned future hydrogen value chains. An overview is provided in table 4.a.

Table 4.a. Overview of coproductions in hydrogen visions for the Netherlands

System components (objects)	Recognised publics (subjects)	Inclusion formats (organisation)
Production modes		
Green hydrogen production	Workers who will benefit from (re-) employment in green hydrogen value chains.	Employment
	Uninformed yet largely optimistic (general) public.	Familiarisation (Show & Tell via pilot projects)
Blue hydrogen production	Critical publics with concerns over CCS (health and safety risks, fossil lock-in)	Information sharing, dialogue with NGOs
Infrastructure		
Pipelines	Household consumer and small business owners that could benefit from blending hydrogen in natural gas grids	None
	Uninformed general public who assumes all gas infrastructure in the Netherlands is to be decommissioned in the short term	Clear communication and information sharing
Underground storage	None	None

Applications		
Hydrogen in electricity provision	Society implicated as wanting the most societally optimal (cost efficient) solution.	None
Hydrogen in the built environment	Household consumers with a preference for hydrogen because of the possibly lower (social) costs in hard to insulate houses, continuance of habitual behaviours, and higher comfort and convenience levels	Project-level, methods unspecified
Hydrogen in (personal) transport	Drivers that can be nudged to adopt hydrogen vehicles with fiscal measures. Drivers with a preference for hydrogen vehicles because of the limited 'time at the pump'	None

4.4.1 Imagined publics in hydrogen production alternatives

4.4.1.1 The green hydrogen route

Green hydrogen is the product of electrolysis, a process in which water molecules are split into hydrogen and oxygen with renewable electricity. Green hydrogen can be domestically produced or imported from places with surplus renewable (solar) production. While vision documents identify import of green hydrogen as essential to acquire sufficient volumes, none of the documents meaningfully engages with potential (justice) issues in the international supply chain. Instead, their detailed focus is on the conditions and requirements for domestic production of green hydrogen. In some of these documents the domestic route appears as more advantageous than the import route because of the associated positive socio-economic effects on employment and economic growth (Interviewee 7: *"It is a new*

form of activity after all. And… yes… at least the money spent on this is invested in the Dutch economy. It remains in the Netherlands")[34].

Currently, hydrogen production in the Netherlands is in an infant stage. Green hydrogen is not yet produced at Gigawatt scale, and it is still expensive in comparison to fossil fuels and grey or blue hydrogen. The challenge of 'the green hydrogen route' is to upscale production capacity towards and beyond 2030, which requires cost reductions, efficiency gains and innovation. While this is complicated by technological uncertainties and economic infeasibilities that make for a risky innovation and implementation environment, there is a broad belief amongst visionaries that in due time, techno-economic difficulties can be addressed through more innovation (Interviewee 6: "*Look, green hydrogen is now four times as expensive as grey hydrogen, or more. It will take another ten years for it to… it will have to develop for years before it really becomes cheaper*"). In the document sample, this framing of necessary cost reductions, efficiency gains and innovation justifies a form of organisation labelled 'piloting and experimentation'. Twelve documents mention the need to try-out hydrogen technologies in projects of increasing scale to stimulate learning, knowledge development and future roll-out.

A perceived advantage of pilot projects is that they will illustrate the advantages of hydrogen to a wider societal audience. This is seen as necessary since hydrogen and its risks are unfamiliar to people and is therefore prone to societal rejection, despite that visions project a general societal optimism about green hydrogen at the same time (Interviewee 6: "*because it is newer, people will be a little anxious at first. It is still uncertain and unclear, so if something goes wrong there is a risk that the image immediately becomes negative. And this is also the reason there are many pilots now, to get people used to the use of hydrogen in mobility, the built environment, industry.…*"). The underlying idea is that pilot projects can create a positive 'show and tell' experience, which will help ease the roll-out of hydrogen on large scale:

[34] Quotes from interviewees were translated from Dutch. In translating, we aimed to stay as close to the original meaning of the quote.

"Another measure to achieve the successful implementation of the use of hydrogen is to participate in and carry out pilots and demonstration projects. These projects can make a positive contribution to the public's perception of safety, if properly executed. If this is successful, the informed population will see hydrogen as a possible solution to achieve the climate goals in a safe way and to move society towards sustainability[35]" (Netbeheer Nederland & KIWA, 2018, p. 39)

Only one of the documents in the sample at points includes a different understanding of public engagement. In the Multi-year Programmatic Approach to Hydrogen Innovation (MPAW) (TKI Nieuw gas, 2020), notions of pilot projects as collaborative learning environments in which partners, including societal ones, work together co-occur with 'show and tell' engagement. In this document, the direct and early inclusion of citizens in pilot projects serves to distil their wants, needs, and values at a moment in the development process at which these can still be included in project design.

"(...) in these projects, attention must be paid to the involvement of social parties, including via careful information provision and knowledge sharing, so that maximum support for projects will be created" (TKI Nieuw gas, 2020, p. 44).

4.4.1.2 The blue hydrogen route

Blue hydrogen is produced via steam reforming of methane or other fossil fuels in which carbon-dioxide is captured and used or stored (CCUS). Compared to the green hydrogen route, the blue hydrogen route is identified as more contentious. On the upside, blue hydrogen may help to rapidly decrease CO_2-emissions in the short term and buy time for more competitive renewable alternatives to emerge, especially for the (chemical) industry. Also, blue hydrogen may enable an incremental phase out of fossil fuels and prime the Dutch system for large-scale green hydrogen uptake (Interviewee 10: *"It is madness not to use CCS now. Look... the target is 95% less CO_2 emissions by 2050. Right now, we are all working hard to develop sustainable techniques. And I* really *have every confidence that we can do this as the Netherlands and as a world. I believe that if we think it is important*

[35] All included text fragments in this paper were translated from Dutch.

enough, we will make it happen. But we do have to be realistic. This all doesn't happen overnight. And with CCS you have the option of fixing it for now, and then doing it really well later.").

On the downside it is argued that blue hydrogen production could create a continued reliance on fossil fuels, also known as a fossil fuel lock-in. Moreover, vision documents also anticipate the possibly negative public evaluation of carbon capture and underground storage (CCS), driven very much by lack of knowledge and understanding of what CCS entails as well as by (activists playing on) people's emotions around health and safety risks of CCS (anonymous interviewee: "*If you look at Barendrecht* [a proposed onshore CCS project in the Netherlands that was halted because of major societal resistance (Brunsting et al., 2011)], *there was a man who went on television with a parakeet in a cage and supplied CO_2, which caused his parakeet to fall dead. Of course, the whole of the Netherlands was in uproar (...) and that is difficult at the moment in the public debate. In all this, scientists are rejected on forehand*").

These two issues – the societal reaction to a possible fossil fuel lock in, and society's negative evaluation of CCS – are the main reasons why blue hydrogen is often framed as dependent on both political choices and the industry's ability to gain a social license to operate for CCS. The possible failure to receive such a license is seriously considered. Four vision documents propose measures to address this, such as providing adequate information on CCS, decoupling discussions on CCS from hydrogen narratives, and increasing procedural legitimacy by involving (environmental) NGOs in decision making on blue hydrogen.

"A different situation arises when using natural gas-based hydrogen in combination with CCS. The past has shown that citizens (can be or) are extremely critical of this and that proper information provision and involvement at an early stage are necessary preconditions. That is why it is extremely important to take forward the learning lessons from past CCS projects. Incidentally, the expectation is that for new CCS projects, a choice will be made for offshore CCS, but this is no guarantee that this will run smoothly from a societal stance. Therefore, it is also necessary to seek a dialogue with NGOs to make clear whether and under what conditions there is support for such routes (...) It is important to 'separate' these discussions in

advance so that the discussion about hydrogen is not dominated by the discussion about CCS." (TKI Nieuw Gas, 2018, p. 63).

4.4.2 Imagined publics in hydrogen infrastructure development

4.4.2.1 Pipelines

For hydrogen to become a substantial energy carrier, a dedicated hydrogen infrastructure – a connected system of technical-physical assets (e.g., pipelines, metering stations, mixing/purification installations, storage facilities and so forth) – must be created. In the vision documents, short term priority is given to the development of transport pipelines that physically connect the major regional industrial clusters. This is also known as the national hydrogen backbone. Once the national backbone is in place, development of intraregional pipelines and hydrogen distribution grids could potentially be explored.

All documents foresee that natural gas infrastructure can at least partially be re-used for the transport of either pure hydrogen or gas mixtures in which hydrogen is blended with methane (natural gas/green gases) up to a certain percentage. Which of these alternatives will be preferred remains to be seen. The choice for blending versus pure hydrogen depends on several factors, amongst others the future users that are to be serviced. A dedicated (pure) hydrogen infrastructure is often mentioned in the context of connecting (Dutch and Northwest European) industrial clusters. Blending, on the other hand, is mentioned in relation to decarbonisation of energy provision and in contexts where demand is not yet established or appliances cannot run completely on pure hydrogen, for example, in the built environment. Here, blending would enable an incremental transition path for household-consumers and smaller businesses while extending the use of natural gas assets and appliances, without compromising on the pace of decarbonisation. Moreover, when combined with downstream gas separation and purification, blending could be a way to deliver pure hydrogen to its consumers without incurring immediate refurbishment costs (Interviewee 4: *"The big advantage is that you do not have to do much in the house initially. You can add green gases (…) such as biogases, synthetic gases, or hydrogen to the gas supply. And you can achieve quite large reductions with this. At some point you do have to completely convert, of*

course. But we could potentially achieve a large emission reduction in heat supply simply by mixing in green gases").

Reuse of natural gas pipelines is not without societal challenges. Three vision documents in the sample mention that the public has developed the incorrect assumption that natural gas will be phased out and gas infrastructure will be decommissioned in the Netherlands on short notice. The confusion stems from the government's decision to stop domestic production in Groningen in the coming years, which often becomes conflated with the decision to phase out natural gas in the built environment towards 2050 (Interviewee 1: *"the frame "for Groningen and climate" that is being used in the public debate on the phase out of natural gas is very unfortunate. These are two vastly different goals, each with their own stakeholders, and each requiring different actions on quite different time scales";* and anonymous interviewee: "*The decision to get rid of Groningen gas is positioned too much as if we decided to get rid of natural gas all together. (...) We are phasing out Groningen gas in the short term, not natural gas or other gases. Some people have difficulty getting that through their heads")*. The suggested way of dealing with these public misconceptions is via communication, information-sharing, and familiarisation.

Another societal theme recognised for re-use of natural gas infrastructure is safety. The question is whether pipelines, valves, connection parts and other infrastructure elements can be re-used safely given the potential wider future range of combustible gas blends in the grid and the specific chemical and physical properties of hydrogen (e.g., density, flammability range, boiling point characteristics, heating values) as compared to natural gas. In this discussion, safety is framed as a technical issue. Overall, the feeling expressed in the vision documents is that further research will have to clarify the unknowns in this area and that safety issues can and will be addressed. Overall, there is a lot of trust in the abilities of gas grid operators to assess and manage these risks. Nevertheless, one vision document projects an explicitly negative public in relation to safety of hydrogen transport. In the vision of Netbeheer Nederland & KIWA (2018) the wider public is feared to potentially misinterpret the safety risks.

"*In* [management of] *existing natural gas infrastructure, leak detection is an important means of guaranteeing safety because it enables the timely detection*

and repair of high-risk leaks. In a hydrogen infrastructure too, leak detection will contribute to safety. Especially in the beginning it is worth considering looking for leaks more often than is strictly necessary. To prevent this from being interpreted negatively, it is necessary to clearly communicate that increasing the search frequency is intended to create a higher degree of safety. This can increase citizens' sense of security. When enough experience with the new infrastructure has been gathered over time, the frequency of the leak search can be reduced again" (Netbeheer Nederland & KIWA, 2018, p. 40)

The expectation is that clear communication on these risks and mitigating measures is important to prevent a negative public reaction. Moreover, also in this case the expectation is that potential safety concerns will disappear once it has been shown that the transport of hydrogen is no more risky than the transport of natural gas (Interviewee 6: "*once people are used to hydrogen, they will know that it is actually not that different from natural gas. Yes, it is flammable. But natural gas is also flammable. It is energy, after all. I think once people realize this, safety will not really be such a big problem*").

4.4.2.2 Underground storage

Besides pipelines and grids, thirteen documents in the sample consider large-scale, underground storage capacity as an important, albeit longer-term, objective in infrastructure development. This becomes particularly relevant once the share of hydrogen in Dutch energy provision increases. There are two options: hydrogen can be stored in existing salt caverns, or in depleted natural gas fields. Regarding storage in salt caverns, the general perception in the documents is that there are no particular issues or concerns: *"Smaller-scale storage in salt caverns is already widely used and does not constitute a major obstacle in the technical, economic or social sense"* (CE Delft, 2018b, p. 39).

Potential storage in empty gas fields is another matter, however. There are multiple uncertainties that require further investigation. The uncertainties identified are of technical nature.

"The underlying question is, to what extent large-scale storage of hydrogen in gas fields is necessary and desirable. (…) Research [is needed] into the possibilities and should answer questions as: can chemical reactions occur between hydrogen and

the reservoir? How much hydrogen loss would occur in these reactions? What is the microbial activity per gas field in the Netherlands? What is the sealing efficiency and corrosion resistance to hydrogen of the materials used in gas fields? How much cushion gas would be needed?" (TKI Nieuw gas, 2020, p. 62)

None of the vision documents mention potential societal concerns or imagine (future) issue publics that could arise around underground storage, even though the future large-scale storage options are mostly located in the North and East of the Netherlands. These are regions with a recent history of controversial salt or natural gas extraction and storage, where industry activities have been very much scrutinized for their safety, environmental and social impacts.

4.4.3 Imagined publics in various hydrogen applications

In the vision documents, four sectoral applications for hydrogen are identified: industrial use of hydrogen as energy carrier or raw material, electricity provision, heating of the built environment, and transport and mobility.

4.4.3.1 Hydrogen in electricity provision

Hydrogen in energy provision is discussed in two ways in the vision documents. Firstly, most vision documents present hydrogen and hydrogen technologies as critical instruments in future electricity grid balancing in times of increasing reliance on intermittent renewable energy sources (Interviewee 10: "We *just cannot control electrification right now. And that entails many risks. Look, for example, at the Climate Accord and the agreements regarding electrification that were in made there; all nice and well, but these agreements did not include control mechanisms. We have no control over the pace or level of electrification of demand. Following the Climate Accord, electricity demand will increase from 125 terawatt hours to 150 in 2030. Maybe even more because we have no steering mechanisms nor brakes. And then we also see an increase in the production park, which is targeted for 35 terawatt hours on land alone. An enormous amount, it almost doubles our total electricity production. But there are actually no agreements on how to manage this properly, and the electricity grid really cannot facilitate all this. So, hydrogen is really promising because it could create more control opportunities.*"

An important advantage of this use of hydrogen is that it helps avoid large social investments in far-reaching electricity grid expansions and reinforcements, needed to integrate increasing levels of electricity demand and supply. In some instances, such expansions are not only expensive, but they are also infeasible or considered undesirable, for example, in or close to natural reserves, densely populated areas, or regions where there is already a disproportionate amount of above-ground energy infrastructure. In these cases, re-use of (underground) gas infrastructure for hydrogen is perceived as the potentially more favourable societal choice. Moreover, a considerable number of vision documents discuss hydrogen as critical to 'systems integration'. Hydrogen can function as a future enabler of interchangeability of energy between various levels and functionalities, infrastructures, technologies, and actors. The emphasis is on the interaction between hydrogen technologies and the wider energy system.

These technical-economic rationalities are often used to justify a systems perspective to hydrogen development in energy provision. This implies taking a 'helicopter' view on energy matters to prevent choices that might work locally but are regrettable for the whole. Overall, many visions call for central coordination in energy provision (Interviewee 2: *"I am not such a huge fan of this strong focus on decentralisation at all. Okay, let us attempt to decentralise where we can, but let us also make sure that we centrally organise what we must for system reliability."* This preference for higher-level, systems-oriented decision making has consequences for the ways in which society is imagined and involved. In discussions on hydrogen in energy provision, society is only indirectly implicated in the need for the most societally optimal – i.e., economical - solutions. What is optimal for society at large is decided by calculations and models from technical experts, who evaluate various solutions against their impact primarily based on affordability.

4.4.3.3 Hydrogen in the built environment

The use of hydrogen for heating in the built environment is contentious. Most documents recognise that this hydrogen functionality is surrounded by uncertainties and economic barriers. Amongst others, it is unclear whether hydrogen use at home is even technically feasible, and if it is, whether there will be sufficient (green) hydrogen available. Other unknowns regard socially acceptability, safety, and affordability. None of the vision documents consider

hydrogen in the built environment a short-term priority and all seem to agree that more research, piloting, and experimenting is advisable to explore desirability of hydrogen use in the built environment.

In some vision documents a more prominent consideration of the use of hydrogen in the built environment is called for after 2030, either because of the societal costs or the social acceptance of the transition. In terms of the societal costs, the most commonly referred to reason is that hydrogen could outperform heat alternatives in districts and buildings that are too difficult or too expensive to decarbonise in other ways, for example because of their protected monument status or their lack of insulation options.

Regarding social acceptance, the vision documents assume that residents will be more favourable towards hydrogen than towards other alternatives for natural gas. There are a number of assumed reasons for this favourable attitude. One is that residents care about convenience and comfort. Their willingness to adopt alternative heat solutions therefore depends on the level of nuisance and the amount of time and effort that comes with their implementation. Because the use of hydrogen in the built environment likely involves but few adjustments in distribution infrastructure, and potentially also in (household) appliances, it is expected that the uptake of hydrogen will involve little hindrance for residents (Interviewee 4: *"If you are converted from one gas to another, and you are suddenly green without having to do anything else... these are of course the drivers of such a choice for households"*). A particular advantage of hydrogen over alternatives such as heating grids or all-electric heat pumps is that residents can move towards decarbonised heating without immediately having to invest in renovation and insulation.

"Social aspects deserve the necessary attention. A good balance between costs and benefits (such as improving living comfort and living environment) is important. To create support for changes, it will help if they are accompanied by as little hassle as possible for residents, for example by unburdening them, and nuisance can be kept to a minimum." (TNO, 2020, p. 35)

The above fragment also makes clear that another assumed reason for positive resident attitudes towards hydrogen is that they are rational and economical

actors. They are assumed to make a sensible assessment of the costs and benefits of various heat solutions. Willingness to adopt hydrogen solutions depends on their relative costs in comparison with other heat alternatives. (Interviewee 6: "*You provide citizens with options and freedom of choice. You inform them about the pros and cons, the costs, and the benefits. And then citizens will decide for themselves what option they prefer. They will choose the option that is most attractive to them, the most cost-effective*"). The fact that hydrogen implementation in the built environment has potentially lower costs for the individual end user than alternatives, could make it a more acceptable form of energy in the built environment. A final reason relates to personal habits, namely, that people prefer to continue their current energy behaviours, rather than having to develop new ones. Because hydrogen and natural gas allow for similar behaviours and use of appliances, the assumption is that residents will be more favourable towards it.

From the nuisance, habits and economic trade-off perspective, hydrogen seems a preferential solution for heating in the built environment. Nevertheless, vision documents project that people might still resist hydrogen because they lack knowledge to appropriately evaluate hydrogen in their direct environment. A particular form of engagement that is coproduced with these knowledge deficits is the public information campaign. Once people are better educated and informed, and their awareness and understanding of hydrogen is improved, they will realise how desirable it is for society, so is the perception in the vision documents.

"An important means of informing and drawing attention to hydrogen to the population is an information campaign. In this way, the distinct characteristics of hydrogen can be discussed at an early stage and attention can also be paid to aspects that are different compared to the existing natural gas infrastructure. Main topics are the low ignition temperature, the invisible flame, the exclusion of CO poisoning, the costs (the price of a hydrogen appliance is probably in the same order of magnitude as the price of a natural gas appliance), the comfort experience (which is comparable to that of a natural gas appliance), the fact that hydrogen is a clean fuel and that hydrogen is odourless. Incidentally, this latter issue can be solved with fragrances." (Netbeheer Nederland & KIWA, 2018, p. 39)

4.4.3.4 Hydrogen in transport & mobility

Like hydrogen in the built environment, there is no agreement yet about the relevance of hydrogen in transport and mobility. There is consensus about the importance of hydrogen for heavy-duty and long-distance freight transport, however, the vision documents are less certain about hydrogen in passenger transport. A successful launch of hydrogen in passenger transport depends, amongst others, on the development and uptake of electric driving (EVs) and the development of a sufficiently dense network of hydrogen fuelling stations along the highways and in urbanized regions. The common assumption for personal transport is that EVs will take a majority share of the market as they will become more affordable and cost competitive for short distance transport. This is in part because EV-technology is already proven and scaled up, and in part because green hydrogen will be too scarce and too expensive in the coming years to offer a cost-competitive solution in this area. Eventually, technology improvements to electric driving, such as in charging time and action radius, and the comparative infrastructure costs of electric versus hydrogen driving will shape the final market set-up and the share of hydrogen fuelled cars versus EVs. Vision documents do suggest that fiscal incentives for hydrogen-fuelled cars could help realise a considerable market share for hydrogen-fuelled cars.

Interesting is that in this modality, the driver and driver behaviour are rarely explicitly mentioned. Changes in driver preferences, for example regarding travel time or kilometres travelled in one go, or preferences for individual, shared, or public transport are not discussed. There is one exception, which relates to the amount of time required to fill the tank at the hydrogen filling station; again, there is the assumption that drivers prefer comfort, efficiency, and habit, and want to get back on the road as fast as possible.

4.5 Synthesis: Recognition of publics in coproductions for hydrogen

In this section, we will synthesize how publics are recognised (or not) in the coproductions presented in section 4 and we will elaborate on the justice implications of this.

4.5.1 A new carrier for old assumptions? Misrecognition of publics in hydrogen visions

A first observable trend is that the publics that are recognised as relevant stakeholders in hydrogen development are often based on reproduced 'deficit' model assumptions of publics, which presume a public that is somehow in default (Wynne, 2006; Rodhouse et al., 2021).

Deficit assumptions regarding the publics' knowledge and understanding of hydrogen come back in multiple coproductions around hydrogen. We can observe such deficit assumptions underlying society's perceived unfamiliarity with hydrogen in general as well as in terms of their incorrect understandings of the 'phase out of gases' in the Netherlands. Moreover, such epistemic deficits also show up in statements on society's subjective evaluation of safety risks around CCS and infrastructure re-use. Generally, these epistemic deficits are seen as a reason why people would object to hydrogen across coproductions. Moreover, also visible across coproductions is that such deficient publics often become coproduced with one-directional engagement approaches such as public information campaigns and 'show and tell' pilot projects, in which the role of publics is limited to observation, absorption of information, and passive acceptance.

Other deficits that come back in multiple coproductions relate to the kind of values that publics are assumed to have. For example, imagined publics in the built environment and transport and mobility (the two functionalities in which people are considered as direct future users of hydrogen) are seen as motivated primarily by comfort, convenience, habit, and economic incentives. They are also assumed unwilling to accept too much change or to experience too much (temporary) discomfort for the benefit of a sustainability-driven transition. These kind of normative deficit assumptions coproduce publics with engagement approaches that aim to minimize the impacts of the transition for users rather than asking these users about their future needs and willingness to change.

Across coproductions, therefore, we can see that deficit model assumptions of publics become coproduced with pre-scoped and limited participation opportunities for real-life publics with hydrogen. This is a case of misrecognition

with possible procedural injustice consequences. Unfortunately, this is far from an exception: assumed deficiencies of publics have been prevalent and taken-for-granted in energy governance for decades now, even though existing research has overwhelmingly shown that these assumptions are stereotypical and incorrect (Wolsink, 2006; Barnett et al., 2012; Cotton & Devine-Wright, 2012; Burningham et al., 2015; Butler et al., 2015; Batel & Devine-Wright, 2020; Venhoeven et al., 2020). The scientific relevance of the identification of these assumptions in hydrogen futures, therefore, lies not in their novelty, but in the recognition of their persistence, even reproduction, despite years of (academic) attempts to trigger institutional reflexivity (see, for example, Wolsink, 2006).

4.5.2 The absence of imagined publics as a matter of non-recognition

A second observable pattern across the identified coproductions is that publics are not always seen or recognised as relevant stakeholders in hydrogen development at all. On an overarching level, namely that of vision creation, the failure to acknowledge that citizens ought to be involved in the imagination and formulation of desirable and just future hydrogen systems is a form of non-recognition (Demski et al., 2015). To our knowledge, while at least some of the vision documents were drawn up by multiple actors, no citizens, future user-consumers, or other publics were involved. This is problematic, not just because an opportunity is missed to benefit from the public's ability to evaluate hydrogen futures based on the extent to which these futures meet their normative demands, but also because these visions present and bestow upon publics a future position and status in relation to other actors around hydrogen. Because publics were not involved in vision creation, they were not given the opportunity to self-define their own desired roles, positions and identities in hydrogen visions that are now increasingly enacted. This may be one of the explanations for the fact that publics are often recognised in biased and narrow ways, or not represented at all in coproductions in hydrogen visions.

Another recognition justice issue emerges from the fact that none of vision documents for hydrogen pay attention to, nor reflect on, pre-existing, institutionalised knowledge, values, roles, and relationships. Most pressingly is the fact that the visions tend to prioritise the introduction of low-carbon hydrogen in the (energy-intensive) industry, including though not limited to the development of

a largescale national hydrogen backbone between large industrial clusters through which parties in these clusters will be the first in line to gain access to significant quantities of hydrogen. The backbone is to be realised with significant public investments. This is all justified by reference to values such as cost effectiveness, availability of renewable alternatives in other sectors, and continued economic growth. Indeed, there is a strong assumption that it will be impossible to maintain energy-intensive industries, such as steel and petrochemicals, without hydrogen, while it is critical for the Netherlands that these industries do remain here. Whatever one may make of such all-or-nothing frames, one thing that can be said is that these frames completely ignore the fact that a prioritisation of the needs of the energy-intensive industry may be perceived as unfair by part of Dutch society. Indeed, many energy-intensive industry players have encountered severe public resistance to their production activities in the last years, not only because their activities have shown to have a negative impact on people's health, their living environment, and the climate, but also because of perceptions of continued governmental support for and protection of these parties. The failure to recognise potential public concerns around a preferential treatment for industrial players in these visions – in other words, the failure to recognise normative uncertainty around industrial use of hydrogen (Van Uffelen et al., 2024) – reflects that distributive justice issues may arise if and when more support is given to facilitate the (energy-intensive) industry's hydrogen transition.

Another matter of non-recognition is that publics are not at all considered as potential (co-)owners or (co-)producers of green hydrogen. There are no visions in which citizen collectives are included as active owners of small-scale, locally operated electrolysers, or, in which energy cooperatives provide renewable electricity to produce green hydrogen. From a coproductionist perspective, the absence of active publics is not surprising, considering the closed down technology innovation and implementation environment for hydrogen, which is aimed towards (financial and technical) risk management, increasing energetic economic efficiency through innovation and upscaling, and professionalisation. This narrow focus may be a very defensible choice for those involved in producing hydrogen visions – such as the national governments and large industry – for whom the need to maintain economic growth while responding to climate change urgency is front and centre. Yet, this lacking attention to justice, public involvement

and economic empowerment of citizens in hydrogen visions is a remarkable deviation from earlier hydrogen futures, in which the potential democratisation effects of hydrogen in a decentralised energy world were not only recognised but even lauded (Rifkin, 2003; Eames et al., 2006; Sovacool & Brossmann, 2010). This relatively new closedness of hydrogen visions for active forms of public participation, inclusion and justice also seems to be at odds with the general trend in energy policymaking, both in the Netherlands as elsewhere, to explicitly strive for local (community) ownership of energy-generating assets (Klimaatakkoord, 2019).

The last albeit important area in which publics remain largely non-recognised is infrastructure development – even though we can anticipate societal concerns around choices for pure or blended hydrogen transport, the allocation of the costs of hydrogen infrastructure over different hydrogen users and over time, and (inter)generational solidarity amongst natural gas and hydrogen infrastructure users (Sandri et al., 2021; CIEP, 2019). More urgently, however, is the absence of imagined publics around underground hydrogen storage. Here again, public concerns are unanticipated, even though the historical context is such that scrutiny from regional and local communities is very much conceivable. Why such scrutiny is not anticipated for underground hydrogen storage remains to be explored: perhaps there is an assumption of continued 'invisibility' of underground energy storage (and the issue publics around this), or perhaps actors consider it too early to focus on these sorts of issues based on the timescale of infrastructure development. Alternatively, actors might think participation in and around particular projects sufficient.

Nevertheless, depending on the choices made in the development of these infrastructure components, and the measures taken to include publics and other stakeholders as well as fairly distribute infrastructure costs and benefits, procedural and distributive justice issues may very well arise here. Procedurally, especially the exclusion of regional controversy spill overs around subsurface (and other infrastructural) activities around hydrogen storage can result in a narrowed-down engagement agenda that does not allow publics to bring to the table their demands for regional fairness and recognition. In addition, a distributive justice issue that could arise concerns the crucial position of guaranteeing security of energy supply in the Netherlands, which again is assigned to the Northern and

Eastern provinces without them reaping the concrete and direct positive benefits of this. This might contribute to the image of these regions as being exploited and used.

The identified recognition injustices and nascent procedural and distributive justice issues discussed here are summarized in table 4.b.

Table 4.b. (Nascent) justice issues in the Dutch hydrogen transition

Recognition injustices	Nascent procedural justice issues	Nascent distributive justice issues
Non-recognition of publics in vision formation	Non-recognition in vision formation can lead to political exclusion – i.e., a lack of opportunity for publics to co-decide on their future roles, identities, and status in visions.	Non-recognition in vision formation can lead to economic disadvantage – i.e., not getting equal, or any, opportunities to economically participate.
Misrecognition of publics in visions	Misrecognition results in pre-scoped and one-directional engagement, in which real-life publics often lack the opportunity to voice their own demands, expectations, and pre-requirements.	
Non-recognition of publics in visions	Non-recognition of publics may result in the absence of efforts to set up appropriate participatory procedures, which may hinder people's ability to voice their demands, expectations, and pre-requirements for certain transition activities	Non-recognition of publics may result in unequal access to infrastructure and control over modes of production. Non-recognition of publics may also result in unequal attention to concerns for the allocation of costs and benefits in transitions.

4.6 Discussion

The potential of low-carbon energy transitions such as hydrogen transitions to foster more just and inclusive energy systems is well-acknowledged. At the same time, there is a growing awareness amongst scholars of the possibility that such transitions may create or work to proliferate existing injustices, when and where insufficient thought is given to their possible diversified impact on various groups in society (Jenkins et al., 2021). Especially with regard to the hydrogen transition, recent calls have been made for more proactive or anticipatory approaches towards energy justice (Dillman & Heinonen, 2022). In response to this call, we introduced the concept of imagined publics in energy justice theory as a means to study recognition justice issues in visions. We were able to identify a number of recognised, misrecognised and non-recognised publics with significant justice consequences in hydrogen visions for the Netherlands. Reflecting on how recognition injustices are coproduced in visions with particular objects, such as hydrogen technologies and infrastructures, and particular engagement modes, such as show-and-tell pilot projects, we identified various nascent procedural and distributive justice issues that might arise when coproductions based on unjust imagined publics become performed. The identification of these issues comes at a time in the transition at which they can still be avoided. This too, is an important contribution to energy justice literature. That is why we conclude that imagined publics are an important heuristic to identify, perceive and understand justice issues in transitions.

Much more research is needed to rigorously test the theoretical perspective outlined and trialled here. We recommend further empirical research, in other future-oriented (energy) transitions to see if this yields similar insights and conclusions. It is critical that these studies pay explicit attention to the evolution of (in)justice in energy systems over time, using longitudinal or process-oriented research methodologies that combine historical as well as forward-looking methods.

In addition, it is also desirable to build on the insights of this research in attempts to stimulate reflection and dialogue among visionaries and policy makers in transitions. Even more important is that it is essential that members of various publics get to reflect on the misrecognitions and non-recognitions identified and

outlined in this study. Arguably, an important limitation of this research concerns the discretionary power of the researcher to identify 'non-recognised publics' in hydrogen value chains, such as local publics wanting to participate around underground hydrogen storage or publics wanting to be involved in the production of hydrogen. In identifying these publics, the authors drew from their shared experience with governance of energy systems and made comparisons with other transitions and developments both in the Netherlands and elsewhere (as well as with earlier literature on hydrogen). However, in the end, whether these non-recognised publics are indeed unjustifiably absent is not to be decided by researchers, but rather dependent on whether real-life publics – if and when they emerge – feel excluded and overlooked in hydrogen visions.

It is therefore important to emphasize that it was not our goal to prescribe another set of narrow identities that publics should adhere to in the future hydrogen transition. Instead, we wanted to show that alternative identities are conceivable, in addition or in contrast to the imagined publics that are now included in visions. Our aim was to stimulate imagination and openness in vision formation in these transitions. That said, what sort of activities could facilitate more open and imaginative visioning process in which more diverse publics are included and imagined? We offer three recommendations here.

4.6.1 Increase awareness of justice issues in the hydrogen transition

This study has shown that justice and inclusion are underexposed themes in the hydrogen transition. Across the board, hydrogen policy and system design choices are not seen in terms of justice or fairness – a finding that seems equally true for hydrogen policy making elsewhere in the world (Dillman & Heinonen, 2022). Yet, dependent on technological and organisational choices, hydrogen will affect society in differentiated and uneven ways, impacting some actors and groups more than others. Therefore, regardless of all its promises, hydrogen can come to foster and perpetuate structural injustice and exclusion – an undesirable outcome that becomes more likely, if justice and inclusion issues remain implicit and unaddressed in the current phases of hydrogen (technology) development. It is thus very important to advocate for governance attention to justice and inclusion in hydrogen development.

4.6.2 Organise openness of hydrogen vision-formation

Open hydrogen vision formation to alternative actors, values and justice understandings – especially those of potential or emergent publics. Meaningfully including publics in the anticipatory stages of a transition would not only be more just, it could also result in the production of more normatively diverse energy futures, which can foster more robust policymaking and more creative and diverse innovation efforts (Demski et al., 2015; Delina & Janetos, 2018; Krzywoszynska et al., 2018; Lehoux et al., 2020). Such involvement should not be limited to visions and scenarios but should also be extended to the models used to generate assumptions and prescriptive insights about the future. These models often prioritize technical and economic knowledge and values – precisely those that already dominate in thinking about hydrogen – and thus indirectly, or unconsciously, limit the space to bring other values and justice understandings into decision making (Cuppen, 2022).

Opening up vision formation is far from simple. Indeed, our study highlights that it would be rather naïve to think that the mere inclusion of some publics in vision formation would address all the identified recognition injustices. We observed that any form inclusion can be a priori hindered by the reproduction of dominant deficit assumptions of publics' knowledge, norms and values in the field of hydrogen. These prevalent deficit assumptions signal a deep incumbent reinvention, with traditional parties remaining in charge of system development, rather than transformative system change (Johnstone et al., 2017). This implies that the address of unjust misrecognition requires not just inclusion, but also reflexivity to the underlying structures and accountabilities for change that are reproduced in visions (Wynne, 2016). While this is a hugely complex task of challenging (frames of) rules, roles, procedures, positions, technologies and infrastructures, there is a unique opportunity to accomplish actual change now, as much of the hydrogen transition is still in the pipeline.

4.6.3 In local-level public participation exercises, explicitly allow a multi-issue agenda that includes precedence, unresolved justice issues, and regional identity

The last recommendation regards the importance of recognising conditionality and context in public engagement with hydrogen solutions. Publics evaluate hydrogen developments based on other energy developments in their region, on stories of similar energy technologies applied elsewhere, and on how these new hydrogen solutions are supposed to interact and function within a wider future hydrogen system (Cuppen, et al., 2020). Also, they bring into participation existing emotions such as fear, anger, (dis)satisfaction, and (dis)trust towards involved actors and formal procedures (Huijts, 2018). Our research highlights that there is a tendency around hydrogen developments to overlook or disapprove of these emotion-based justice perceptions – which is quite in line with other literatures (Cass & Walker, 2009; Roeser & Pesch, 2016; Perlaviciute et al., 2018). Alternatively, we see attempts to 'manage' these spill-over effects by decoupling public and political engagement on controversial activities from public engagement with the wider hydrogen narrative (e.g., CCS and engagement around blue hydrogen). For a more just hydrogen transition, we would argue for the exact opposite of decoupling. Instead of striving for single-issue agendas in participation exercises that only allow publics to evaluate standalone projects or technologies, we argue for divergent, multi-issue participation agendas that allow publics to reflect on these system components, based on their import and impact on the wider hydrogen system as well as on the unique historical, geographic and social contexts in which these components are to be introduced (Demski et al., 2015).

4.7 Conclusions

Hydrogen transitions will affect society in differentiated and uneven ways, impacting some actors and groups more than others dependent on the technological and organisational choices that will be made in the next coming years. Consequently, despite its many promises, hydrogen can come to foster and perpetuate structural injustice and exclusion, an undesirable outcome that becomes more likely when justice and inclusion remain implicit and underexplored

themes in hydrogen (technology) development. There is only a short window of opportunity to ensure that hydrogen transitions are just and inclusive, a window that starts to close once policies, technologies and infrastructures become implemented to solidify the socio-economic functioning of the hydrogen system for decades to come.

To engage with the possible injustices of hydrogen transitions, anticipatory approaches to energy justice are required. In this article, we have developed and tested one such approach drawing on theory and insights in imagined publics literature. We show that nascent justice issues in hydrogen transitions can be made explicit by studying the way in which different publics are recognised (or not) in hydrogen visions.

Recognition injustices perform a lesser status for publics in current and future decision making on hydrogen. This is problematic and needs to be redressed. However, further procedural and distributive justice issues also emerge from these recognition injustices, as imagined publics increasingly become enacted in hydrogen policies, technologies, and infrastructures. In this article, we have provided a way to identify and reflect on these nascent justice issues that stem from certain imagined publics and have provided recommendations for their prevention and redress. With these recommendations we hope to provide an impetus for a more just and legitimate hydrogen transition.

CHAPTER 5

From expectational conflicts to energy synergies: the evolution of societal value co-creation in energy hub development

Abstract

Societal value co-creation is an emerging practice in renewable energy projects. Despite its increasing popularity, however, unclarities persist regarding its operationalisation. This paper provides relevant insights by explaining how expectations of societal value co-creation evolved and became performed in a co-creative energy hub project in Emmen, the Netherlands. Over the course of project development, different and sometimes conflicting expectations co-existed of the hub's societal value potential. Drawing on observations, interviews, and document analysis, we describe the developers' efforts to synthesize these different value expectations into a coherent co-creation approach. The results indicate that timing in and of expectations, actor positions and organisational design are influential in how expectations become operationalised in renewable energy projects. Recommendations are provided for design of societal value co-creation processes in future renewable energy projects.

5. From expectational conflicts to energy synergies: the evolution of societal value co-creation in energy hub development[36]

5.1 Introduction: expectations of societal value co-creation in energy hubs

The International Panel on Climate Change recently concluded that the combined efforts to limit global warming to 1.5 degrees Celsius are insufficient to prevent significant overshooting, with large-scale environmental breakdown as the grim consequence (International Panel on Climate Change [IPCC], 2023). In this light, it is beyond critical that countries prioritize climate change mitigation and scale up immediate and systemic measures to reduce greenhouse gas emissions, amongst others in energy provision. This necessarily involves developing many large-scale renewable energy (RE) projects in the coming years, such as large, multi-turbine, wind farms, solar farms, and bio-digesters. A potent showstopper for such projects, however, is local resistance (Susskind et al., 2022). Indeed, local stakeholders like communities of citizens and municipalities are increasingly objecting plans for RE project in their direct environment, both because of the potential negative impacts of these projects on landscape aesthetics, place identity, nature, and health, and because of perceived unfairness of the followed development procedures (Upreti & van der Horst, 2004; Perlaviciute et al., 2021; Susskind et al., 2022). When insufficiently addressed, local resistance can result in unaffordable delays or cancellations of RE projects (Susskind et al., 2022).

Consequently, there is a growing realisation amongst project developers that constructive relationships with local stakeholders are essential for successful RE

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project delivery (Aitken et al., 2016). That is why they are now experimenting with more inclusive forms of stakeholder participation. Amongst the emerging practices is societal value co-creation (Keeys & Huemann, 2017; Mulholland et al., 2020). *Societal value co-creation* concerns the creation of social, environmental, and economic benefits for and with communities, end-users, governments, small and medium-sized enterprises, not-for-profit organisations, and other stakeholders (Keeys & Huemann, 2017; Mulholland et al., 2020; Cook et al., 2022). The societal value of RE projects can take many forms, such as job creation, nature conservation, supply of renewable electricity or residual heat to nearby neighbourhoods, and even co-ownership over modes of energy production. A critical aspect of co-creation is that stakeholders get to co-decide on the sort of value(s) they receive as well as on their level of involvement (Keeys & Huemann, 2017; Cook et al., 2022; Mihailova et al., 2022).

Value co-creation is not an established approach yet. Many unclarities persist, for example, on which stakeholders to involve – and, when, how, and how much – and how to balance their respective value demands (Mulholland et al., 2020). Of particular consideration is whose value demands to prioritize in light of often limited project resources (Di Maddaloni & Davis, 2017). Also unclear is how to compare qualitative societal value vis-à-vis quantifiable commercial value of energy projects in the formulation of a project's value proposition (Smyth et al., 2018; Babaei et al., 2021). Finally, it remains to be seen whether value co-creation always contributes to better and more acceptable project delivery, or only does so in particular kinds of projects. Early research indicates the latter (Heredia-Rojas et al., 2018), which highlights the need for a better understanding of the operationalisation of value co-creation in projects in general, and societal value co-creation in particular.

The first RE projects that experiment with societal value co-creation are trying to fill in these unknowns. In this paper, we reflect on attempts to develop a societal value co-creation approach in GZI Next in Emmen, the Netherlands. GZI Next is the site of a former natural gas purification plant that is currently redeveloped by a group of heterogenous collaborators, including private developers, local and provincial governments, and a grid operator. The group's vision is to turn GZI Next into an *energy hub*: a location where various forms of energy generation, conversion and

storage are developed in synergy, with the aim to create new regional energy supply and storage solutions. A prerequisite for the developers is that GZI Next contributes to the needs of the regional society, but different expectations on how to do this best co-exist in project development over time. This may not be surprising – after all, the co-creators in GZI Next have diverse backgrounds, interests, and motivations for participating, and therefore they also have quite different ideas on value creation in project development (Chang et al., 2013; Davis, 2014; Smyth et al., 2018). Nevertheless, it does mean that the development of a societal value co-creation approach in this project involves a dynamic process in which different expectations become explicated, confronted, negotiated, and agreed upon before they are adopted in project development. These dynamics of expectations are what we are concerned with in this paper. Our research question is, '*How do expectations of societal value co-creation evolve and become performed in the multi-actor development of energy hubs?*'.

Expectations are value-laden assumptions of how a project could or should look like in the future (Konrad, 2006; Borup et al., 2006; Geels & Raven, 2006). They drive strategic action and stimulate actors to prepare for specific future conditions (Borup et al., 2006). Project development tends to involve a multitude of expectations, for example on costs, project planning, technology application, the value proposition, relationships between project developers, and society's response to the project (Geels & Raven, 2006; Raven et al., 2009; Van Lente, 2012). These expectations may be complementary, but they may also be conflicting. Which expectations become prioritised and performed in project development depends not only on the credibility of the expectations and the promises and ideals ingrained in them, but also on developers' positions, relations, and power, on organisational cultures, and on the adaptive flexibility of project development processes (Brown & Michael, 2003; Stirling, 2008; Konrad & Palavicino, 2017). Accordingly, the study of dynamical expectations in project development contributes to an in-depth understanding of the socio-organizational context in which value co-creation processes in RE projects are evolving and with which they interact. This, in turn can help to clarify how societal value co-creation is operationalised in such projects – which is the aim of this paper.

This paper reflects on the expectational dynamics around societal value co-creation in GZI Next, a unique pilot project. Nevertheless, there are good reasons to assume that it will be exemplary for future hub projects. Firstly, the re-use of fossil fuel assets and infrastructures is progressively advocated as a cost-effective transition route, and more redevelopment projects can be expected in the coming years (Pereira et al., 2020). Secondly, energy hubs are concrete learning grounds for synergistic energy development. Moving towards synergistic or even integrated energy systems is considered vital for future system reliability, security, and flexibility (Ruth & Kroposki, 2014; Cambini et al., 2020). So far, however, on-the-ground knowledge of and experience with the implementation of integrated solutions is incomplete – and this is not merely a matter of technological know-how. Integrated energy systems can only be advanced if a diverse set of actors prove capable of intensive, intraorganizational and cross-sectoral cooperation (Cambini et al., 2020). Therefore, pilots should also involve piloting collaboration and joint energy hub projects fit right in with this urgent experimentation agenda.

In this paper, we first introduce the theoretical bases of our analysis: societal value co-creation and expectations. These are the building blocks of a new conceptual framework to study the dynamics of expectations of societal value co-creation in collaborative renewable energy projects (section 2). In section 3, we outline the case study methodology. Section 4 introduces the case and presents the results, namely, three dialectical expectational cycles. We close off with a discussion of the results (section 5) and the conclusion (section 6).

5.2 Theoretical foundations

5.2.1 Societal value co-creation in project management

Societal value co-creation is an emerging practice in project development (Keeys & Huemann, 2017) in which social, environmental, and economic benefits are created for and with societal stakeholders around a project (Keeys & Huemann, 2017; Mulholland et al., 2020; Cook et al., 2022). The concept of value co-creation originated in the management and marketing literature, where it was initially used to describe the collaborative efforts of service providers and their (future) clients to improve the (experienced) quality of service delivery (Vargo & Lusch, 2004). Studies

on value co-creation in project development have similarly focused on the attempts of developers to include upstream service providers or downstream users in the creation of the project value proposition (Liu et al., 2014; Fuentes et al., 2019).

Recently, the value co-creation concept has been applied in the project development literature to describe co-creative processes with various societal stakeholders (Chang et al., 2013; Keeys & Huemann, 2017; Smyth et al., 2018; Candel et al., 2021). One rationale for the inclusion of a variety of stakeholders is that it could improve project performance (Heredia-Rojas et al., 2018). Bringing together heterogenous actors with diverse experiences, resources, knowledge, value preferences and skillsets – or input values – allows for exploring and establishing value synergies (Eriksson et al., 2017; Di Maddaloni & Davis, 2017). In turn, these value synergies could lead to novel, competitive and efficient project solutions that could not have been created by the individual organizations on their own (Liu et al., 2014; Jin et al., 2022).

Developers have also voiced instrumental motivations for co-creation. Co-creation is recognised by some developers as a potentially fruitful instrument for increasing the likelihood of societal acceptance of a project (Aaltonen & Kujala, 2016; Elkjær et al., 2021). Societal stakeholders are considered less likely to oppose a project *"when they have taken part in creating the frameworks for planning, implementation, and development"* (Elkjær et al., 2021, p. 5), feel that they have had *"opportunities to exert influence and correct decisions"* regarding the project, and believe they bear partial responsibility for it (Schweizer-Ries, 2008, p. 4133; Aaltonen & Kujala, 2016).

Finally, in line with recent calls for more ethically aware project management, some developers have embraced co-creation as a *"conscious endeavour for fairness",* especially in relation to local communities (Di Maddaloni & Davis, 2017, p. 4). Acknowledging that most large-scale projects have unavoidable impacts on communities, while also observing that communities are underrepresented or misrepresented in formal decision making procedures, co-creation is embraced to ensure community interests are properly included in project valuation (Elkjær et al., 2021). Understood in this way, co-creation is cognizant of pre-existing socio-political dynamics and aims to empower (vulnerable) local stakeholders.

One significant difference between conventional project development and co-creative approaches – whether driven by substantive, instrumental or ethical considerations – is increased normative diversity. Noticeably, with the inclusion of various stakeholders, not only do input values become more diverse, so do output values. Local stakeholders tend to have other expectations of the sort of value that projects ought to deliver than traditional developers (Chang et al., 2013; Davis, 2014; Vuorinen & Martinsuo, 2019). In societal value co-creation, conventional values in project development – such as timely delivery, staying within budget constraints, quality of delivery, and when applicable, return of investment – are complemented with *societal values* – that is, additional environmental, social and economic values that can be derived from the project by and for societal stakeholders rather than for the developers (Mulholland et al., 2020; see also Keeys & Huemann (2017, p. 1197) , who speak of "sustainable development benefits co-creation"). Concrete societal value of RE projects can be local job creation, taking part in and thereby strengthening educational curriculums, nature conservation, supply of renewable electricity or residual heat to nearby neighbourhoods, increased energy security or financial returns for citizens from selling or using the energy produced (Itten et al., 2021; Elkjær et al. 2021; Cook et al., 2022; Mihailova et al., 2022). Intangible societal value can include increased trust and perceived fairness or legitimacy of project development (Itten et al., 2021; Elkjær et al. 2021).

Societal value is project-, context and time-specific (Martinsuo et al., 2019). The sort of value that can be created in RE projects depends on project characteristics – such as technology choices, the sort of energy to be produced, and the project scale. The value potential of a large-scale onshore wind project differs from that of an experimental hydrogen project, for example. Context also matters. If there are no secondary educational institutes in proximity of a project, it may prove difficult to attract interest in education programmes on the site. Furthermore, societal values can be very dynamic (Van de Poel, 2021). Value preferences of stakeholders may change over time, and so may the types of value that RE projects can deliver. Last but not least, the same value may be evaluated differently by different societal stakeholders (Chang et al., 2013; Zerjav et al., 2021).

Effective societal value co-creation approaches are those that are sensitive to a project's specific societal value potential and that consider the dynamic, diverse,

and subjective nature of value. Early research has pointed to process design principles that help accomplish this. Firstly, process design is such that societal stakeholders get to *equally* co-decide on the sort of value(s) they receive as well as on their level of involvement in value co-creation (Keeys & Huemann, 2017; Mihailova et al., 2022). That is, the involvement of stakeholders goes beyond consultation towards real partnership, in which stakeholders are included in important developments in the project and appreciated for their own unique contributions. Their different perceptions of value are taken seriously (Di Maddaloni & Davis, 2017) and made integral to the future vision for the project and its value proposition (Whyte et al., 2022; Chi et al., 2022).

Secondly, while such project-society partnerships extend over a project's entire lifecycle, they should start as early as in the so-called front-end stage (Smyth et al., 2018; Liu et al., 2019; Babaei et al., 2021; Candel et al., 2021). This is the earliest phase of project development, which involves exploratory research, strategic planning, and vision formation with the aim of assessing a project's value potential. Only if the front-end stage results in a positive value proposition, do developers decide to commit significant resources to further project development (Candel et al., 2021; Babaei et al. 2021). Consequently, even though actual value creation and delivery takes place later, it is in the front-end stage that project value is defined and can still be influenced (Liu et al., 2019).

A partnership necessarily entails a shared sense of responsibility. The third design principle is that project developers are willing to give up full control over critical decisions in the project (Ruiten et al., 2023). Stakeholders, on the other hand, should be willing to take up some responsibility in and for project tasks and activities. How far this extends depends both on stakeholders' abilities and their willingness to invest time and resources.

Shifts in influence and responsibility in the project have to be reflected in alternative project arrangements, procedures, and practices – which is the fourth principle. Developers are expected to reflexively rethink and revisit existing knowledge, assumptions, procedures, and evaluation criteria (Whyte et al., 2022). This requires adaptive flexibility – the fifth and final principle – meaning, that it should remain possible to renounce or alter earlier commitments to particular suppliers, technologies, or value outcomes, for example, when these

commitments do not match stakeholders' differing or changing demands (Stirling, 2008; Keeys & Huemann, 2017; Whyte et al., 2022).

5.2.2 Expectations and their dynamics

Project development is an inherently forward-looking process driven by expectations. *Expectations* are assumptions of how a project could or should look like in the future (Konrad, 2006; Borup et al., 2006; Geels & Raven, 2006). These may be project-specific expectations (Budde & Konrad, 2019), such as on project planning, development trajectory and value proposition. Other expectations may concern external aspects and their impact on project development, for example, the technical, economic, regulatory, and societal conditions that surround the project (Raven et al., 2009). Expectations can be both positive, projecting welcomed events or achievable outcomes, and negative, foretelling future threats that would materialise if no preventative action were taken (Van Lente, 2012).

Expectations are not just *what ifs* (Van Lente, 2012). They involve a strong belief that things can, and even will, come about in a particular way and order. Consequently, expectations scope down the possible outcomes considered. This allows actors to prepare for exactly those narrow outcomes, amongst others by starting new partnerships, reorienting resources, and investing in new, innovative technologies and practices (Raven et al., 2009).

Expectations not only enable but prompt action; this well-known phenomenon is called performativity (Borup et al., 2006; Van Lente, 2012). Some expectations are more performative than others, for example because they are considered more credible or have a stronger emotional or normative appeal than other expectations (Berkhout, 2006; Van Lente, 2012). Researchers have also found that socio-organisational dynamics can influence performativity. Amongst others, they observed that shared expectations tend to be more performative than individual expectations as they trigger more and diverse actors to use their skills and resources for the enactment (or prevention) of the expected (Berkhout, 2006; Van Lente, 2012).

Furthermore, generalised or collective expectations – expectations that are part of a widely acknowledged social repertoire – tend to be more performative than specific expectations – expectations that are shared in and attributed to (groups of)

individuals and bound to specific contexts or geographies (Berkhout, 2006; Borup et al., 2006; Konrad et al., 2017). This is because generalised expectations are more often deeply ingrained in formal rules and regulations and tend to have a more binding character (Konrad & Palavicino, 2017). Their higher level of institutionalisation also tends to make generalised expectations more static than specific expectations – though that is not to say they do not change (Borup et al., 2006; Budde & Konrad, 2019). Nevertheless, overall, specific expectations tend to be more dynamic, not in the least because they are more often informal and challenged by conflicting expectations. To become performed, specific expectations need ongoing nurturing, protection, lobbying, and formalisation. Obviously, some actors (networks) are better at these activities than others because of their position, relationships, and resources (Brown & Michael, 2003; Konrad, 2006; Pollock & Williams, 2010).

The relevance of actors' position and power in performing expectations draws attention to the importance of governance. Konrad and Palavicino (2017) point out two governance modes. First and most studied is governance by expectations, which relates to the ways in which expectations shape, coordinate, and legitimise decisions. Second, and less studied, is governance of expectations, which refers to the different organisational formats that can be employed to articulate expectations and coordinate their development, stabilisation, and performance (Konrad & Palavicino, 2017; Kuhlmann et al., 2019; Hielscher & Kivimaa, 2019). Such organisational formats can either be designed opened up or closed down to new expectations, dependent on whether the aim is to bring in challenging expectations and broaden the value proposition, to gain societal acceptance for decisions made in project development, or to keep stakeholders committed to earlier set project objectives (Ruiten et al., 2023).

5.2.3 A theoretical framework to study the dynamics of expectations of societal value co-creation in collaborative, multi-actor projects

How expectations of societal value co-creation evolve and become shared and performed in RE projects has received little empirical attention so far. To our knowledge, there is no applicable conceptual framework to study this process. Therefore, we propose a new framework based on a dialectical process perspective.

Dialectical perspectives have their basis in social constructivism – i.e., their starting premise is that reality is an (inter)subjective social construct that is marked by tensions and incompatibilities (De Keyser et al., 2021). These frictions generate an ongoing process of negotiation between actors as they try to come to a mutual understanding of the issues and solutions at hand. In other words, these frictions create a dynamic interplay in which ideas and understandings *"emerge and evolve, dissolve or reproduce themselves in the context of ongoing social interaction within and among social systems"* (Langley & Sloan, 2011, p. 262). Hence, in dialectical thinking, ideas, understandings and also expectations are ever-emergent and part of continuously dynamic processes (Van de Ven & Poole, 1995).

There are different dialectical traditions. Well-known is the Hegelian model, which assumes a process in which a thesis is increasingly contradicted by an anti-thesis (Langley & Sloan, 2011). At some point, these theses become confronted, negotiated, or reconciled in a novel synthesis that is often neither thesis nor anti-thesis, though may contain elements of those. Well-known and relevant in the context of co-creation may also be the Socratic dialectic, which describes co-operative settings in which such dialectic confrontations may take place. The Socratic dialectic emphasizes that it is the ideas that conflict, and not necessarily the people (Nielsen, 1996). In cooperative settings, *"[p]artners in the conversation are able to discuss conflicts among ideas without getting angry with one another... it is less important to advocate an individual position than it is to cooperate in the dialogic process"* (Nielsen, 1996, p. 281).

Drawing on these two dialectic ideals, our framework assumes that expectations of societal value co-creation exist in a pluralistic world in which they compete with other expectations of society-project relationships (Van de Ven & Poole, 1995; Berkhout, 2006; Van Lente, 2012). Whether an expectation is dominant can be explained by, firstly, its relative performative power, i.e., the extent to which it is seen to be more credible, affective, and culturally and materially ingrained than other expectations; secondly, the extent to which it is shared by more and diverse project developers, and the power, relationships, and resources that these developers can deploy for performative action; and thirdly, the type of project governance that is in place. Critical events can trigger a change in any of these components (Van de Ven & Poole, 1995). Examples of such events are the failure of a technological pilot

project, a major regulatory change, or new insights on negative externalities of projects. These events may trigger the emergence of and support for counter expectations and result in expectational conflicts. Conflicts, in turn, can initiate dialogue, learning, synthesis, and an adjustment of dominant expectations (see figure 5.a).

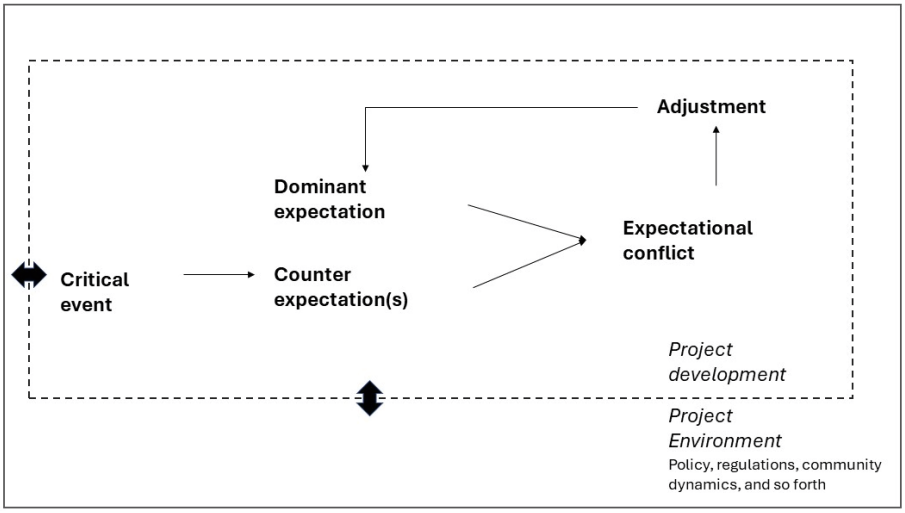


Figure 5.a. Expectational dynamics of project-specific expectations in RE projects: a theoretical framework inspired by Van de Ven and Poole (1995).

5.3 Case study methodology

This paper is based on single case study research (GZI Next). The case was selected because it was a collaborative project in the front-end stage, with an explicit commitment to societal value co-creation. In the case, we investigated the dynamical development of developers' individual and shared expectations of societal value co-creation.

Our study was longitudinal and qualitative in nature. Developers' expectations regarding societal value co-creation were tracked over the course of two years (December 2018-October 2020). Data collection was based on methodological triangulation. Data were collected from observations (n=19) in project meetings,

interviews with project developers (N=9), and critical documents produced in and by the project (N=7).

A researcher-observer was present and took elaborate notes in core group meetings as well as in the MVI working group meetings. Core group meetings took place at regular intervals (in the beginning of the project, once every two months; as per 2019, they were organised on a monthly basis). Most core group meetings lasted 2 hours. While most meetings were physical, in 2020, a number of project meetings took place online because of COVID. The MVI working group meetings took place from July 2019-December 2020 and were more irregular, yet frequently organised.

We also carried out interviews with the project developers. Developers were interviewed once, and the timing of their interview was based on incidents or activities in project development in which they were involved, for example, starting focus groups with citizens. At the occurrence of such incidents and activities, the developers were invited for an interview via email. Of the eleven developers invited, nine were able to participate; the backgrounds of the interviewees were as follows: governmental (N=3), private business developer (N=3), grid operator (N=2), and network organisation (N=1). The interviews lasted 60-90 minutes and all but one (which was conducted online) were conducted in real life. The interviews were semi-structured; interviewees were asked about their organisation's intrinsic motivations for participating in the project and about their value expectations. They were also asked to share their perspective on how to manage project-society relationships in GZI Next. We stimulated interviewees to reflect on their implicit assumptions on society and societal value co-creation.

A third and final data source was key documentation produced during the project, such as communication approaches and strategy notes, to which we were kindly given access.

Data analysis was inductive, manual, and iterative (see figure 5.b for an overview of the coding process). We started with a thorough (re)immersion in the data, rereading the interview transcripts, observation notes, and working documents and taking in the initial ideas, descriptions and observation commentaries made

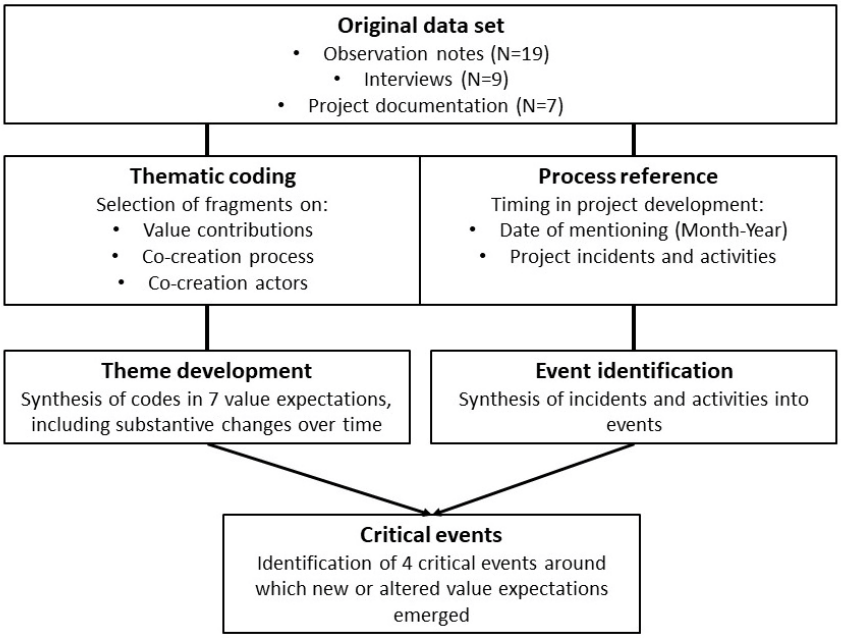


Figure 5.b. Overview of the coding process

by the researcher at the time of data collection. We then proceeded with the coding process, which in itself consisted of various steps.The first step in coding involved identifying and selecting text fragments that contained statements about what sort of value or outcomes the project could and should generate (both positive and negative), including how (co-creation processes) and with whom (societal stakeholders and co-creation parties). When those statements were expressed in project team meetings, the whole interaction in which these statements were expressed was labelled. The text fragments were given a topical code and description. While coding, patterns between topics became apparent; in other words, higher-order expectation themes emerged (Elliott, 2018). Text fragments that described the same societal value(s) were grouped into seven inferential expectational value themes:

1. Re-use and decommissioning
2. Reemployment and economic growth
3. New renewable energy solutions for the decarbonisation of the regional energy system

4. Field Lab for educational purposes
5. Protest as a threat
6. Synergistic development/energy hub concept
7. Value trade-offs & opportunities for financial and material participation of community members

For each of these expectation themes, a working definition was provided. The resulting codebook was used to code the remainder of the data. Changes in how expectational themes were discussed by the project developers were documented. Simultaneously, the selected text fragments were given a code for incidents and activities in project development (Van de Ven & Poole, 2017). The fragments were given a descriptive label of the incidents and activities and a time reference, for example 'Discussing a strategic communications approach (September 2018)', and 'Preparing for focus groups (June 2019)'. Incidents and activities that were related were ordered into a chronological sequence and translated into meaningful events (Van de Ven & Poole, 2017). Events that coincided with or gave rise to new or altered value expectations were characterized as critical. We identified four critical events:

1. The joint brainstorm session in July 2017
2. The signing of the Letter of Intent for Green Gas in October 2018
3. The planning for the construction of the Solar PV Park, close to the summer of 2019
4. The start of the MVI working group committee in the summer of 2019

This first analysis resulted in a preliminary chronological project outline and an overview of the respective expectations of societal value co-creation in GZI Next, held by different project developers over time. This overview was presented to the developers and discussed in two validation and reflection sessions at the end of 2020. Additions and comments at this stage were taken forward in analysis.

Next, a more thorough and conceptually guided reconstruction was undertaken. The chronological outline was broken up in sub-chains, each containing a critical event, expectational conflicts and synthesis/adjustment of expectations. This

resulted in three expectational cycles[37]. Developers were again invited to reflect on our characterization of events and expectations, this time by providing written feedback on the three cycles. The final expectational cycles are presented in the following section. Illustrative quotes used were translated from Dutch.

5.4 Results

5.4.1 Case introduction

From 1988 to 2017, the Nederlandse Aardolie Maatschappij [NAM] operated a gas purification plant [in Dutch: gaszuiveringsinstallatie, or GZI] in Emmen (figure 5.c). The plant processed natural gas from fourteen small natural gas fields in the provinces of Drenthe and Overijssel. When only seven of these fields were still in production in 2017, the decision was made to close the GZI.

The owners of the GZI and the terrain on which it was located – the NAM and Energie Beheer Nederland [EBN] – immediately saw opportunities to redevelop the 35-hectare area for the benefit of the energy transition. The site had various advantageous qualities; it was large and had a pre-assigned industrial purpose, a well-maintained and regionally well-connected underground gas pipeline system, and an existing connection to regional electricity transmission infrastructure. Instead of the complete decommissioning of the site, which would have necessarily involved the complete dismantling of these energy infrastructures, the site owners proposed to investigate whether components of the site could be efficiently reused for the production, storage, and transport of renewable energy.

From the start, the site owners showed a commitment to broad societal value co-creation. In 2017, the NAM reached out to various societal stakeholders, amongst who were the Municipality of Emmen and the Province of Drenthe, to discuss if redevelopment of the site could contribute to regional policy goals.

[37] Based on critical events 2, 3, and 4. Critical event 1 took place prior to the involvement of the researcher and insufficient data was available to reconstruct the expectational cycle.



Figure 5.c. Location of GZI Next in Emmen, the Netherlands

The Municipality immediately recognised that redevelopment of GZI could enhance local reemployment and economic growth. These issues were high on the municipal agenda at the time, because of the rapidly decreasing exploitation of gas reserves in the Northern Netherlands and the subsequent declining employment rates in the regional gas industry. The Municipality was thus open to explore redevelopment of the site.

With these affirmative sounds in mind, the NAM invited a group of twenty-eight regional societal stakeholders for a joint brainstorm session on the future of the site in July 2017. Given the size of the site, several energy activities could be developed simultaneously. Particularly promising were considered biomass gasification and digestion for green gas production, and electrolysis for hydrogen production. In

addition, an on-site field lab for students from vocational education institutes in the area was mentioned.

A group of interested parties – NAM, the Municipality, Emmtec services, New Energy Coalition [NEC], Gasunie New Energy, and Gasunie Transport Services [GTS] – agreed to actively investigate the feasibility of these activities. In March 2018, the parties concluded that gasification would be unfeasible, while largescale solar PV generation was added as a potential sub-project on the terrain. GZI Next, as the project was named, continued with three working groups (Solar, Hydrogen and Green Gas) while the municipality of Emmen committed to exploring opportunities for a field lab.

In the working groups, parties collaborated in varying compositions. The developers also installed a core group in which working group representatives provided updates on their progress, shared insights, and flagged potential showstoppers. At the end of 2019, the collaboration installed a steering group with executives of the member organisations. Over time, some partners left while new partners entered the collaboration (see Appendix C.1 for an overview of partners).

5.4.2 Expectational cycles

In what follows, we depict three expectational cycles. Each cycle starts with a critical event that triggers an expectation conflict. We describe how these conflicts result in synthesis and in (the performance of) adjusted expectations.

5.4.2.1 Expectational cycle 1: synergy, resistance, and value trade-offs

In 2018, the working groups explored technical and financial feasibility for Solar PV, Hydrogen and Green Gas. Amongst others, they looked for potential project executors and future customers, and searched for applicable subsidies. For each of the activities, multiple short-term and longer-term value chains were possible.

At the same time, the core group started to explore value co-creation beyond the three concrete activities by identifying ways to connect the three value propositions with each other. In other words, it started to brainstorm on realising possible technical and organisational synergies between the various sub-projects. One of the ideas floating around was to use the renewable electricity produced by the on-site Solar PV Park to produce green hydrogen. Another was to use the

hydrogen produced on the site, together with the CO_2 released in bio-digestion, to produce green gas. The expectation that GZI Next could become an energy hub that could facilitate experimentation and knowledge development on the integration of energy flows was increasingly embraced and shared amongst the developers (i.e., *the dominant value expectation*). Moreover, the importance of successful development of GZI Next was increasingly emphasized, as at least some of the developers had formed the intention to redevelop other gas assets and infrastructures in the Northern Netherlands in a comparable way. GZI Next became an essential first proof-of-concept pilot project for the hub concept.

While the group of developers experienced an increasing sense of urgency to turn GZI Next into a successful pilot project, at the same time they perceived the project to be potentially threatened by opposition from local community members. This became most explicit when the consortium partners were preparing to sign a Letter of Intent (LoI) for Green Gas on October 18, 2018 (i.e., *the critical event*). The partners intended to sign the LoI for Green Gas during New Emmergy, a local energy industry conference. New Emmergy being a very public event, the announcement of the LoI would attract media attention. While on the one hand, the partners were excited to show they were moving forward, at the same time they feared that communicating on their plans at the conference could trigger local resistance to the proposed largescale bio-digestion installations on the site. They expected people to have strong negative associations with odour nuisance and to get upset by the additional negative impacts caused by massive biomass transport to the site (i.e., *the counter value expectation*). The public signing of the LoI was therefore seen as extremely sensitive, and any ill-considered messaging could result in the whole project being *"down by 3-0 before we even start"* (NAM project lead). While fear of resistance increased the importance of communication with residents early on, it also increased the perceived need to be very strategic in communication activities – for example, about when to mention controversial technologies in communication messages.

The expected negative societal evaluation of bio-digestion was in stark contrast to the perceived positive evaluation of hydrogen and large-scale PV. In line with the search for synergies between the projects, the partners soon developed the idea that support for these activities could help to create broad acceptance for GZI

Next. They started expressing the expectation that financial value and/or solar energy or hydrogen for local communities, or value from additional activities on the site such as the educational Field Lab, could offset the possible negative feelings towards bio-digestion (i.e., *the adjusted value expectation*).

In summary, figure 5.d depicts expectational cycle one.

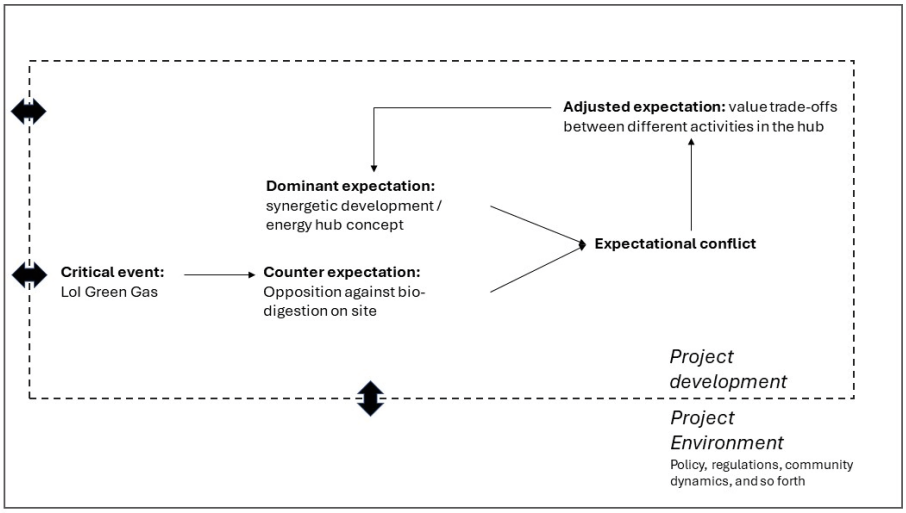


Figure 5.d. Dialectical dynamics of expectations – resistance and value trade-offs

5.4.2.2 Expectational cycle 2: expectational conflicts illuminate inconsistencies

Mid-2019, it became clear that the sub-projects were developing at different speeds. The Hydrogen and Green Gas working groups were still struggling to formalise the concrete value chains for their product – amongst others, they had not yet decided on the scale of technology and production, and were still searching for future project executors, transporters and buyers of the renewable gases that were to be produced on the site. The plans for a Field Lab were temporarily put on hold; there was little interest from the vocational education institutes, firstly because of the considerable distance between these schools and the GZI Next site, and secondly, because other, sometimes similar field labs were already being set up in the area. All the while, the Solar PV working group had been able to accelerate because of the presence of a committed project executor (Shell), the

applicability of an existing subsidy scheme (SDE+), and the arrangement of an electricity feed-in agreement with the local electricity grid operator. Consequently, in the summer of 2019, Shell was preparing for the construction of a 12MW Solar PV Park on the site.

The planning of the first construction activities on the site *(i.e., the critical event)* triggered the emergence of two important expectational conflicts. Firstly, one of the earliest decisions made by Shell was to outsource construction to a contractor from outside the region because of past experiences and established relationships with this particular contractor (e.g., *counter value expectation 1*). This went against the value expectations of some of the other consortium partners, amongst which were the local and regional governments, who would have liked to have seen a local contractor being hired, in line with their goals to further local job retention and knowledge creation (e.g., *dominant value expectation 1*).

Secondly, as planning progressed, the project executor highlighted that this type of project was not suitable for direct participation of citizens (i.e., *counter value expectation 2*), for example through co-ownership or through the supply of renewable energy to local neighbourhoods, because such participation could create limits on the future use of the generated electricity for electrolysis. Other factors that also seemed to have been influential in this expectation were the large production scale that was aimed for, the time pressure that was experienced in applying for permits and subsidies, and the expected minimal impact of the Solar PV Park on local communities.

In short, the planning for the construction and operationalisation of the Solar PV Park on the site exposed inconsistencies between pre-existing expectations in the consortium. In this concrete case, expectations for synergistic development of the sub-projects were incompatible with expectations for material and financial participation of community members in Solar PV. This negated the value expectation embraced in the previous cycle, e.g., the expectation that value trade-offs, including the positive (economic) local value from Solar, could result in acceptance of the project (e.g., *dominant value expectation 2*).

In the end, dialogue in the core group led to convergence of expectations. While the decision to outsource contracting to a non-local party could not be undone,

the group reiterated the importance of local reemployment as a value driver for GZI Next and recognised the need for more governance on value realisation in the collaboration. What is more, the importance of steering towards increased synergy was again acknowledged, and the ideas to involve community members financially or materially in solar PV were abandoned at this stage (i.e., *the adjusted dominant expectation*). Shell did express a willingness to explore opportunities for community investment later on in the project. Shell also took part in upcoming focus groups with community members living in relative proximity to the project, which were organised by the NAM and the municipality of Emmen to gather feedback on initial concerns with impacts of the energy hub before making any definitive design decisions. Hence, consultative citizen participation prior to construction in Solar was realised.

Even though expectational convergence was achieved, the underlying expectational conflict in the core group was not completely addressed. For some developers, the energy hub concept was upheld with convergence towards synergistic energy development. For others, however, the lack of more direct participation of local residents was an important break with the hub concept.

Project Lead Green Gas New Energy Coalition: *"this is vastly different from what we have all discussed as core values for our concept. Does this still fit with the energy hub concept?"*

NAM project lead: *"let's add some nuance to this. Our approach has never been: 'we will put every decision in front of residents'. Our approach has always been aimed at three pillars, one, re-use of redundant gas infrastructure. Two, to do this not as a NAM project but in collaboration. We all contribute with our own strengths. The municipality was the driving force behind the strategy memorandum, the New Energy Coalition leads on subsidy matters, and so forth. And three. The integration of the three energy themes on site. In addition, I agree with you off course, we want to explore what other value we can create for society. Can we stimulate employment? Can we do something with education? Can we limit social costs? But I have to say, if we do not manage the latter, GZI Next will still be an energy hub. Ultimately, the hub concept is about these three pillars."*

Project Lead Green Gas New Energy Coalition: "*I understand that, but as far as I am concerned, added value for and with society is an integral part of the hub. For me, this is also a pilot in a new way of generating energy, where you work together with society rather than only for it*."

Figure 5.e summarizes the described expectational cycle.

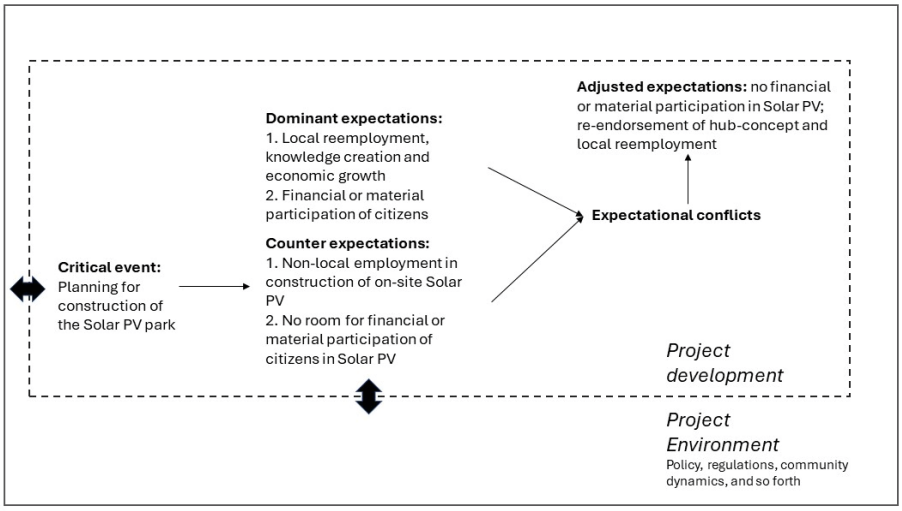


Figure 5.e. Dynamics of expectations – expectational conflicts illuminate inconsistencies

5.4.2.3 Expectational cycle 3: continued dialogue or co-creation with citizens?

The third expectational cycle started when one of the core group members was approached by a new programme of the Topsector Energy of the Netherlands Enterprise Agency[38] focused on Responsible Innovation[39] [hereafter: RVO-MVI]. The RVO-MVI programme was looking for case studies on responsible innovation in large-scale energy projects. The GZI Next core group believed that participating in the programme could help discover whether and how co-creation with, rather

[38] In Dutch: Rijksdienst voor Ondernemend Nederland
[39] In Dutch: Maatschappelijke Verantwoord Innoveren

than for, communities could be an integral aspect of GZI Next. Two representatives of the programme were invited to present their approach in the core group. During this presentation RVO-MVI clarified that the programme was still exploratory: they aimed to experiment with and learn from the concrete implementation of responsible innovation principles in RE projects, amongst which was co-creation with local communities.

The GZI Next core group agreed to take part and asked RVO to develop a societal value co-creation approach for the project. The group set up a fourth working group for MVI that consisted of six members: the team lead of the Green Gas working group, two communication officers from the GZI Next consortium, one of the RVO representatives, and two process facilitators from an external consultancy hired by RVO.

This establishment of the MVI working group in the summer of 2019 proved to be a *critical event* that triggered new expectational conflicts. Early on, tensions between the aim and mandate of the MVI working group and already ongoing engagement activities became explicit – in particular, in relation to the focus groups. While the external MVI working group members wanted to set up a new social lab or a similar co-creative engagement format (*i.e., counter value expectation*), some communication officers felt that additional outreach to local community members for MVI, during or close after the focus groups, could result in fragmented participation and in confusion and annoyance of the participants. They also felt that participating on the same matters with the same people twice would not help generate new insights. Hence, they preferred engaging with community members through the more dialogical focus groups and any future follow-ups on these groups (i.e., *dominant value expectation*).

To solve these frictions, the decision was made to scope MVI towards engagement with non-residential stakeholders, like businesses, while the communication officers continued the focus groups with residents. In addition, the MVI working group was asked to focus on hydrogen and green gas (i.e., *adjusted value expectation*). The external MVI working group members agreed with the revised scope.

In the end, however, both the choice to set up a separate MVI working group in parallel to the other working groups, rather than as an integral part of core group, and the choice to scope down towards non-residential stakeholders, proved suboptimal. The MVI working group set out to explore the overarching value themes for the hub but did so without most of the project developers being involved. The MVI working group was led by its external members, and most core group members continued to have a wait and see attitude as they were working to achieve major milestones in their own sub-projects. In other words, not only were citizens not involved in the MVI approach, neither was most of the core group. This was a major disappointment for the RVO-MVI representatives, who had hoped – though perhaps not clearly communicated – that the project developers would have assumed increasing leadership over MVI.

The external members of the MVI working group presented their final insights in a workshop with the core group members in November 2019. They presented various perspectives on the different scales of societal value creation, amongst others challenging the dominant value contribution of GZI Next as an energy hub and mentioning other non-energy products that the site could generate. While this workshop was interesting for the core group members, they also recognised that it was hard, if not impossible, to decide on future value creation opportunities without clearer ideas about project design of the bio-digestion and hydrogen parts of the hub. Moreover, some core group members felt that the more abstract workshop did not provide concrete guidance nor answers to the underlying questions that drove their participation in the RVO-MVI programme, namely, how to set up a societal value co-creation approach in GZI Next.

Notwithstanding that the MVI working group had opened the eyes of the developers to the wider value potential of the hub, the GZI Next core group decided not to continue with MVI in December 2019. Instead, in January 2020, the core group sat down to co-develop a joint set of rules for societal value co-creation. The social value drivers of GZI Next became formally defined in terms of re-use of existing natural gas infrastructure (I), the synergetic development of different energy carriers (II), supporting governments with their energy transition agendas (III), and supporting local employment and knowledge development (IV). Rules were drawn up to clarify the relationship between the core group and project executors and to

specify their roles in development. The rules included a procedure that future project executors would have to go through to ensure that their plans aligned with the GZI Next goals. Hereafter, information evenings for residents and dialogues with acknowledged dialogue partners, such as village and neighbourhood representative organisations and energy cooperatives, became more frequent and intensive. During these events, community members expressed an interest in continued information-sharing and dialogue in the upcoming project development stages. However, they did not display a particular interest in direct involvement in co-creation in the project.

Figure 5.f summarizes the described expectational cycle.

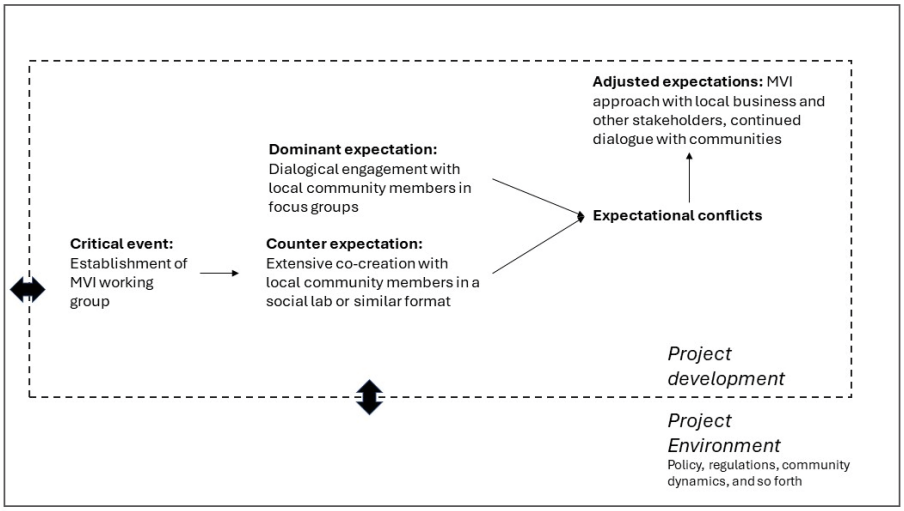


Figure 5.f. Dynamics of expectations – continued dialogue or co-creation with citizens?

5.5 Discussion

5.5.1 Understanding expectational dynamics for societal value co-creation

This paper set out to explain how project-specific expectations of societal value co-creation evolve in multi-actor energy project development, with the aim of generating learning lessons on the practical operationalisation of societal value co-creation processes in RE projects.

For over two years, we followed a heterogenous group of project developers in GZI Next, a co-creative energy hub in the Northern Netherlands. Our focus was on how these developers produced particular societal value expectations and how they interacted with and reacted to emerging expectational conflicts in project development. This focus on internal dynamics in project management is in itself distinctive and a contribution to the literature, as most studies on society-project relationships look at how communities and other local stakeholders perceive, evaluate and react to RE projects from the outside, rather than understanding how choices and actions of project developers contribute to better or worse relationships with society (Van de Grift & Cuppen, 2022).

Our research question was, '*How do expectations of societal value co-creation evolve and become performed in the multi-actor development of energy hubs?*'. We can conclude that co-creative project development is inherently characterised by co-existing and co-evolving societal value expectations, whose performative power – that is, their ability to prompt action – fluctuates over time, as a consequence of critical events that challenge pre-existing assumptions and trigger the formulation of new expectations. The function of the resultant expectational conflicts was to uncover uncertainties, ambiguities, and trade-offs in and between different value expectations in project development. In other words, these expectational conflicts were essential for continued learning about both the project's societal value proposition and often resulted in a strengthened collaboration between, and increased commitment of the co-creators.

In our case, we identified seven specific value expectations that were continuously present in project development, even though interpretations and prioritisations shifted over time. These value expectations were: the efficient re-use of existing energy infrastructures and assets (1); the reemployment of local workers and any

economic spill-over effects that may occur as a consequence of the activities on the site (2); the renewable energy produced on the site (3); knowledge and insights from experimentation with synergistic energy development (4); the on-site field lab for educational purposes (5); the negative value or impacts from activities on the site, in particular from bio-digestion (6); and the direct (financial and material) participation of community members in the project (7).

Whether and how the expectational conflicts between these seven value expectations were addressed by the project developers proved critical for the operationalisation of societal value co-creation in GZI Next. Indeed, the extent to which certain value expectations became part of the project's shared repertoire and narrative strongly depended on how synthesis was achieved. What is more, synthesis often required not just coming to a shared understanding of the project's societal value proposition; it generally also necessitated the development of new organisational rules, structures, and practices to reinforce or protect shared expectations.

In this case, it thus appeared that project governance was essential for constructive synthesis of expectational conflicts. In this regard, we want to draw attention to three main governance aspects: timing in expectations, timing of expectations, and actor positions.

5.5.1.1 Timing in expectations

Timing in expectations refers to when and how different societal stakeholders are expected to be included in co-creation. In our case, the project initiators recognised that co-creation with governments, local not-for-profit organisations and other societal stakeholders had to take place as early as in the front-end stage. Early and ongoing co-creation with these stakeholders became a critical part of developing the energy hub concept. However, we also observed that the project developers struggled to include community members in this stage, and over the course of project development, they faced multiple expectational conflicts exactly on this issue.

One probable reason for this is the absence of mobilised communities in the front-end stage, a direct consequence of the intangibility and invisibility of the project in this stage (Pesch, 2019). In other words, interested communities are not pre-

existing social entities that hold clear and singular preferences and assessments, which can be collected by developers prior to project development. Instead, publics are made by projects, that is, projects *"figure as issues around which a group of people mobilises itself"* (Pesch, 2019, p. 3). Communities are immobilised and thus invisible in the front-end stage of development, in which the project is non-existent and uncertain to the extent that even involved project developers are unsure whether to pursue it and how.

As a result, decision making about social value co-creation with local community members is by and large driven by the developers' assumptions about what these community members supposedly want and are willing to accept in terms of impacts, positive value, and ways of participation (Walker et al., 2010; Barnett et al., 2012; Pesch, 2019; Van de Grift & Cuppen, 2022). Influential yet not validated assumptions in our case involved community members not wanting bio-digestion in their backyard, but also, community members willing to financially invest in Solar PV, using the renewable energy produced on the site, or participating in a social lab. Many of these assumptions proved pervasive in project development, despite being challenged sometimes by counter expectations of other co-creators. When these assumptions were tested against reality, however, for example in the focus groups and in information events for community members, they often proved to be somewhat inflated. For example, in the period in which the researcher was involved in the project, resistance and protest against bio-digestion did not erupt; and citizens seemed to mainly want to be informed rather than be actively involved in co-creating the project.

These observations add nuance to recommendations of other authors to co-create with societal stakeholders in the front-end phase of project development. In line with other scholars, we concur that it is important to start value co-creation as early as in the front-end stage (Smyth et al,. 2018; Liu et al., 2019; Babaei et al., 2021; Candel et al., 2021). However, we add that the level of involvement of different societal stakeholders in front-end stage co-creation can differ.

In the absence of mobilised communities, project developers can choose to differentiate in one of two ways. Firstly, private project developers, local governments and other organised stakeholders may choose to partner up early in the front-end stage and include community members once there is a clearer idea

on which particular technological solutions, energy flows, and designs (i.e., potential issues) are relevant to pursue. This approach is not without risks; it is prerequisite that in such an approach the *societal value proposition* remains flexible and proactive towards future community wants, yet such flexibility may create considerable uncertainties in the project's *economic business case* and may endanger ongoing commitment of other co-creators in the front-end stage.

Secondly, project developers could choose to differentiate between stakeholders based on the nature of their involvement and the types of topics that these stakeholders will participate on. A wide group of community members could contribute to the front-end stage through the early identification of possible *higher-level relevant value drivers*. This would be accomplishable through open-ended dialogue with communities on issues that are already of concern to them, such as continued affordability of energy and future quality of life in the region, rather than on the project itself. Particularly public co-creators such as local and provincial governments are well-positioned to organise such a more generic and open-ended dialogue. This type of participation could generate a wide range of societal value demands, some of which could be taken into the project's value proposition. At the same time, when it proves impossible to embed the more significant community values in the project's value proposition, this could well lead to major disappointment. Open-ended participation therefore requires expectations management and clear communication.

5.5.1.2 Timing of expectations

Timing of expectations is about when to open up for new expectations of co-creation. Inviting new and alternative value expectations is often considered useful when the aim is to explore or identify new and unknown ideas, perspectives, and value opportunities or to challenge pre-existing commitments to particular technologies and project designs (Stirling, 2008). When done right, opening up helps create an atmosphere for learning from, revaluating of, and reflexivity on prevalent expectations. This atmosphere does not emerge automatically, however. Much depends on the timing of opening up, and on the sort of underlying dynamics that characterise project development at that time (Ruiten et al., 2023).

In the third expectational cycle of our case, we saw that it proved difficult for external parties (RVO-MVI) to connect to project development, even though they were purposefully invited to investigate a variety of societal value propositions for GZI Next. Timing was an important reason for this disconnect. Firstly, the parties were invited at a time at which other engagement activities were already performed. Secondly, at the time of their involvement, new uncertainties had arisen around two out of the three sub-projects (amongst others, because of changing subsidy rules and retracting project executors), and it was uncertain whether these two sub-projects would come out of the front-end stage with a positive economic business case. Thirdly, after having missed some opportunities to create local employment in the previous phase due to the informality of value expectations in the project, at least some of the project developers expressed a want for more formalisation. In other words, while the external parties aimed to open up project development by introducing new expectations and challenging pre-existing assumptions about the project's societal value proposition, most of the project developers were looking for prescriptive and concrete advice that would highlight a clear course of action and would facilitate deeper commitment and involvement of all the co-creators involved – that is, they wanted to close down (Stirling, 2008). Considering these dynamics, it is not surprising that the abstract and open-ended recommendations of the MVI working group did not catch on.

Therefore, our study highlights that a priori reflexivity and strategic planning are essential for successful learning from expectational conflicts in co-creation. Opening up only works when the project is in a stage in which developers feel that they can benefit from reflecting on diverse problem definitions and value opportunities for the project. When there is the feeling that such an exercise contrasts with the need for increased certainty, or undermines already ongoing activities, opening up may reinforce previous commitments and dominant value expectations rather than contribute to learning.

5.5.1.3 Actor positions

Lastly, looking at which expectations become embedded in project development, and which do not, a*ctor positions* emerge as relevant. Ideally, co-creation revolves around an equal partnership between heterogenous developers that all have their own role to play in project development (Elkjær et al., 2021; Mihailova et al., 2022).

In reality, however, there are differences in how much influence each of these roles provide to developers. In GZI Next, we saw that project executors had more influence than others on which value expectations were being realised, because they were in charge of the construction and operation activities of the sub-projects on the site.

Amongst the important learnings from GZI Next has therefore been that organisational measures are needed to ensure that all developers have sufficient insight in, and influence over, the sort of value and value creation processes that are prioritised in critical project decisions. In GZI Next, the measures taken were two-fold; firstly, project executors became members of the core group and steering committee. This helped executors to connect to the wider narrative and value proposition of the hub. Secondly, the developers formalised the hub concept and its societal value contributions and specified the responsibilities in, and procedures for, co-creation in site-specific governance rules. This promoted the performance of shared expectations while giving various cocreators leverage and control over value cocreation.

We would concur that these two measures – firstly, have all co-creators equally involved in the collective imagination of value expectations, and secondly, put in place governance rules that establish leverage and control for non-executing partners – are important pre-requirements for co-creation. Future co-creation projects could benefit from adopting these or similarly empowering measures as co-creative design criteria.

5.5.2 Methodological reflections

This paper was based on a longitudinal single case study. The longitudinal design enabled repetitiveness of observations within the case, which contributed to reliability (Yin, 2009). However, the lack of cross-case comparison, because of case design but also because of the absence of truly comparable energy hub cases in current literature, comes with possible limitations to generalizability (Yin, 2013). We have discussed our results in comparison with co-creation in other (RE) projects and believe this has allowed us to externally validate our study to some extent. However, energy hubs are inarguably different from more traditional energy projects, and as a consequence, so is their societal value potential. Amongst the

noticeable differences with traditional RE projects is that in energy hubs, societal value co-creation is not only about creating synergies between heterogeneous co-creators, but also, about creating synergies between different project parts and activities. This may result in different expectational dynamics than in traditional RE projects. Considering the increasing importance of systems integration in the energy transition, future case studies on societal value co-creation in energy hubs can be expected. We recommend that the exploratory insights of this study should be treated as propositions and tested in these (multi-)case studies.

Another limitation of the research design was that data was collected and analysed by one observer-researcher, which increased the risk of researcher subjectivity. To mitigate this, observations and insights were frequently discussed within the team of researchers over the course of data collection and analysis. More importantly, the analysis was also iteratively discussed with the project developers, both in two valorisation sessions on the first insights and through written feedback on the final expectational cycles.

A final reflection concerns the bounded time that the researcher was involved in the project. The runtime of the research was shorter than the front-end stage of the project; that is, observations and interviews were carried out up to October 2020, but since then, GZI Next has developed further. New critical events and regulatory changes, amongst others around the development of regional renewable gas infrastructure, have significantly influenced the project's societal value proposition. Unfortunately, it was impossible to include these later developments in the analysis.

5.6 Conclusions & future research

Societal value co-creation is an emerging practice in project development. This paper provides insights in how societal value co-creation processes become designed and operationalised in renewable energy (RE) projects. Focusing on the case of GZI Next, we describe how co-creation in RE projects is continuously shaped by conflicting expectations of a project's societal value contributions as well as of the co-creation process and the (potential) co-creation actors. In our case, we identified seven continuously co-existing and co-evolving expectations:

the efficient re-use of existing energy infrastructures and assets (1); the reemployment of local workers and any economic spill-over effects that may occur as a consequence of the activities on the site (2); the renewable energy produced on the site (3); knowledge and insights from experimentation with synergistic energy development (4); the on-site field lab for educational purposes (5); the negative value or impacts from activities on the site, in particular from bio-digestion (6); and the direct (financial and material) participation of community members in the project (7).

Expectational conflicts between these different value expectations worked to uncover uncertainties, ambiguities and trade-offs in project development. As such, expectational conflicts were critical for learning and, when addressed appropriately, were strengthening collaboration between, and increasing commitment of, involved co-creators.

In our case, particularly ambiguous were expectations around the direct participation of communities in the project. This ambiguity left much room for speculation and sometimes inflated assumptions about community members' wants, needs, and interests in the project. At the same time, the assumptions on community responses to the project were an important reason why involvement of this stakeholder group was only taking place late in the front-end stage – thereby delaying their own (in)validation. We recommended two routes to overcome this conundrum.

A notable result of our analysis was that the address and synthesis of expectational conflicts involved not just new negotiations about the project's possible societal value proposition, but also required the development of new organisational rules, structures and practices that could reinforce and protect shared expectations. Governance of expectational conflicts proved essential for the practical operationalisation of societal value co-creation, in particular with regard to the timing of opening up or closing down to new and alternative expectations in project development, and, with regard to how and when to formalise shared value expectations. We made a number of recommendations on these themes to improve the operationalisation of societal value co-creation, which we believe to be widely applicable and relevant for other projects in the energy transition.

As our research is based on a single case study, we highly recommend future (multi-case study) research that can test and add to our insights. Particularly fruitful would be to investigate whether societal value co-creation in energy hubs is different from co-creation in conventional RE projects. Energy hubs are inarguably different from more traditional energy projects. Amongst others, societal value co-creation in hubs is not only about creating synergies between heterogeneous co-creators, but also, about creating synergies between different project parts and activities. This may result in quite different expectational dynamics than in traditional RE projects – a hypothesis to be further investigated in future research.

CHAPTER 6

Challenge accepted:
regional governments and the legitimacy of co-creative redevelopment projects in fossil-industrial regions

Abstract

In regions reliant on fossil fuel production, economic decline and increasing unemployment are (soon to be) prevalent. To address these issues, local change agents including regional governments engage in co-creative asset redevelopment projects that can accelerate pathways towards more sustainable and just economies. So far, our understanding of the role played, and legitimacy challenges faced, by regional governments in co-creative redevelopment is limited, however. Drawing from insights from the case of GZI Next in Emmen, the Netherlands, we identify critical legitimacy challenges for governments in co-creative redevelopment projects, including incorrect role expectations, intra-organisational conflicts of interests, public accountability issues, and difficulties in claiming the right to a just transition. We reflect on these challenges and their impact on the transformative capacity of co-creative redevelopment. Emphasizing the need to re-envision asset redevelopment as relationship rebuilding, we propose avenues for future research to enhance the transformative potential of co-creative asset redevelopment.

6. Challenge accepted: regional governments and the legitimacy of co-creative redevelopment projects in fossil-industrial regions[40]

6.1 Introduction: co-creative redevelopment in fossil-industrial regions

Regions with a strong economic reliance on fossil fuel production increasingly struggle with deindustrialisation, economic decline, and deteriorating well-being (Coenen et al., 2018; Harrahill & Douglas, 2019; Loewen, 2022; Markey et al., 2022). These are complex issues, and their address has proven particularly difficult both because of multi-faceted lock-ins (Grabher, 1993; Seto et al., 2016; Coenen et al., 2018; Harrahill & Douglas, 2019; Isoaho & Markard, 2020) and a lack of necessary (public) resources (Halseth, 2017; Markey et al., 2022). Collaborative and truly transformative interventions are critical to overcome lock-ins, alleviate existing economic dependencies (OECD, 2019), and advance sustainable and equitable regional futures (Hölscher et al., 2018; Isaksen et al., 2022; Grillitsch et al., 2023). Such interventions would necessarily have to involve the concerted efforts of diverse change agents with a shared vision and agenda, including governments, businesses, non-profit organisations, research institutes, and communities. These often regionally embedded change agents collaborate in experimenting, learning, and implementing innovative, sustainable and fair solutions for regional change (Avelino, 2017; Wolfram et al., 2019; Loorbach, 2022). In essence, these agents engage in what is called *co-creation*, a process known for its transformative capacity (Castán Broto et al., 2019; Sillak et al., 2021) as it generally strengthens local change agency, facilitates innovation and entrepreneurship, and leads to new institutions for radical system change (Wolfram, 2016; Avelino, 2017; Grillitsch & Sotarauta, 2020).

[40] A version of this chapter is currently in the final round of review. Please cite as Rodhouse, T., Cuppen, E., Pesch, U., & Correljé, A. (Forthcoming). Challenge accepted: regional governments and the legitimacy of co-creative redevelopment projects in fossil-industrial regions.

Quite unique for fossil-industrial regions is that co-creation could not only be applied for the development of new and innovative regional (energy) solutions, but also for redevelopment of traditional fossil fuel assets, infrastructures, networks, and capabilities. Increasingly recognised is that co-creation around these deeply intrinsic fossil system components – previously considered 'lock-ins' – could stir a process of reimagination and redevelopment in which such fossil assets, infrastructures, networks and capabilities become catalysts for just and sustainable regional transitions (OECD, 2019; Morgan, 2017). So far, research exploring the potentiality of existing fossil industrial assets as levers for the acceleration of transformative change is scant, however, most certainly in transition studies, where scholars more often have advocated for the disruption and phase out of old (elements of) supply chains (Turnheim & Geels, 2012; Johnston & Hielscher, 2017; Andersen & Gulbrandsen, 2020) instead of for retention and reuse of fossil assets. Consequently, at the moment, we lack a comprehensive understanding of how to organise co-creative redevelopment for regional transitions (including though not limited to the critical questions of *what to retain* and *how to retain*).

This knowledge gap is worrying and needs to be filled. Firstly, because we can expect co-creative redevelopment to be increasingly common in fossil industrial regions, where numerous fossil fuel assets will become obsolete in the coming decades. And secondly, because there is a considerable risk that, without proper (knowledge of appropriate) organisation, narratives of redevelopment for just and green futures become used as shields to protect vested interests and perpetuate further injustice (Heffron & McCauley, 2022).

Of particular relevance to understanding the organisation of co-creative asset redevelopment for regional transformation is the role of regional public authorities, such as municipalities and provincial governments (Harrahill & Douglas, 2019; Borrás & Edler, 2020; Elkjær & Horst, 2023). Regional governments are seen as a critical force behind the regional transformation agenda, amongst others because they set the direction of local and regional change, facilitate cooperation, and represent and include local communities (Castán Broto et al., 2019; Borrás & Edler, 2020; Braams et al., 2021; Sillak, 2023). They have a unique position and responsibility, amongst others in that they have to ensure that co-creation

legitimately safeguards and realises public values. Despite their unique and critical role, the emerging literature on co-creative asset (re)development has yet to pay specific attention to these actors (Henderson, 2015; Arena et al., 2020; Morgan & Henderson, 2023; Sillak & Vasser, 2023).

This paper aims to address the gaps introduced as we explore the challenges experienced by regional governments in their efforts to ensure transformative co-creative redevelopment. Not in the least, we are interested in their engagement with the legitimacy issues and dilemmas that arise in transformative co-creation. Our research question is, '*What challenges arise for regional governments when engaging in co-creative gas infrastructure redevelopment projects, and how to address these challenges to enhance the legitimacy of such projects?*'. Our insights are drawn from an exploratory single case study, namely, GZI Next in Emmen.

In the remainder of this paper, we introduce co-creation as an instrument for regional transformative change and discuss known governmental challenges in transformative co-creation (section 2). In section 3, we introduce GZI Next and provide a brief overview of the co-creative activities that were carried out in the project. In section 4, we outline the case study methodology while in section 5 we present six legitimacy challenges to transformative co-creation for local and provincial governments. Last, we conclude our article with reflecting on the wider implications of our insights for public authorities in co-creative redevelopment for just and green transitions in fossil-industrial regions and present a future research agenda (section 6&7).

6.2 Co-creation and the transformative change of fossil-industrial regions

6.2.1 The co-creative redevelopment of dedicated fossil fuel assets and infrastructures

Traditionally, asset management in fossil industries is a closed process, marked by the default choice – or obligation – to abandon or decommission assets such as reserves, platforms, pipelines, treatment plants and refineries at the end of their

lifecycle. This is typically planned long in advance by the asset-owning organisation and involves only a few trusted experts, companies and regulatory authorities (Sillak & Vasser, 2023). Abandonment and decommissioning decisions normally pay limited attention to new value that end-of-lifecycle assets could generate (Mulholland et al., 2019).

This is now changing. An emergent trend amongst asset owners is to investigate opportunities for repurposing and redevelopment in new, sustainable, and innovative ways (Spezakis & Xydis, 2023; Capobianco et al., 2022). The advantages of repurposing are plentiful for owners. Firstly, decommissioning costs can be substantial, encompassing the costs of dismantling, disposal, and environmental remediation (Capobianco et al., 2022). Though redevelopment may still require partial dismantling and cleaning up, it can prove to be the more cost-effective avenue. Secondly, repurposing assets for new value-generating activities can become profitable, while decommissioning or abandonment mainly signifies a loss or destruction of value (Leporini et al., 2019). Thirdly, asset repurposing may offer fossil industrial parties a new purpose in a carbon-neutral world. Lastly, given concerns over climate change and economic decline in fossil-industrial regions, redevelopment is seen as more acceptable than decommissioning or abandonment, mostly because redevelopment provides new employment opportunities, clean energy and a new socio-economic outlook to local communities (Arena et al., 2020; Capobianco et al., 2022).

Attempts at redevelopment involve doing new and different things, not only in finding novel functionalities for the assets in question but also in experimenting with new and inclusive project (re)development formats (Zagonari, 2024; Basile et al., 2022). Indeed, under labels such as 'inclusive governance experimentation' (Coenen et al., 2018), 'societal deliberation' (Rinscheid et al., 2021), 'social innovation', 'shared value creation' (Arena et al., 2020), and 'co-design' (Sillak & Vasser, 2023), traditionally closed asset management processes are increasingly inclusive of a variety of change agents with alternative – often more regionally embedded – viewpoints who help incorporate regional problems and opportunities in asset management (Coenen et al., 2018; Morgan & Henderson, 2023).

What these inclusive activities have in common is that they are formats for *co-creation*. Co-creation entails a collaborative process in which two or more change

agents with diverse backgrounds and interests work together to find innovative solutions – technological, social, organisational, or otherwise – to societal problems (Ansell & Torfing, 2021; Itten et al., 2021; Ansell et al., 2022; Elkjær & Horst, 2023). The rationale is that co-creation facilitates the exchange of diverse competences, perspectives, knowledge, and other resources (Itten et al., 2021; Elkjær et al., 2021), resulting in synergies and complementarities that may give rise to new and innovative solutions with socio-economic value (Torfing et al. , 2019; Ansell & Torfing, 2021).

Co-creation has transformative capacity: it supports change agency and generates new forms of value, helps to develop new and innovative practices and processes, and brings forth new structures and institutions for radical system change (Wolfram, 2016; Avelino, 2017). The transformative capacity of co-creation can be explained by three of its key features. Firstly, co-creation involves local and bottom-up projects in which change agents engage with pressingly felt, shared problems as they occur in real time (Ansell et al., 2022). The tangibility and urgency of problems at the local scale enhances the collective motivation of change agents to act, while it also provides them with context-specific opportunities for innovation. This has shown to advance coordination (Ansell et al., 2022). Secondly, rather than reacting to emerging conflicts between stakeholders, co-creation allows for the proactive inclusion of diverse demands in the innovation process, so that constructive conflicts between these diverse demands can be leveraged into more acceptable solutions (Cuppen, 2012; Itten et al., 2021; Rodhouse et al., 2023). Co-creation also helps change agents to develop or gain access to new capabilities, such as the skills to facilitate learning and experimentation in the face of significant differences (e.g., constructive conflict resolution), to lead in a challenge-driven programme, or to participate with local stakeholders (Arena, et al., 2020). Thirdly, and lastly, co-creation is experimental and often requires change agents to venture into (yet) unregulated areas. As such, it often involves efforts to bring about the institutional and political change that is required to successfully launch new innovations (Grillitsch & Sotarauta, 2020; Sillak et al., 2021).

6.2.2 Governmental challenges in transformative co-creation

As asset owners are increasingly open to the involvement of other societal actors in redevelopment of assets, new opportunities emerge for regional public authorities to explore whether and how co-creative redevelopment can facilitate regional transition goals and ambitions. Despite the many advantages of co-creation in theory, however, in practice co-creation is often characterised by considerable implementation challenges that may endanger its legitimacy (Voorberg et al., 2015; Steen et al., 2018; Dudau et al., 2019; Elkjær et al., 2021).

Amongst the critical issues for governments according to existing literature is that co-creation is often costly, time-consuming, and labour-intensive. This can become a barrier and issue for legitimacy when governments experience that they lack the time, capacity, or skills to correctly carry out co-creation (Tuurnas, 2015; Torfing et al., 2019; Itten et al., 2021; Sillak et al., 2021; Ansell et al., 2022). This issue may be particularly pronounced in fossil-industrial regions, as typically these regions face a complex myriad of social, economic, and environmental challenges and existing public capacity is already spread thin. At the same time, the narrow and slowly diminishing economic opportunities in these regions, amongst others in terms of employment opportunities, often prove counterproductive for attracting skilled and knowledgeable civil servants and other professionals.

Other challenges may include entrenched role perceptions hindering collaboration and alignment. Politicians may resist sharing power, public managers may prioritise efficiency over collaboration, and private organisations may fear competition (Torfing et al., 2019). Moreover, political agendas and private interests may impede co-creation, with powerful actors dominating agendas or sabotaging efforts (Steen et al., 2018; Sillak et al., 2021; Ansell et al., 2022; Elkjær & Horst, 2023). Governments must figure out how to embrace the co-creative spirit throughout all layers and functions of their own organisation, but also how to manage or deal with persistent role perceptions and (self-)interests of other actors.

Additionally, concerns about stakeholders' relevance, abilities, and interests may limit inclusiveness and legitimacy of co-creation. For example, civil servants may fear special interest activism in projects and policies (Itten et al., 2021). When such

fears result in the inclusion of only 'professional agents' – that is, agents with essential and tangible resources – or agents with supportive interests (thus excluding outspoken agents with alternative wants, needs and interests in co-creation), they undercut the legitimacy of co-creation (Avelino, 2017; Torfing et al., 2019; Sillak et al., 2021). Concerns may also arise with the lack of democratic legitimacy of co-creation due to the participation of non-elected actors and the lack of formal and transparent decision making and monitoring (Torfing et al., 2019). Last but not least, governments may worry that co-creation in some projects or policies could set an undesirable precedent (Itten et al., 2021; Ruiten, et al., 2023). If such fears translate into concrete efforts to minimize the use and impact of co-creation, they endanger the transformative capacity of co-creation.

Summarizing, governments can face various legitimacy challenges in co-creation and these challenges can limit its transformative capacity. Yet not all of these challenges necessarily also apply co-creative redevelopment projects, and at the same time, such projects may give rise to unique challenges because they are different from co-creation in which actors start from scratch, so to speak. Not in the least, co-creative redevelopment projects will more strongly build upon historically grown relationships and resources. In such projects it will be hard(er) to ignore pre-existing ownership arrangements, which will influence the position and role of diverse change agents in co-creation. Furthermore, change agents will not only have to come up with novel repurposing opportunities, but they will also have to engage in matters such as dismantling and cleaning up. Therefore, we can expect a continuous balancing between destruction and creation in co-creative redevelopment projects. How these and other characteristics affect the co-creation dynamics and legitimacy challenges for different change agents, including governments, is unknown.

6.3 Case introduction: GZI Next

GZI Next is a co-creative redevelopment project in Emmen, the Netherlands (figure 6.a.). It is located on the site of a former natural gas treatment plant [GZI] of the Nederlandse Aardolie Maatschappij [NAM], which was closed down in 2017.



Figure 6.a. Location GZI Next in Emmen, Northern Netherlands.

At the time of closure, the owners of the GZI site – NAM and Energie Beheer Nederland [EBN] – saw opportunities for the redevelopment of the 35-hectare area. The site had various advantageous qualities, such as a pre-assigned industrial purpose, a well-maintained and regionally well-connected underground gas pipeline system, and an existing connection to regional electricity transmission infrastructure, which makes it suitable for a large number of renewable energy-related activities. The owners also realised that there were opportunities to align the project with other regional goals. That is why, end of 2017, the NAM brought the opportunity of reuse to the attention of multiple regional stakeholders, amongst which were the municipality of Emmen and the Province of Drenthe.

Like other parts of Drenthe, Emmen was confronted with declining employment in the gas sector. With the exploitation of gas reserves in the Northern Netherlands rapidly decreasing, economic revitalization was high on the governmental agenda. Both the municipality and province recognised that the redevelopment of GZI could contribute to local reemployment and to regional economic growth.

With these opportunities in mind, the NAM invited twenty-eight regional stakeholders for a joint brainstorm on the future of the site. Given the size of the site, the participants of the session believed that multiple activities could be developed simultaneously. Following the brainstorm session, an emergent and over time expanding consortium including the NAM, EBN, the municipality of Emmen, the Province of Drenthe, Shell, Engie, Emmtec/GETEC services, New Energy Coalition [NEC], Gasunie New Energy, and Gasunie Transport Services [GTS] (see appendix C.1 for an overview of involved actors in the project over time) continued to investigate the feasibility of three suggested options. These were electricity generation by use of Solar PV, hydrogen production via electrolysis, and biogas production via bio-digestion. Also explored was the idea to develop an on-site Field Lab, in which local secondary schools could learn from and experiment with processes and technologies on the site. Ideas for the synergetic development of the various energy activities soon emerged. The co-creators felt that the site could become an 'energy hub': a location where various forms of energy generation, conversion and storage were developed in integration with the aim of creating new regional energy supply and storage solutions. GZI Next, as the project was named, became the first pilot for this 'hub-concept'.

The co-creators worked on business development of each of the activities in separate working groups (Solar, Hydrogen and Green Gas), while the municipality of Emmen took charge over the Field Lab. In addition, the consortium regularly organised core group meetings, in which working group representatives provided updates on their progress, shared insights, and flagged potential showstoppers. The core group addressed overarching issues that related to the hub as a whole, identified opportunities for regional value generation, and worked on the systemic imbedding of the hub. Last but not least, it investigated the reproducibility of the hub-concept. Indeed, if successful, at least some of the co-creators aimed to turn

other soon-to-be-redundant natural gas locations in the Northern Netherlands into energy hubs too, thereby contributing to the just and green regional transition.

Within the core group, four different co-creative activities were undertaken within the time period of observations. These were:

1. The development of the hub's societal value proposition: while activities on the site had their own value propositions, the energy hub also had an overarching societal value proposition, though what this value proposition entailed was subject to different expectations. Over the course of project development, the core group needed to balance the useful ambiguity of 'societal value' – which enabled different parties to connect to the project while also allowing them to see opportunities to realise their own ideas and interests in the future hub – with the increasing need for concrete and delineated value goals in project development. Over time, it became clear that not all societal value expectations could be realised, and so-called expectational value conflicts emerged. Addressing and synthesizing expectational value conflicts was an essential co-creative activity in the practical operationalisation of the hub concept (Rodhouse et al., 2023).

2. The development of a communications plan for GZI Next: early on in project development the co-creators realised that some of their plans, primarily large-scale bio-digestion, could become controversial. For involved governments, the plans were also politically sensitive, as elected representatives of their organisations would have to assume a certain degree of political accountability for how activities on the terrain would unfold. That is why in 2019, these governments proposed a strategic communications plan that would prevent uncareful or fragmented communication. After endorsement by the rest of the consortium, communications specialists of the NAM and the municipality of Emmen took the lead and co-developed a communications plan for the project.

3. The development of a Strategy Note to formally embed GZI Next in municipal policy: as the first of the three working groups (i.e., Solar PV) was preparing for subsidy and permits, some co-creators expressed concerns over complex and lengthy procedures. Despite uncertainty about the responsible authority for hydrogen and green gas permits, there was a consensus that a municipal policy note could streamline administrative procedures. Project developers also believed

that acceptance of this note by the Municipal Council would signify crucial political support for GZI Next's further development. They co-developed what was later named the Strategy Note Energy Hub GZI Next Emmen, with which they aimed to clarify GZI Next's alignment with local, provincial, and national policies.

4. The lobbying, networking, and carrying out of other activities to gain external support for the energy hub concept: the energy hub concept was novel and unproven, and therefore, external support and regulatory flexibility were required to succeed. To secure backing, consortium partners presented and promoted the hub as a solution for regional issues in various forums and networks. They also created a lobbying fiche, that is, a one-pager outlining the legal and regulatory challenges that hindered energy hub development, which was applicable not only to GZI Next but also to future hubs in the Northern Netherlands. This fiche was to guide engagements of the (political) co-creators with higher-level authorities like RVO and the Ministry of Economic Affairs and Climate. With their lobbying and networking activities, the consortium aimed to facilitate the trans-local diffusion of the hub concept.

Despite that each of these four co-creative activities was carried out within the same project context, sometimes even in the same phases of project development, they were characterised by their own dynamics and unique unknowns, tensions, and challenges for governments.

6.4 Methodology

This research is based on a single case study. The choice of method followed the exploratory nature and aim of the research (Yin, 2009). The case was selected because it was an asset redevelopment project in which the change agents, including local and regional governments, made an explicit commitment to contribute to sustainable regional socio-economic change.

The study was longitudinal and qualitative in nature. The first author followed the group of co-creators (see Appendix C.1) over the course of two years (December 2018-October 2020). In addition to observations during project meetings (n=19), data sources included semi-structured interviews with project developers and

critical external stakeholders (n=21), working documents produced in the project, such as team meeting slides, a communication plan and a strategy note (N=19), relevant public documentation such as recordings of Council (Committee) meetings in which the project was discussed (N=3), and online news messages covering the project (N=7).

Co-creators were interviewed once, and the timing of their interview was based on events in project development in which they were implicated, for example, signing a Letter of Intent for the sub-activities in the hub. At the occurrence of such events, co-creators were invited for an interview via email. Of the eleven developers invited over the course of time, nine were able to participate; the backgrounds of the interviewees were as follows: governmental (N=3), private business developer (N=3), grid operator (N=2), and network organisation (N=1).

All interviews lasted 60-90 minutes and all but one (which was carried out online) were conducted in a face-to-face setting. Interviewees were asked about their organisation's intrinsic motivations for participating in the project and were asked to share their perspective on how to co-create value in the project. They were stimulated to reflect on ongoing developments, activities, and challenges in project development, as well as on their learning process in accomplishing these activities and addressing these challenges with the other partners. In addition, the first author was given access to notes from interviews with project developers and critical external stakeholders (n=12), which were carried out by external consultants hired to research societal value opportunities for the project in the timeframe of the research. As the themes and items discussed in these secondary interviews at least partially overlapped with the interests of the authors in this project, these secondary interviews were treated as a relevant data source and used to validate insights from the self-gathered data.

Data analysis was inductive and manual. We started with a (re)immersion in the data, rereading the raw data sources and taking in the initial ideas, descriptions and observation commentaries made by the researcher at the time of data collection. We then proceeded with the coding process, which in itself consisted of various steps. The first step in coding involved extracting text fragments from the data that provided information on the dynamics, opportunities, and difficulties in and of co-creation in GZI Next. Each text fragment was given a descriptive code. In

the second coding step, codes were grouped into meaningful categories (Elliott, 2018). This resulted in 21 distinctive co-creation themes. Each of these themes was given a definition and code rules, which were then used to re-examine the raw data sources. In this process, some codes were altered, refined, added, or removed. In addition to the co-creation themes, the selected text fragments in the sample were all specific to one or more of the above mentioned four separate co-creative activities. The third step in the analysis involved developing a detailed narrative for each of these co-creative activities, describing how and when the identified themes influenced the co-creation dynamics in and around these activities. These narratives led to the identification of six critical legitimacy challenges for regional governments in co-creation for transformative regional change. Figure 6.b visually summarizes the coding and analysis process.

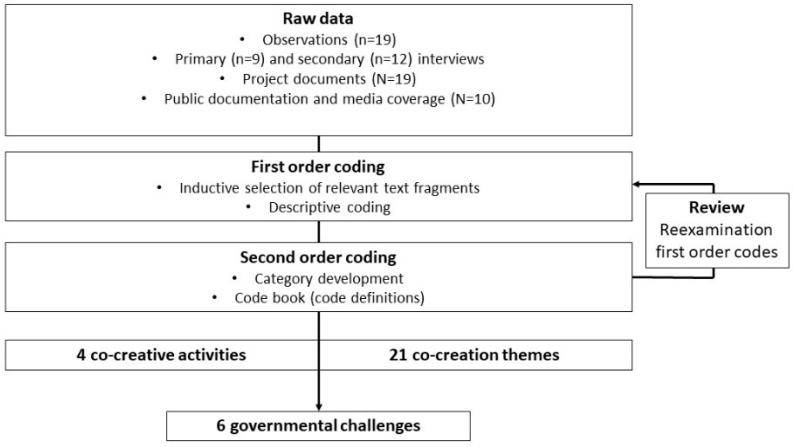


Figure 6.b. Visual representation of the analysis process

6.5 Results: legitimacy challenges in co-creative redevelopment

6.5.1 Challenge 1: striking a balance between addressing financial and human resource constraints and managing concerns for private interference

Regional governments in GZI Next had limited financial and human resources to dedicate to co-creation. Civil servants recognised this as an obstacle to governments' ability to drive transitions in general, and also felt that these capacity constraints impacted their position and ability to secure public value in co-creation. Amongst others, concerns were expressed about not being able to remain a reliable and trustworthy partner to others in co-creation if capacity constraints worsened.

During co-creation, capacity constraints were mentioned multiple times and in relation to multiple co-creative activities. The most prevalent example of how capacity constraints limited the ability of the involved governments to undertake particular designated tasks and activities was in the development of the Strategy Note. At first, civil servants of the municipality were to write the Strategy Note, not in the least because the Note would become part of formal municipal strategy once accepted by the Municipal Council. However, soon after the idea of the Strategy Note took shape, the involved civil servants raised the issue of having insufficient internal capacity to deliver the Note within the given timeframe. They thus wanted to outsource the drafting of the Note to an external consultant. However, they also had to retract this idea as there were no internal financial resources available. Considering the critical importance of the Strategy Note, another party in the consortium decided to commission the assignment on behalf of the whole consortium. All parties in the consortium had to provide input for the Strategy Note, which was drafted by a consultant with much experience in the public domain, and this Note was presented to the Municipal Council as a joint piece of advice from GZI Next rather than treated as an internal policy note.

The decision to co-write the Strategy Note resulted in concerns for perceived private interference in policy formulation. The concern was that external stakeholders, not in the least local politicians and residents, would consider the Note a piece of municipal policy and would not find private involvement in the

drafting process desirable. To prevent the image of interference, therefore, the municipal officers were insistent in naming the Note a Strategy Note, and not, for example, a policy note. They also ensured that the aim of the Note was not to introduce new policy ideas, commitments, or activities for the municipality, but instead, was to clarify how the plans for GZI Next aligned with already existing and accorded policies of the municipality.

Civil servant Municipality of Emmen: We should be sure the note is more like look how well our plans fit into the existing policies of various governments and look what's possible here. That is enough.

GZI Next project leader NAM: you raise a good point. The nuance is that we're writing this as a consortium and offering it as advice to the municipality, and not that we are writing policy on behalf of the municipality[41].

The Note was discussed in the Municipal Council Committee Economics and Public Resources in September 2019. During this discussion, the presenting civil servant was explicit and transparent about the authorship and function of the Note and reiterated that the Note did not impose any obligations for the Municipality in following project development stages, such as for granting permits. In the subsequent Municipal Council meeting, the Strategy Note was adopted without further questions and became a part of formal municipal policy.

6.5.2 Challenge 2: Bridging differences in cultures, preferences, and legitimacy concerns

The second challenge in GZI Next involved how to bridge the distinct cultures and perspectives of the co-creators, all the while safeguarding critical democratic values. This became most evident in the development of the communications plan for GZI Next by communication specialists of the NAM and the municipality of Emmen.

Early on in the development of the plan, different preferences emerged in terms of the content of the communications plan, and specifically regarding the level of

[41] Quotes used in this section to illustrate the challenges were translated from Dutch.

detail that was considered workable. The NAM communications specialists preferred a concise and flexible communications plan that could easily be altered based on iterative feedback from people living in close proximity of GZI Next. The municipal communications specialists, on the contrary, were used to working within a more political and bureaucratic environment, in which the lack of detail and clarity could easily turn into political risk. They felt they needed more detail on the individual co-creators' roles and responsibilities both in terms of communications and the wider project development. Hence, by detailing roles and responsibilities, they aimed to gain more confidence in the joint commitment of the co-creators to transformative co-creation as well as to inspire a shared awareness of the political sensitivities around the project.

Another difference concerned the definition and demarcation of relevant 'society'. The NAM – and other co-creators with an energy sector background – tended to speak of engagement with 'neighbours' or 'communities living in close proximity' of GZI Next. The municipal communication specialists felt that this was too narrow a term and preferred to speak of 'citizens' living in and around Emmen. More than just a matter of geographical scale, this difference revolved around procedural aspects of communication. Firstly, the interests of citizens can be much broader than just the particulars of an energy project, and therefore the scope of communication and engagement would necessarily have to be broader than that of conventional community engagement in energy projects. Secondly, citizens have different rights and obligations than neighbours, amongst others in terms of how they ought to be informed about and included in activities of the municipality. For example, the municipality had an obligation to be non-discriminatory in her communications, which had direct consequences for the kind of distribution channels it wanted to use and the language proficiency level that it needed to respect in news messages. Oftentimes, these kind of demands for non-discriminatory communications became expressed around practical and small issues. One example is that the municipality had to push back when the NAM, with its focus on neighbours, sent the first information letters on the project *only* to residents of surrounding neighbourhoods. What is more, these letters fell within the category of *door-to-door advertising* and thus were not even delivered to all people in those neighbourhoods – those who had indicated by means of a sticker on their door that they did not wish to receive such advertising were missed.

A last difference concerned the pace at which the communication specialists wanted to communicate with outside stakeholders. The NAM wanted to start communicating with neighbours as early as possible. It felt that postponing information sharing increased the likelihood of some form of resistance *("Just now, I had a meeting with one of the executives, and he said: "we really need to get going now". And then we have to wait on the municipality of Emmen, because they can't get going yet"*, ***communications specialist NAM***). For the municipal communication officers, however, communications with residents could not precede information sharing with the Municipal Executive and Council – which was an activity bound by specific procedures and time paths. This was not just about the practicalities of communicating, but much more about safeguarding important democratic principles and procedures.

Communications specialist municipality of Emmen (1): *the Municipal Council is our client, and we have to inform them. So, if the NAM starts communicating about all sorts of developments before the Council is... brought up to speed... there is a political-administrative process that needs to be adhered here... (...) Soon, we will present the project to the Council, so that they get informed of all that is going on. The steps are coming, but it is challenging to find the right timing.*

Communications specialist municipality of Emmen (2): *And it's difficult. Because things are happening, people see that things are happening, but you can't communicate because the Council is not yet brought up to speed.*

In the end, the communication specialists of both sides proved well capable of regulating these differences. Both sides showcased great willingness to learn from each other and from the collective process. The NAM proved particularly facilitative of and attentive to the perspective of the municipality in communications. Also, both organisations felt that each organisation brought in important strengths and skills. Whereas the NAM had plenty of experience in organising and facilitating participation in the context of energy projects, the municipality brought in its knowledge of (managing multiple stakeholders in) the political process. This culminated in a draft communications plan, which was adopted by the rest of the consortium (though not necessarily also consistently put in practice afterwards).

6.5.3 Challenge 3: clarifying and managing role expectations

The third challenge of regional governments in GZI Next concerned managing the role expectations that other co-creators held for them. A critical aspect of the societal value proposition was to establish clarity on the roles, rights, and responsibilities of the various co-creators in value creation and capture. At the end of 2018, therefore, the co-creators in GZI Next explicitly discussed these aspects in hub development. At this point, it became clear that there were different ideas for the role of governments in co-creation. Some of the initial expectations were for governments to take the lead in activities such as permitting, subsidies, political management, and citizen participation. Involved civil servants, on the contrary, considered their contribution more in terms of being a linchpin between the project and the region.

One explanation for the initial misalignment in expectations may be that the non-governmental co-creators implicitly and unconsciously viewed governmental organisations as rather homogenous entities, while the involved civil servants experienced their organisations as heterogenous and diverse, consisting of different departments, sections, and bodies that had strictly separated roles and responsibilities. The internal heterogeneity of government organizations is not arbitrary. In fact, in governmental organisations different tasks and responsibilities are purposefully assigned to different bodies and departments to ensure the public interest is secured in an independent and proper manner. Hence, for the civil servants from the municipality and province, the fact that they were actively involved in GZI Next did not automatically mean that there was a broad and established political support for the project, nor did it necessarily mean that permits would be granted more easily. The challenge for the civil servants involved was thus to manage the role expectations of their co-creators, amongst others by creating awareness of the internal dynamics of governmental organisations.

6.5.4 Challenge 4: managing emerging intra-organisational conflicts of interest

One of the critical challenges for the governments involved in GZI Next was how to position themselves in co-creation – as one of the many settings in which the different involved parties met – when elsewhere, in other settings and arenas, they

had other interests and also, their interests and those of their co-creators were not aligned. Indeed, the relationships between the parties involved in GZI Next were complex and multifaceted. Different public interests co-existed in GZI Next as well as outside of it. Governments and other parties in GZI Next were continuously striving to align these and other interests for the betterment of the regional economy. Yet, their attempts to create situations and settings in which multiple interests were served did not always pay off.

One of these other settings in which multiple project partners of GZI Next found themselves at opposite sides concerned the ongoing gas and petroleum extraction activities in the region. Controversial issues included, amongst others, the costs and scope of compensation and restoration activities in the province of Drenthe as a consequence of damages from extraction-induced earthquakes around the Slochteren gas fields. Other issues regarded the commissioning of small new gas fields around Assen (the capital of Drenthe), and the injection of wastewater from oil extraction into empty gas fields in the South of Drenthe.

Regardless of the disagreement around these activities, regional governments still chose to collaborate with fossil-industrial parties in the region, not only in GZI Next, but also in the development of a larger economic perspective for the region's future after natural gas extraction. First studies indicated that the scaling down towards complete termination of natural gas activities in the region could result in around 7,000 direct and indirect jobs lost in Drenthe alone. In attempts to counter this, the Province and main municipalities in the region, Emmen and Assen, worked together with major employers in the region, including the NAM, to create Drenthe 4.0. In this economic perspective document, GZI Next was explicitly mentioned as an example project for the re-use of conventional fossil assets and as a potential driver of green economic activity and employment in the region.

Drenthe 4.0 was presented to the Ministry of Economic Affairs and Climate in an attempt to receive considerable funding for the region's transformation. The official reply from the Ministry was that it was sympathetic and supportive, yet it was not willing to dedicate new economic resources to Drenthe. This may not be surprising considering the high-level, agenda setting nature of Drenthe 4.0, but it still came as a disappointment for the Province of Drenthe. Not in the least, because the Province had met the Ministry halfway on another issue: at the time

that the Ministry was evaluating Drenthe 4.0, the Province of Drenthe had had to decide whether to appeal against the Ministry's decision to allow gas extraction under and around Assen. It had chosen not to make an appeal as to not endanger Drenthe 4.0:

"Drenthe wants more from the Minister (Drenthe 4.0), this involves much larger interests. The public gain from a probably unsuccessful appeal does not outweigh the negative effect on the relationship, just now that a conversation about Drenthe 4.0 has started" (Deputy of the Province of Drenthe, quote given to RTV Drenthe)[42]

6.5.5 Challenge 5: overcoming difficulties in successfully claiming the right to a just transition

The fifth challenge relates to the necessary institutional entrepreneurial activities in co-creation. Regional governments experienced that they had to be able to convince the national government, not just of the innovative potential of this one particular redevelopment hub-pilot, nor just of the essentiality of energy hubs for the betterment of the region. Instead, more fundamentally, they had to be able to successfully justify their claims on the right to a just transition for the region.

The involved governments in GZI Next made their claims on such a transition primarily via the above mentioned new economic perspective for Drenthe, Drenthe 4.0. Despite that Drenthe 4.0 established the severity of the anticipated economic decline in the region, and also expressed the regional need for and urgency of a sustainable and just transition, the plan did not attract financial resources. There may be several reasons why Drenthe 4.0 was not particularly successful, not in the least the abstract nature of the development agenda. Still, the failure to gain substantial financial support is noteworthy when one compares the situation of Drenthe with that of the neighbouring Province of Groningen, where the Slochteren reserves are located. Groningen is a mere 20 kilometres north of Assen, the capital of the Province of Drenthe, yet those 20 kilometres are substantial. In Groningen, state-level support for a transition took on gigantic proportions in 2021, when the

[42] https://www.rtvdrenthe.nl/nieuws/14690102/shell-papers-drenthe-koos-voor-nam-bij-energietransitie-nam-koos-voor-zichzelf

State agreed to invest 1.15 billion euros in the National Programme Groningen (NPG). The NPG was to provide Groningen with a new, more secure and liveable future outlook. All this was justified by the idea that the interests and needs of the residents of Groningen had long been overlooked in extraction of the Slochteren reserves. This lay not only in the failure of the national government and involved industry partners to adequately address extraction-induced earthquakes, but also because of the prolonged unclarity and stickiness of repair, compensation and reinforcement procedures. Consequently, with regard to Groningen, there seemed to be an understanding that previous injustices needed to be addressed beyond mere compensation for damages, and the NPG was seen meaningful effort to establish a fairer distribution of costs and benefits of gas extraction in the region.

That same support for the right to a just transition does not seem to be present for Drenthe. Even though here too, some people have suffered damages from often the same extraction-induced earthquakes. And these people have also lived with these damages to their homes for years without clarity about repair, compensation and reinforcement. Here too, the region anticipates systemic problems of economic decline and unemployment – even though the number of jobs that will be lost due to the closure of the Slochteren fields is lower than in Groningen. The way in which Groningen had already made a rightful claim on a just transition, in a sense, limited Drenthe to establish that same claim via Drenthe 4.0, possibly because its anticipated losses were much less in comparison.

"In addition, the question is what impression this manifesto makes on the ministries. (...) what leads do we have to ensure that Drenthe is heard? Has consideration been given to why the government would be impressed by this action? (...) for comparison: in Drenthe, a total of seven thousand (direct and indirect) jobs are lost as a result of turning off the gas tap. In Groningen, this concerns approximately 50,000 jobs[43]. Will Drenthe make an impression with this

[43] Most news articles reporting on the issue of job losses due to closure of gas activities report that 20.000 jobs are at risk in Groningen. That number – 20.000 – has been powerfully used in national and regional policy discussions, yet, according to some economists, is a high overestimation: https://www.rtvnoord.nl/nieuws/199819/rtv-noord-checkt-verliest-groningen-20000-banen-als-de-gaskraan-dicht-is

manifesto and the scale of the problem it addresses, in addition to the other consequences of the gas decision?" (Municipality of Emmen, internal communications Drenthe 4.0/Reactie Gas 2.0).[44]

Another explanation for the lacking national attention to fairness and justice in discussions around economic restructuring in Drenthe might be that the governments chose to collaborate in Drenthe 4.0 with the parties that, at least in the public and political debates, were considered responsible for the damage to the region. While it is unclear whether this played a role, we can assume that this may have affected the extent to which governments could legitimately embed GZI Next within the narrative of a just transition.

"Due to all the commotion surrounding the NAM and gas extraction, I quietly wonder: is the NAM the right case to display for this campaign? Has the deputy already checked this with the ministries? If not, then it would be a good idea to do so." (Municipality of Emmen, internal communications Drenthe 4.0/Reactie Gas 2.0).[45]

6.5.6 Challenge 6: ensuring accountability in the face of often (intangible and indirect) regional value

The last challenge is how to steer on the creation of the often indirect and intangible value for the region in a co-creative redevelopment project – a challenge that arose during the development of the project's societal value proposition.

Regional governments were participating in GZI Next because of the project's potential to create economic spillovers, such as attracting new businesses and green economic activities to the region, maintaining energy-related employment, and knowledge creation, amongst others by involving local secondary schools and educational institutes.

[44] Obtained at https://www.ftm.nl/document/21205975?projectId=1
[45] Obtained at https://www.ftm.nl/document/21205975?projectId=1

Alderman Economy and Participation, Council Committee Meeting EBM, September 12, 2019: *[GZI Next] is a catalyst for employment growth. Perhaps not directly on the site itself, but today I had conversations with someone from the New Energy Coalition, and they said that because we have received this hydrogen valley subsidy grant, there are already three commercial parties from abroad that are exploring our region, and one has already settled here. We see that there is potential, I want to emphasize that. (…) we can take advantage of the opportunities in terms of retaining knowledge and employment, or even expanding these.*

Even though the wider consortium supported their aim to generate regional socio-economic value, it proved particularly difficult to steer on such value creation in the project. The quote above emphasizes one of the key difficulties: most of the socio-economic value contributions of GZI next were going to be only loosely related to the concrete activities that are undertaken on the site. It was particularly difficult, therefore, to come up with concrete goals, let alone indicators for the indirect or even intangible socio-economic value contributions of GZI Next. This, of course, had consequences for accountability of the governments involved.

The difficulty of measuring and steering on regional socio-economic value became most explicit during a societal value workshop that was organised by external consultants in November 2019, following their six-month assignment to identify different societal value opportunities for GZI Next. The consultants presented an overview of the various scales at which value could be generated by GZI Next. One consortium member reflected on these scales as follows: "*At the lowest level, that of the sub-project, it is relatively easy to realise value. We're talking about concrete amounts of energy produced. When you are looking to integrate project components to create more value… other requirements come into play. That is more difficult. And when you look at value generated outside the site itself… The difficulties and uncertainties become increasingly prominent when you climb that value ladder*".

The increasing intangibility of value higher up in the value ladder, the increasing number of other factors that come into play, and the level of uncertainty that this creates are amongst the most important reasons for the difficulties experienced in steering on regional value in the project. Other reasons involve, amongst others, that the co-creators in GZI Next had little to no experience with developing a

societal value proposition for a redevelopment project – and this applies to both the co-creators with a background in energy business development, and the governmental partners. It is no understatement that they were struggling to find proper and workable ways to integrate societal value potentialities in project development and evaluation.

Last but not least, because of the various uncertainties and unexpected events – amongst others, the techno-economic uncertainties around scale of production and demand, changes in subsidy requirements and withdrawing project executors – it took a long time to ascertain the commercial value of the separate sub-activities. As uncertainty persisted, it became clear that at least some of the commercial co-creators were hesitant to commit to a societal value proposition so long as it was uncertain how that commitment would fit with and affect the commercial proposition of sub-projects.

Commercial co-creator in GZI Next during the societal value co-creation workshop: *Let's take a step back. I mean... basically, the internal business case is leading. If there is no business case, then we won't develop this project. I think that applies to all internal parties. And if additional regional value is created in the process, then that's great.*

One of the conclusions of the consultants was that, as a consequence of these dynamics, it seemed that technological rationalities and micro-economic developments rather than societal value potential were driving decision making in the hub. This was problematic for the involved governments, not in the least because their involvement in and political endorsement of GZI Next implied that they were politically accountable for whether the project was able to deliver on societal values.

6.6 Discussion & future research

6.6.1 Discussion of results

Our research question was, '*What challenges arise for regional governments when engaging in co-creative gas infrastructure redevelopment projects, and how to address these challenges to enhance the legitimacy of such projects?*'.

In this paper we identified six critical legitimacy challenges for regional governments involved in co-creative asset redevelopment projects in fossil-industrial regions. Some of these seem applicable to co-creation in general. For example, we identified that governments need to learn *how to strike a balance between addressing financial and human resource constraints and managing concerns for private interference*. This challenge is well-recognised in wider co-creation literature as well (Tuurnas, 2015; Torfing et al. 2019; Itten et al. , 2021; Sillak et al., 2021; Ansell et al., 2022). Also, generally applicable would seem to be the *difficulty of integrating, measuring, and steering on regional value in local co-creative project*s, although this seems somewhat underexplored in existing literature. This is striking, given that measurability of outcomes has significant consequences whether governments can account for their involvement in co-creative projects and thus for the (perceived) legitimacy of governmental participation in such projects (Moore, 2012). Lastly, also in line with already existing insights on co-creation is the need to *clarify role expectations in co-creation* (Sillak & Vasser, 2023), though this challenge is rarely explicitly discussed in relation to governments in the literature (for an exception, see Torfing et al., 2019). Our research adds to existing insights on this challenge that while a clear definition and demarcation of governmental roles is important, even more important in 'expectation management', especially for legitimacy of co-creation, is awareness building around the workings of the internally heterogenous governmental organisation. Not in the least, this involves awareness raising for the administrative-political and democratic procedures that regulate (the possibly varied) governmental roles in co-creation.

We also identified legitimacy challenges that appear specific to co-creative redevelopment projects, or at least, unfold in unique ways in these projects because of the fossil-industrial histories that the co-creators are still tangled up in. Our case pointed to the unique institutional challenges that regional governments face in making the case for transformative, co-creative change. On the one hand, just transitions narratives for fossil-industrial regions are gaining foothold at the European level (European Commission, sd), yet, on the other, a distinction appears to be made between which fossil-industrial regions are considered deserving of support for such a just transition, and why. How can regional governments convey the essence and necessity of a just transition in their region,

when it seems as if other regions are more entitled to that just transition? Even more important, to what extent does cooperation with the fossil industry influence the perceived legitimacy of a claim or request for support for a just regional transition? These are essential and project-transcending challenges that warrant more research.

Last but not least, particularly distinctive for co-creative redevelopment in fossil-industrial regions is the unique dynamic that arises around *possible conflicts of (public) interest and concerns for democratic legitimacy*. Our case shows that (various levels of) governments have different and sometimes conflicting values and interests inside and outside of co-creation in fossil-industrial regions, and it proves a major challenge for these governments to separate and protect (all of) their own values and interests. Moreover, as Coenen et al. (2018) also highlight, innovation and renewable change can be difficult in fossil-industrial regions, where involved organisations tend to have a history of conflict and distrust. Issues that could affect the delicate balance now achieved between previously adversarial parties, albeit temporary and situated, are quickly perceived as sensitive. Our case shows that even though change agents have committed to co-creation, they often remain misaligned on other policy issues, especially those relating to potentially harmful extractive activities. Their relationships are thus intricate at best and can easily be troubled.

A recent trend that adds to the complexity of this is the increasing public scrutiny of relationships between the fossil fuel industry and governments, especially so in the Netherlands. Governmental awareness of this is clearly reflected in our case, in which, for example, a lot of thought is given to processes around the Strategy Note to avoid even the slightest impression of private interference in municipal policymaking. Without wanting to invalidate the righteousness of increased public scrutiny, such scrutiny could foster a two-sided approach among regional governments, wherein they vocally oppose fossil fuel extractive parties and their activities in the media while simultaneously adopting a more conciliatory and cooperative stance during co-creation. Such a stance is hardly conducive for trust in co-creation. Moreover, such increased scrutiny would also drive a fear of making mistakes in cooperating with fossil industrial parties, which can further limit the willingness of governments to engage in intensive collaboration with these parties

despite that they offer unique and indeed critical opportunities and capabilities for future transitions.

Issues with political accountability, conflicts of interests and (democratic) legitimacy can seriously undermine the transformative nature of co-creative redevelopment. After all, co-creation will rarely be seen as an example of place-based leadership when there is a sense that it facilitates other interests than those of local or regional society, when it is felt to detract from the quality of the representative democracy, or when there is an image of co-creation as leverage in, or smoke screen for, lobbying for continued extractive activities. At the same time, these challenges are difficult to address in co-creation because they are often much broader than the co-creative exercise.

How can regional governments deal with these complex challenges to enhance the legitimacy and thus transformative capacity of co-creative redevelopment? We would like to give three pointers here.

Firstly, it may be helpful not to view co-creative redevelopment projects as aimed at generating innovative techno-economic solutions or creating new lives for fossil industrial assets, but rather, to reimagine them as a platforms that can facilitate attempts at restoring trust and strengthening intricate, vulnerable and multi-faceted relationships in fossil-industrial regions. Indeed, we propose to consider co-creative redevelopment as primarily being about *redeveloping relationships* and only secondarily about innovative reuse. Such a focus would by no means be less transformative, especially when we consider that the transformative potential of innovative redevelopment projects lies in the repeatability of the co-creative concept. Regional governments – be that the same governments or others – will only be willing to co-create in new redevelopment projects when they can trust the other parties involved. Amongst others, they must (re)gain confidence in the other (fossil industrial) parties' moral commitment and accountability to the region and must see these actors acknowledge that this commitment surpasses the commercial business case of individual redevelopment projects. In other words, repeatability of co-creative redevelopment is not necessarily endangered by the failure of pilot redevelopment projects to deliver concrete public value. Pilot projects are rarely completely successful. The whole intention of piloting is to learn from mistakes to be able do things better in follow-up projects. Instead,

repeatability of co-creative redevelopment is endangered when there is a sense, either amongst governments, society, or both, that the failure to deliver public value in redevelopment projects is intentional and a consequence of some actors prioritizing commercial interests over the interests of the region. Restoring trust and building longer-term relationships in and through redevelopment projects are thus essential prerequisites to shared learning and transformation, rather than being things that automatically emerge in co-creation.

Secondly, co-creative redevelopment must more proactively engage with questions of and concerns for the political accountability and (democratic) legitimacy in and of co-creation. This exercise should not be limited to legitimacy of concrete activities on the site of redevelopment, but instead, and in line with the previous recommendation, should concern the legitimacy and acceptance of renewed and ongoing co-creative relationships between parties in the region. Proactive engagement with these issues would involve, not in the least, the establishment of boundaries between representative democratic procedures and co-creation. Often, this will require awareness building on the workings of the governmental organisation and its traditional role in public value safeguarding. Moreover, proactive engagement would also necessarily involve establishing more clear measuring systems for public value creation in co-creation. This should not be limited to output measures, such as amount of renewable energy produced, number of jobs created on the site, and number of students hosted in the project's field lab. Considering the often higher yet more intangible public value created by the project for its surroundings, such site-specific measures might seem somewhat superficial. Arguably, more important would be input and throughput measures, the first specifying which contributions are made by the different co-creators over time, and the second clarifying what sort of safeguards and requirements that are adopted and upheld to ensure (steering on) public values in redevelopment (Moore, 2012). Such a steering system could help address accountability issues for governments in co-creation.

Thirdly, we would like to draw attention to the essentiality of transparent information sharing and public engagement – scary as it may feel to those actors involved. As public scrutiny for collaboration with the fossil industry is increasing, the proactive and transparent sharing of, amongst others, the conditions under

which governments participate (and possibly decide to stop participating), the safeguards that are in place to ensure that public interests are protected, and the progress on input, process and output is critical for the legitimacy of the project. More importantly, however, it could actually provide citizens with an opportunity to take an active role in overseeing these types of relationships. Formal public involvement could further strengthen the active role of citizens in supervision.

6.6.2 Future research

Our results nuance new and emerging narratives of transformative redevelopment, and more specifically, of the potentiality of co-creative redevelopment for transformative change. Although we do not want to dispel the notion that co-creative redevelopment can be a useful instrument for (regional) governments to accelerate the just and sustainable regional transition, this exploratory research highlights the need for caution. Indeed, whether co-creative redevelopment is transformative will very much dependent on how often complicated and deeply systemic legitimacy challenges are dealt with and addressed. Our research provides some initial ideas and learnings on how to approach these challenges, However, more research is needed to both validate the findings and to further investigate, understand and test diverse ways of handling these challenges in co-creative redevelopment. We also call for more research on how to align simultaneous co-creative processes for destruction and creation in co-creative redevelopment projects, and on how to make broader societal value of local co-creative redevelopment projects more tangible. Last but surely not least, we recommend further research into the various tensions that may arise in institutional entrepreneurship and staking claims on the right to a just transition as a consequence of collaborating with the fossil industry.

CHAPTER 7

Discussion and Conclusion

7. Discussion and conclusion

In this dissertation I sought to understand how imagined publics are coproduced with transition expectations. My empirical studies towards this phenomenon spanned three Dutch transitional governance settings that, while all concerning gas & gas infrastructure, differed in terms of the development and implementation stages they were in, the levels at which decision making took place, and the technology or object focus that was prevalent. In line with the holistic tradition, I aimed to understand coproductions of publics and transition expectations – or, *webs of expectations* – as integral parts of the governance settings in which they arise, interact, perhaps even conflict, and evolve (Diesing, 1971/2017; Martin, 2018). Across settings, I searched for common rationalities and patterns – rationalities that I came to understand in terms of *legitimacy*, and patterns that I came to explain as *legitimation* (Chapter 2). Simultaneously, I tried to understand how governance was continuously shaped and reshaped in and by these webs, leading it to unfold in the ways it did. The main research question was:

How are imagined publics coproduced with transition expectations in governance of gas & gas infrastructures in the Dutch energy transition, and what consequences does this have for the legitimacy of this transition?

This question was answered in five parts, each led by their own sub-question.

7.1 Answering the sub-questions

7.1.1 Conclusions SQ1: conceptualising the legitimacy of transition expectations

Chapter 2 revolved around the sub-question, *'How to conceptualise legitimacy of transition expectations?'.* In this Chapter, I developed a theoretical perspective on the legitimacy of transition expectations, merging insights from, amongst others, Science and Technology in Society, Political Science and Philosophy, and Public Administration. The first step was establishing that transition expectations for future technologies, systems, projects, institutions, behaviours and so forth in fact do require legitimacy. I argued that it is essential to think about the legitimacy of

transition expectations because of the influential functions that these expectations fulfil in governance, the politics in which these expectations are tangled up, and the generally *high degree of publicness* that characterizes these expectations.

Expectations are not automatically legitimate – a belief in their legitimacy must be instituted, fostered, and defended by those who want to see their expectations enacted. In other words, governance actors must actively legitimize (their) expectations. Legitimation can be understood, as I have argued, as a visionary process in which different *imagined publics* are coproduced in and with webs of transition expectations. Alternatively, I could say that coproduction is the mechanism through which governance actors construct and claim legitimacy for expectations. How diverse publics are imagined, included, and prioritised in webs of expectations (or not) is at the core of the legitimacy of transition expectations, and therefore, examining coproduction enables researchers to get a grasp on the *potential legitimacy issues* posed by transition expectations.

7.1.2 Conclusions SQ2: imagined publics in governance of the Dutch heat transition

In the third chapter, I aimed to gain an empirically grounded understanding of the diversity of imagined publics in governance of the Dutch heat transition. Driven by the sub-question, *'What are the diverse imagined publics in governance of the Dutch heat transition?',* I conducted a Q study to identify five distinctive imaginaries, each shared by (sub-)groups of actors in governance. These were:

1. *Meaningful participation in a diverse society*
2. *Strong and enthusiastic communities in the lead*
3. *NIMBYs, social contestation and the threat to decarbonisation*
4. *Collectivism & vulnerable groups at risk*
5. *Unburdening individual user-consumers in the transition*

Each of these imaginaries included and justified particular ideas about the roles and responsibilities that could and even should be fulfilled by publics. Such imagined publics were also drawn upon to legitimize a particular attribution of responsibilities to other actors in transitions, predominantly government(s) and market parties.

7.1.3 Conclusions SQ3: coproduced publics in the Dutch hydrogen transition

In Chapter four, I explicitly aimed to understand how imagined publics are coproduced in and with wider webs of transition expectations, conceptualised as transition visions in this Chapter. The research question was: '*How are imagined publics coproduced in and with visions for the Dutch hydrogen transition, and with what consequences?*'. These consequences were discussed in terms of energy justice.

Based on a qualitative content analysis of twenty-one hydrogen visions, I identified seven coproductions. In each of these coproductions, imagined publics were used to justify particular technological and organisational preferences for the production (e.g. green and blue hydrogen production), transport (pipelines and underground storage), and use (electricity provision, heating in the built environment, and transport) of hydrogen. How publics were recognised or not in these visions was not always just. Firstly, publics were regularly misrecognised in coproductions: their presence was only imagined based on a generally limited set of (biased deficit model) characteristics, such as being poorly informed and unknowledgeable, or being (only) incentivised by concerns for individual comfort or economic advantage. These misrepresentative imagined publics were often coproduced with understandings of techno-economic complexity and of high levels of uncertainty in the hydrogen transition. Moreover, they were also related to preferences for rather narrow and one-sided public engagement instruments that limited citizen participation around key hydrogen activities.

Secondly, in other coproductions, publics were not seen or recognised as a relevant public at all (i.e., non-recognition). Publics were absent, amongst others, around electrolysis, underground hydrogen storage, and industrial applications of hydrogen. Oftentimes, these coproductions also favoured more centrally coordinated, technocratic, and upscaling-oriented modes for technology and project development in the hydrogen. This too worked to constrain the opportunities for engagement of diverse, real-life publics with hydrogen.

Misrecognition and non-recognition of publics in visions – both of which may well be a consequence of lacking public involvement in vision creation – are

problematic and forms of injustice on their own. However, these current-day recognition injustices can result in further procedural and distributive injustices when hydrogen visions become performed, for example, when a failure to appropriately recognise diverse groups of people now results in unequal access to infrastructure and control over modes of conversion, or in an unfair allocation of diverse costs and benefits later on.

7.1.4 Conclusions SQ4: evolving expectations of societal value co-creation in GZI Next

In the fifth chapter, I focused on (governance of) expectational conflicts in governance. Driven by the sub-question *'How do expectations of societal value co-creation evolve and become performed in co-creative gas asset redevelopment?',* I researched how evolving and diverse social value expectations, which also regularly conflict with each other, can be governed in co-creative redevelopment projects.

For this study, I drew on insights from an in-depth single case study, namely, GZI Next. In GZI Next, the site of an old gas purification plant was converted into an energy hub by a group of actors different in everything except their shared yet abstract commitment to 'societal value cocreation'. For two years, I observed these actors in the front-end stage of project development: a phase of exploring, researching, planning, and developing the project's commercial and social value proposition. The front-end stage of project development is interesting from the theoretical perspective of expectations because it is a stage in which a lot of flexibility, even ambiguity, is maintained regarding the project's proposition and lay-out.

In the case study, the inherent ambiguity of the front-end stage was initially facilitative of co-creation. It left room for diverse actors to bring in and maintain their own expectations of the project and what it could mean and do for society. Over time, however, ambiguity turned into uncertainty and was increasingly seen as problematic. This particularly applied to expectations on the influence and participation of residents living in the vicinity of the project.

As the project progressed, new and oftentimes more commercially driven parties entered project development. With the entrance of these parties also came new

expectations on the project's commercial and societal value priorities, which not always aligned with pre-existing expectations in and for GZI Next. For example, we observed that while at least some co-creators showcased an initial commitment to co-create societal value with residents and other societal groups on the site, in an increasingly commercial setting these intentions became somewhat overshadowed by concerns for financial viability and operability of project activities. Consequently, co-creation with relevant members of society became somewhat side-tracked, and citizen participation turned into an instrument to both inform residents and collect their concerns with the project.

In this case, the growing influence of new parties in the project put pressure on the initial expectations of other co-creators, giving rise to more explicit expectational conflicts over the project's societal value proposition. When and where these new parties had a more executive function in project development, observably, their expectations became somewhat inadvertently prioritised, preferred and performed in and through their doings and decisions in the project. While the effective reduction of expectations was critical to move forward in project development, this was not necessarily without its issues. Prioritizing and performing some expectations generally meant foreclosing others, and this was experienced as undesirable by other co-creators as no explicit discussion had taken place about which (and whose) expectations to prioritise (a dynamic also observed by Andersson & Westholm, 2019; Veenman, Sperling, & Hvelplund, 2019, for instance). This could happen because the co-creating actors had neither considered how to resolve expectational conflicts, nor had they put in place governance rules or steering mechanisms for this aim. In short, without functioning governance of expectations in place, underlying power dynamics – driven by conflicting interests, formal actor roles and positions in the project, and unequally divided financial and knowledge resources – determined whose expectations of society and its demands from the project were prioritised in project development.

7.1.5 Conclusions SQ5: legitimacy challenges for regional governments in transformative co-creation in fossil-industrial regions

Co-creative asset redevelopment is an example of actors performing expectations for the organisation of transitions in traditional fossil fuel producing regions. During the performance of these expectations, legitimacy and concerns hereabout are

continuously emergent. In this final empirical chapter, I explored these emergent legitimacy concerns from the perspective of the regional governments involved. Concretely, I looked at the diverse legitimacy challenges faced by regional governments in co-creative asset redevelopment projects. The research question was, '*what legitimacy challenges arise for regional governments when engaging in co-creative gas infrastructure redevelopment projects, and how to address these to enhance the legitimacy of such projects?'*.

I drew on insights from the case study of GZI Next again. In GZI Next, redevelopment encompassed multiple co-creative activities, such as joint strategy development, collaborative communication and participation planning, negotiations on the projects' social and commercial value propositions, and institutional work for policy support and resources. Each of these activities presented specific legitimacy challenges for regional governments, of which I identified six in total. These were, how to:

1. Strike a balance between addressing financial and human resource constraints and managing concerns for private interference.
2. Bridge differences in cultures, preferences, and legitimacy concerns.
3. Clarify and manage role expectations.
4. Manage emerging intra-organisational conflicts of interest.
5. Overcome difficulties in successfully claiming the right to a just transition.
6. Ensure accountability in the face of often (intangible and indirect) regional value.

To address these challenges and strengthen the legitimacy of co-creative redevelopment, I made three recommendations. Firstly, to view co-creative redevelopment projects not as ways to generate innovative techno-economic solutions or revitalize fossil industrial assets, but first and foremost as platforms to restore trust and to strengthen intricate, vulnerable relationships in fossil-industrial regions. Secondly, to proactively rather than reactively engage with issues of political accountability and democratic legitimacy, not in the least by setting clear boundaries between democratic procedures and co-creation and by establishing clear input, throughput and output indicators for public value co-creation. And, thirdly, to more transparently share information not just about the project's progress, but also on the conditions under which governments participate (and

possibly decide to stop participating) and on the safeguards in place to ensure protection of public interests. Such transparency could provide citizens with an opportunity to take an active role in overseeing these types of relationships.

7.2 Returning to the main research question

As I consolidate the results of the different studies in this dissertation and the governance settings to which they pertained, I come to the four overarching insights. Together, these inform our understanding of how imagined publics are coproduced with transition expectations in the Dutch energy transition, and with what sort of consequences for the legitimacy of these expectations in governance. These insights are:

1. Coproduction is what legitimation is all about.
2. Legitimacy requires the (just) production of multiple and relational imagined publics.
3. Legitimacy claims and their publics interact and compete with other claims.
4. The legitimacy of expectations is always in flux.

7.2.1 Coproduction is what legitimation is all about

Similar patterns in coproduction across studies and governance settings show that, firstly, imagining publics in and around transition expectations serves not just a creative but also, or perhaps even predominantly, a *political purpose*. Imagining publics in and around expectations is prerequisite for the establishment of claims on legitimacy for the sort of solutions advocated in expectations. Expected technologies and infrastructures, policies, plans and regulations, roles and responsibilities for actors, or even expected-to-be-necessary social behaviours need to have a right and reason to be brought into existence. Such right and reason can only be obtained through the ideal of societal betterment (Jasanoff, 2015) – an ideal that, perhaps obviously, must build upon certain images of a society that needs and benefits from the performance of expectations.

Coproduction proves to be the mechanism through which actors, quite often unconsciously and as much for themselves as for others, establish a claim on the rightfulness and legitimacy of the transition solutions they propose. A look at the

imaginaries identified in Chapter 3 of this dissertation might clarify this. If we zoom in on imaginary 3, for example, it is quite clear that this imaginary produces very specific expectations for the organisation of the heat transition, amongst others in terms of rather top-down decision making. These expectations can only be understood as justified or 'right' in reference to their coproduced publics. The imaginary builds on minority local publics displaying NIMBY opposition. Portrayed as both distrustful and not to be trusted due to the strategies they apply to get their own particular interests prioritised in decision making, NIMBY publics are near impossible to constructively work with and in fact, even endanger the larger common interest in this transition. The general public is similarly depicted in a way that justifies such top-down and more technocratic decision making: it is ignorant, confused, unable to differentiate between various truth claims, and not particularly caring for the transition beyond its financial impact. For acceptance of transitions, such a general public must be better informed as well as be thrown a metaphorical financial bone, though it should not be overly involved in decision making. In other words, only if society-in-transition is characterised by these publics, can centralised, top-down and somewhat technocratic organisation be perceived as desirable and very much necessary for progress in transitions.

Coproducing particular publics with expectations for the organisation of the transition thus provides the necessary *right and reason* for expectations to become performed. Chapter 6 of this dissertation provides another illustrative example of this phenomenon. Again, publics prove to become imagined in particular ways in establishing claims on the legitimacy of certain expectations. Quite specific is how, in this Chapter, governments and energy developers prove to have different portrayals of relevant 'society' in and around co-creative asset redevelopment. These different portrayals – society as neighbours of projects versus society as regional citizens - influence the forms and aspects of legitimacy considered essential for the project (socio-political legitimacy, procedural legitimacy, democratic legitimacy, and so forth) as well as how to obtain these.

Slightly more implicit yet by no means not less meaningful in this Chapter are the various images of 'Drenthe' as a regional society that circulate and work to justify why actors collaborate on asset redevelopment. Drawing on both the region's past and its possible futures, co-creators construct on the one hand, a somewhat

dystopic future image of Drenthe as a destitute post-fossil society with limited industrial activity and high unemployment. On the other hand, they draw on images of Drenthe as a strong and resilient society with a longstanding history in energy, plenty of human (and other) capital, and lots of societal goodwill for collaborating with the fossil industry to redefine its future and identity (and that of the industry) based on the good experiences and personal affiliations of many of Drenthe's inhabitants with this industry. These imaginaries of Drenthe are so deeply ingrained in expectations for (societal value creation in) co-creative asset redevelopment that we could even say that they provide the project's *raison d'ëtre*. Without these imaginaries, the project neither had a right to exist nor a justification for its co-creative organisational format. In other words, these particular expectations for co-creative asset redevelopment are considered legitimate because they are based on these societal imaginaries or, as I have named it earlier, because of their *degree of publicness*.

7.2.2 Legitimacy requires the (just) production of multiple and relational imagined publics

A second observable pattern is how publics become produced in relation to each other in legitimation of transition expectations. Expectations oftentimes promise differentiated impacts on multiple publics, with some publics likely to be more affected than others. One observation that stood out for me across governance settings was that this differentiation between publics in and through expectations oftentimes seemed to be made based on certain societal and normative rules and principles.

In Chapter 3, for example, each of the five imaginaries contained multiple publics that were imagined in relation to each other. Based on the particulars of these relationships did certain priorities in transitions emerge (between publics and their interests, sometimes on different levels), and were certain rights and responsibilities for both public and other actors in transitions considered appropriate. In other words, in each imaginary, certain public(s) interests became prioritised based on how publics were imagined and understood to relate to each other in the heat transition. In imaginary 1, for example, capable and willing citizens were to be involved in decision making on local energy transitions with direct implications for their lives, although not so much in decision making over

'collective' aspects of energy systems such as infrastructure. In imaginary 4, the existence of a significantly large group of vulnerable households in transitions necessitated a more centralised and collective approach, even though such an approach could possibly limit the choices of other, more empowered households in transitions. Lastly, in imaginary 5, the public as an aggregate of individual user-consumers was to be facilitated, supported, and nudged towards adoption of more sustainable heating technologies as this would serve a higher-order 'public interest' in decarbonisation.

One way to understand the priorities made in and between these different publics is by use of the theoretical distinction between *Publics in Particular* (or, *PiPs*) and the *Public in General* (or, *PiG*) (Michael, 2009; Pesch, 2019). In some imaginaries, the interests of the *Public in General*, although oftentimes implicitly and ambiguously present, ultimately were seen to transcend the interests of presented *Publics in Particular*. These imaginaries claimed legitimacy for a certain division of roles, rights, and responsibilities in the heat transition exactly because it would contribute to the *general public interest*. Interestingly, in other imaginaries, such roles, rights, and responsibilities were being justified in relation to *particular interests*. Such a prioritisation of particular interests was generally based on specific understandings of (un)fairness. In imaginary 2, for example, giving particular publics a large degree of control and ownership over the transition was framed as a response to (recognition) injustices committed by incumbent parties in previous and ongoing energy exploitation activities. In imaginary 4, the prioritisation of the interests of vulnerable households was considered legitimate in reference to the need to prevent further disadvantage to the already disadvantaged. In both these imaginaries, accountability, fairness and (restorative) justice were seen as important grounds for legitimacy of expectations that prioritised the interests of particular publics.

This pattern of prioritising some publics over others in legitimation of (webs of) expectations in transitions was also observable in Chapter 4. In the hydrogen visions studied in Chapter 4, it was the (oftentimes implicit) general public and its rather one-sided interests that generally became prioritised over other publics. The general public's interest was seen to be continued economic prosperity while achieving carbon neutrality in the transition. These interests seemed deeply

ingrained and taken for granted in these visions and were also assumed more or less fixed. This rather singular and static perspective on 'the public interest' at least to some extent denied existing societal plurality. In fact, striking was that potentially relevant publics were not explicitly imagined or recognised at all around a number of hydrogen activities. Publics were absent, amongst others, around large-scale green hydrogen production, underground hydrogen storage, and industrial applications of hydrogen. Something rather interesting seems to have happened here: while the hydrogen transition as a whole was portrayed as having a high *degree of publicness* – not in the least in how it was framed as more than critical for sustainable and continued prosperity in the Netherlands – that *degree of publicness was denied or ignored* around specific proposed aspects and activities in this transition, by regarding these as matters that did not implicate publics in any way (see also the work of Young, 1990, on the denial of difference and its justice consequences).

When and where societal plurality was recognised – that is, in those instances and around those hydrogen activities in which other publics than the implicit *General Public* were recognised – it was often interpreted more as a threat than as an opportunity. For example, the perception was that concerns for safety or sustainability in and around particular hydrogen related activities such as CC(U)S could easily develop into a protest against hydrogen adoption at large. Rather than (substantively) engaging with these concerns, most hydrogen vision documents proposed more information sharing on the relevance and necessity of hydrogen, show-and-tell pilot projects and other one-sided engagement approaches to alleviate concerns. In other words, it seemed as if visionaries involved were *emphasizing and defending their prioritisation of imagined PIG interests* rather than reflecting on and discussing whether diverse publics and their interests were actually properly recognised in visions.

The *denial of publics and publicness* creates oversight – after all, there are fewer people to include and fewer issues to consider – but also oversights. Not in the least, it can limit anticipation in and through visions, making it almost unavoidable that consequences of proposed developments for different groups in society are not properly considered. Obviously, this leaves the hydrogen transition vulnerable to legitimacy issues. Thus, whether legitimacy claims for expectations resonate

with other governance actors and emergent publics – i.e., real life legitimizing audiences – and thus become accepted and believed, not in the least depends on the just recognisability and prioritisation of imagined publics and their interests made in and through these expectations.

7.2.3 Legitimacy claims and their publics interact and compete with other claims

A third common theme across the studies bundled in this dissertation is the contested nature of legitimacy. Each chapter in this dissertation describes how legitimacy claims for transition expectations interact with each other in processes of contestation and conflict (in line with the work of, for example, Delina & Janetos, 2018).

In Chapter 3, I noticed how identified imaginaries reflexively engaged with one another, with some imaginaries calling out and refuting claims to legitimacy made in other imaginaries. A typical and necessary part of such refuting was the production of alternative public identities and interests. In Chapter 5, interaction between expectations resulted in three expectational conflicts over the meaning and operationalisation of societal value co-creation in project development. In these conflicts, competing ideas and assumptions about relevant 'society', 'value', and 'co-creation' were fighting for performance in project execution. In Chapter 6, at last, competition between legitimacy claims was evident in the efforts of co-creators to promote Drenthe 4.0. The claim for sustainable and just regional redevelopment made in this vision for the region did not garner the desired financial support. While not negatively received, the claim seemed to struggle to resonate at a national level against the backdrop of a similar and arguably more compelling claim on a just transition from the neighbouring Province of Groningen.

Interaction and competition between expectations offer a particularly insightful lens for understanding power dynamics in energy transitions (Jasanoff, 2015; Delina & Janetos, 2018). Expectations claim legitimacy on diverse grounds and publics, and interaction and competition highlight that such claims are by no means automatically accepted. In energy transition governance, legitimacy proves a political battleground, on which it is of critical importance who gets to

successfully define and claim 'the public interest'. Both the dominance of certain imaginaries and understandings of public interests, and the emergence of alternative imaginaries in which different interests are prioritised, point towards the (symbolic or discursive) power struggles that actors are engaged in in transition governance. These actors do not just try to gain support for their expectations; in legitimation, they actually aim to construct and impose knowledge, ideas, norms and principles, imaginaries, and indeed, public identities in transitions (Habermas, 1973; Fricker, 2013; Howarth et al., 2014).

7.2.4 The legitimacy of expectations is always in flux

Precisely because legitimacy is a battleground, it will always be the subject of contestation. Transition governance settings will always be characterised by different ideas about how (il)legitimate an expectation is. The legitimacy of transition expectations can thus never be assumed; legitimacy remains perpetually ambiguous, even if at points there appears to be a widely shared belief in it. At any time, something critical can happen, new knowledge and information can become available, or new publics can arise or gain foothold in governance. Presents and futures can and do change, and this will not rarely involve casting doubts and raising concerns with the previously assumed as apparent legitimacy in and of expectations.

In short, the legitimacy of transition expectations is always in flux and legitimacy claims will not rarely have an expiration date. To illustrate this point, let me revisit one of the studies discussed in this dissertation, namely, the study on different imaginaries in the Dutch heat transition. Amongst the imaginaries found in this study, which was based on data collected in 2018/2019, was 'Collectivism & vulnerable groups at risk'. In this imaginary, concerns for financially and socially vulnerable households took precedence. These households were seen as characterised by lower education levels, lower incomes, minimal savings, and limited social support networks. These households were perceived as ill-equipped to shoulder the burdens of transitions, not in the least in the form of high transition costs. Despite the potential limitations on individual consumer choice and freedom, collective solutions such as heating grids were favoured for these vulnerable households as these solutions were centrally organised (i.e., supporting a taking care of people mentality), scalable, and mostly, affordable.

It is 2024 now, and a noticeable change has occurred in how legitimacy is construed in this sort of imaginary. While the foundational justice concerns and imagined publics have remained the same, mounting uncertainties have surfaced regarding the viability of collective heating grids to best serve these vulnerable publics. The disproportionately high increases in heat tariffs for the end-users of collective heat have given rise to experienced injustice, especially as quite some of these end-users now pay more than they would if they had continued with gas-fired central heating (Radar, 2023; NOS, 2024; NRC, 2024), and will likely continue to pay more than households that have chosen for individual heating solutions such as heat pumps (FD, 2024). Moreover, these users also pay significantly more than collective heat end-users in other countries (TNO, 2024). The main reasons for this seem to be the increases in the costs of heat production, the way in which heat tariffs in the Netherlands are set and regulated, and the increasing costs of maintaining and expanding heat infrastructure. Yet, this is quite difficult to ascertain because of the relative opacity in the costs and revenues of heat suppliers (Energeia, 2024a). Partly due to the lack of transparency it is difficult to have an informed societal and political debate on what could be considered as more just pricing mechanisms and regulations. Not surprisingly, this has led to accusations at the address of large commercial heating companies. According to some, these companies exploiting the flexibility afforded by regulatory principles (e.g., NMDA) to maximize their profits from heat provision, without caring much for the societal consequences of these behaviours (NRC, 2024).

Under the current market dynamics and (proposed) rules, collective heating grids increasingly appear financially untenable. 'Vulnerable households' that are already on such modes of heat provision often find themselves facing disproportionately elevated energy bills. Households and neighbourhoods that were supposed to transition to collective heat in the coming years have started to protest, municipalities have called for price ceilings and other means of controlling heat prices for their (vulnerable) inhabitants, and heating companies have indicated that they can no longer make a conclusive business case under these circumstances and pressures. Consequently, many plans have been suspended – or cancelled – until more clarity on State policy, intervention, and support is provided (see, for example, Energeia, 2023; FD, 2023; De Volkskrant, 2024).

This consequent inertia is about much more than a mere struggle to produce viable business cases. This is about an initial claim to legitimacy – e.g., heating grids were seen as right because they could be developed against the lowest societal costs and could provide easy and affordable heat to those most vulnerable – that now proves at least partially untenable in practice. To re-produce legitimacy for heating grid plans and developments, alternative claims and solutions are needed that not only guarantee a lower and more affordable tariff, particularly for 'vulnerable households', but that also increase transparency, trust, and stability in the emergent heat market (Energeia, 2024b).

This example highlights that beliefs in the legitimacy of expectations can and do change over time and thus, that legitimacy must permanently be remade and reclaimed or else is lost. Legitimacy is, in other words, "*...permanently under scrutiny and must be reconquered day after day and case by case"* (Rosanvallon, 2008, p. 117). This is particularly true when it comes to the legitimacy of *expectations*. There is more unknown than is known about the future. There are many futures to promise and equally as many legitimacy claims to make. And as the future unfolds, it is generally in a way quite different from our promises, expectations and predictions. When it comes to the future, therefore, legitimacy is always a powerful albeit only temporary mark of authority, easily challenged and thus always in need of defence.

7.3. Governance implications

In the preceding sections, I have discussed the overarching theoretical insights and advancements emerging from the studies bundled in this dissertation. To conclude the analytical part of this dissertation, I will reflect on the implications for energy transition governance. What sort of lessons, recommendations or even warnings emerge from this body of work, in other words, what is the message that I would like to convey to governance actors?

My thinking on governance implications starts from the perhaps obvious observation that the legitimacy of expectations cannot be overlooked or assumed in transition governance. Expectations are not innocent, and therefore governance actors involved in transitions should not underestimate their influence. Even

expectations that are just ideational are very much functional. They do things. They create politics, they intervene in projects, they influence decisions, and they affect people and their options in energy systems. This is why the legitimacy of transition expectations should be an explicit theme in transition governance. In particular, more concern is warranted for both the politics and the publics invoked by expectations. Put in the terminology of this dissertation, it is critical for governance actors to acknowledge (their own contributions to) the politics of making, creating, supporting, and denying public identities and interests in and around transition expectations.

To expect is to imagine publics – this is the essence of coproduction. Such imagined publics are *de facto* characterised by a narrow set of traits. Hence, it is in the nature of imagined publics to deny the richness, diversity and fluidity that are so typical for real life publics. Arguably, therefore, imagined publics are unavoidably and hopelessly unrepresentative. One might deduce from this that expectations that derive their right and reason to exist and be performed from such biased, limited, unrepresentative or even unjust imagined publics must subsequently be incorrigible illegitimate. This is a rather fatalistic conclusion as it seems to imply that nothing can be done to enhance or ensure legitimacy of expectations in transition governance.

Fortunately, my interactions with and observations of transition governance have shown this to be incorrect. There are ways to enhance the legitimacy of expectations, and these are mainly related to the design of the decision making processes in which expectations and their publics are coproduced, drawn upon, and performed. In the remainder of this sub-section, I will provide some suggestions on how to do this, grouped under two overarching themes. These are:

1. Organise for competition and change, as these are the cornerstones of the legitimacy of expectations in transitions.
2. Organise for conditional legitimacy, that is, ensure that legitimacy claims are fitting to the temporal, spatial, technological and socio-cultural conditions of particular governance settings.

7.3.1 Organise for competition and change, as these are the cornerstones of legitimacy

In answering the main research question, I concluded with highlighting that transition governance will always be characterised by different ideas about how (il)legitimate an expectation is. Expectations emerge as a challenge to other expectations; different expectations compete with each other for legitimacy, resources and performance; and from these ever-ongoing processes of contestation, challenge and competition does change in legitimacy beliefs emerge. As such, legitimacy is best seen as but a temporary mark of authority that is always in need of defence. This continuous need to defend and reclaim legitimacy in the face of ever emergent concerns for illegitimacy might be seen by some governance actors as burdensome. Yet, I would tell them that it is nevertheless very much desirable (see also the work of Rosanvallon, 2008, or Delina & Janetos, 2018). In fact, I would go as far as to say that the possibility for alternative expectations to emerge in light of potentially perceived as illegitimate dominant expectations is at the core of what constitutes a belief in the legitimacy of transition expectations. Alternative expectations will regularly build on and require other imagined publics, sometimes even so-called *counterpublics*, who will enable different claims to legitimacy (see, for example, Chapter 3). The fact that these imagined (counter)publics and their legitimacy claims are allowed to exist, are taken seriously, and even are adopted and thus allowed to significantly influence decisions at times, introduces a necessary check on symbolic power in governance of transitions.

Hence, to strengthen the legitimacy of expectations, I would recommend governance actors to take competition, contestation and change as leading principles for the design of governance processes. This translates into a number of concrete governance design preferences or choices.

7.3.1.1 Early stage opening up and inclusion

Firstly, competition and contestation require a minimum of two legitimacy claims, but ideally implies a certain plurality of legitimacy claims and understandings in governance (see, for example, Chapter 3, in which I found five of such understandings). To actively realise plurality of understandings in decision making, it is essential that governance settings are designed in an open and inclusive

manner. Often, this will mean that new actors with alternative points of view – especially those of citizens, social groups and other societal stakeholders – are purposefully sought and invited in. Contrary to common practice, this is critical as early as the vision formation (or front-end) stages of governance. This may be scary. After all, these are completely ambiguous phases of governance in which it is generally uncertain if and how things will evolve. The perceived risk of early inclusion of such parties is, on the one hand, that it may raise expectations that might prove unattainable in execution or implementation. This will lead to resistance, or so it is feared. On the other hand, these societal parties may ask questions and raise concerns for which one might not have a clear answer or address – which, so is the perception, would equally lead to resistance. As I have sometimes heard declared, you should not *"organise your own resistance"* by ill-timed opening-up (see also Chapter 5 of this dissertation).

In practice, therefore, there seems to be a tendency not to involve societal parties too much in early phases of governance. This is not only evident from my own research (see, for example, Chapter 4 of this dissertation), but is also a frequently raised point of critique on how the Netherlands' energy and climate policy has been given shape in the last two decades (Hendriks, 2008; De Geus, Wittmayer, & Vogelzang, 2022). The 2019 Dutch Climate Agreement, for example, was largely created at various sector tables, where professional parties talked and negotiated about the future of the Dutch energy system. Also considering that energy and climate are not often critical themes during elections, in fact, are by no means thoroughly considered and discussed during election times, such a more organisational rather than democratic vision formation and goal setting procedure means that citizens rarely have the opportunity to vote on or provide substantive input on the future of energy in the Netherlands as much as elsewhere (for a welcome exception, please see Populytics, 2023).

Including citizens and other societal groups in these early, perhaps even preliminary stages of governance and decision making is even more important when one considers the guiding and performative effects of imagined publics in these stages. Amongst the key insights of my work is narrow public identities and interests can steer governance in certain directions from the earliest conception of a plan, project, or transition. These often implicit and unconsciously reproduced

imagined publics have an early-on filtering and excluding effect and can come to determine how the relationship with society in and around these plans, projects and transitions takes shape in later, more executive stages (see Chapters 4 & 5).

In short, to enhance the legitimacy of expectations, I would promote attempts to check and challenge functional expectations and their coproduced imagined publics as early as possible. Such check and challenge should come first and foremost by the publics that are supposedly represented by imagined publics. This can be done, without necessarily creating resistance, by looking for a level of abstraction at which it becomes possible for these publics to meaningfully provide input. This is rarely the level of the concrete policy document, plan, or project to be developed. Conversations with members of diverse publics become valuable when they are allowed to reflect on the underlying, implicit assumptions that are made about them – not in the least, about their values and their interests; their demands, conditions, and requirements of (the process towards) a policy, plan or project; and their willingness and ability to be involved in decision making.

In this regard, I would like to emphasise that organising for inclusivity, amongst others by setting up participatory channels for citizens to provide input, should not necessarily be aimed to prevent resistance. More inclusivity and participation do not automatically result in less protest, or so is my experience (See for example Ruiten, et al., 2023 and Rodhouse, Mouter & Cuppen, unpublished work). It has proven a relatively easy pitfall to dismiss protest and resistance as illegitimate or irrelevant because acceptance has been somehow measurably achieved amongst participants. However, there will be societal parties that prefer or resort to channels other than participation to express their legitimacy concerns and objections; the fact that they are shared through these channels does not mean that they are automatically less legitimate or relevant than the concerns and objections of participants. Protest and resistance against expectations through these channels can indeed be a source of valuable feedback on legitimacy claims, especially as such feedback somewhat escapes the trap of assumptions about publics that generally also underlies participation design (Cuppen, 2018; Felt & Fochler, 2010).

7.3.1.2 Ensure rules and procedures for reflection

Open and inclusive governance is essential for increased legitimacy of expectations, but not sufficient. Additional design principles are needed to

guarantee legitimacy as much as possible. Illustrative of this were the issues that arose in co-creative project development of GZI Next, described in Chapter 5. In the design of GZI Next, a conscious decision was made by, amongst others, the owners of the terrain of the project to invite and involve parties with different backgrounds, interests and expectations. Both the open brainstorm sessions before project commencement, and the co-development of the project by a diverse group of governance actors resulted in the circulation of seven diverse expectations for (social value creation in) the project. Over the course of project development, these expectations conflicted sometimes. As it turned out, without clear rules or procedures to reflect on and resolve these conflicts, existing knowledge gaps, individual interests, formal actor roles and unequally divided influence in governance unintentionally came to determine whose expectations became prioritised and performed.

Collaboratively designed and agreed upon rules and procedures for reflecting, comparing, evaluating, and resolving conflicts of expectations proved necessary to prevent these types of power dynamics. Such rules and procedures not only help to explicate expectational conflicts, but they also give a certain influence and backing to parties with less material influence in governance. One form that such a rule could take is to jointly commit to, and formalise, the prioritisation of a certain (value) expectation. Another form, this time from Chapter 6, is a document in which the roles and responsibilities of involved parties in governance are laid down. In this case, it may not be so much the end result, but the conversations about (the expectations that governance actors have of each other with regard to) these roles and responsibilities that can facilitate learning and concord in governance.

7.3.1.3 Opening up should be two-directional

A final recommendation, or perhaps warning, that I would like to give to governance actors under this heading is that opening up should not only mean involving more people and viewpoints in decision making. Opening up, as the term somewhat implies, essentially is about creating an opening for the exchange of information between two previously separated domains. These may be the domains of science and policy, or science and society (see, for example, Wynne, 2007; Stirling, 2008), or as in this dissertation, the domains of governance and society. Opening up will of course entail 'society' contributing new information, not in the least in the form

of new understandings of legitimacy, but it must also entail governance to provide information to society. To clarify, by this I do not mean that governance actors should be sharing more communication materials with citizens with the aim of somehow educating these citizens, for example, on the risks of certain technologies or developments. Instead, I am talking about sharing the sort of information that will enable publics to follow decision making in governance in a transparent manner, and to hold governance parties accountable if necessary. What sort of information this is, and with which audiences it should be shared, may differ per governance setting. In Chapter 6, for example, I recommended actors in co-creative asset redevelopment to proactively share information about, amongst others, preconditions for public participation in co-creation, actions taken to safeguard boundaries between democratic and non-democratic decision making, and the progress of project development against societal value goals and indicators. Such information would assist society to assume a more supervisory role in cooperation projects involving public and private parties in the governance of transitions.

7.3.2 Organise for conditional legitimacy

A second governance implication stemming from the theoretical insights of my work regards how legitimacy of expectations should be seen and understood in energy transition governance. Quite in line with scholars who have argued that legitimacy can best be understood as a contestable and changing *belief* (see, for example Habermas, 1973; Weber, 1978b; Beetham, 1991; and Rosanvallon, 2008), this research underscores that legitimacy is constructed and claimed in ways that are both highly particular to the settings in which these expectations exist and interact with other expectations, and tied to the governance actors that are involved in these settings. Similarly, the extent to which certain legitimacy claims resonate in governance seems contingent upon the capabilities, experiences, interests, and positions of diverse actors involved.

Consequently, legitimacy should always be evaluated and discussed in light of the specific contexts to which webs of expectations pertain and in which they do their functional work. Such an understanding of legitimacy may prove disappointing, not in the least to some of the governance actors with whom I have engaged over the

years. Many of them seemed to seek clear, uncontested, almost objective standards of legitimacy to meet in and with their expectations – and understandably so, given the significant socio-political complexity of modern-day transitions. On multiple occasions, I was asked to provide (recommendations for) universally applicable toolkits, repeatable procedures, and comprehensive lists of legitimacy criteria that could be straightforwardly implemented in governance. Sometimes I wished I could have provided precisely that. How elegant a solution it would be, amidst the already overly complex landscape of the energy transition, to have a simple and definitive set of legitimacy criteria, applicable in any situation without much differentiation for the issues at stake, the expectations articulated, and the societal background against it is all to unfold! How inspiring it could be to have a simple legitimacy tool that could help address many of the delaying social and political issues in transitions, especially at a time at which many a planned transition initiative is halted or progresses at a frustratingly slow pace! Alas, my research highlights that such a relatively simple and generally applicable operationalisation of legitimacy will not do. Instead, my work underscores the need to produce understandings of legitimacy that are inclusive of the temporal, spatial, and sociocultural conditions of specific situations.

Not in the least, in legitimizing their expectations, governance actors will have to weave together pasts and futures of publics-in-transition. That is, for their legitimacy claims to resonate, they cannot be based only on legitimacy grounds and publics related to, for example, new technological solutions in transitions. Such claims must also address legitimacy issues from the past. This may need some clarification. In Chapter 4, for example, I concluded that the legitimacy of underground hydrogen storage seems assumed in vision documents based on how such storage contributes to the interests of the *General Public*. Publics in Particular were not coproduced with, and thus not recognised around underground hydrogen storage, despite the fact that this technology is to be primarily implemented in eastern and northern parts of Netherlands where the communities that are to live on top of or around such storage have a sensitive and not yet completely closed history with mining activities in the underground. To resonate with these communities, any legitimacy claim for underground hydrogen storage must accommodate the unique relationship of these publics with their subsurface.

Another relevant example of this need to account not just for society's future, but also for its past comes from Chapter 6. In this Chapter, I described co-creative asset redevelopment as part of a wider effort to economically and socially transform the regional society. To establish the legitimacy of this sort of co-creative activity, which was deeply based on collaboration with fossil industrial parties, actors could not only base their claims on for example, the (cost) effectiveness of co-creation – among other things, by stating that co-creation is a cost-effective way for regional governments to realize their goals and ambitions. Again, there is history here that must be accounted for. Co-creative asset redevelopment had to deal with legitimacy sensitivities, concerns and objections precisely because of the (partly shared) past of the various parties in co-creation.

In short, expectations for new energy sources and carriers, pipelines and other infrastructure, for the adoption and implementation of energy technologies or activities, and so on, are always introduced into a long-existing context, and this context will establish particular conditions for the legitimacy of these expectations. Amongst others, unresolved issues may linger in these contexts, and thus, the legitimacy for new expectations that aim to do their work in these contexts may have to rest on a promise of recovery or even restorative justice (see also Chapter 2). In other words, while proposals for new plans, policies and projects often start on a blank drawing board, such a clean sheet cannot be assumed when it comes to legitimacy. Governance actors attempting to legitimize their new expectations need to be particularly cognizant of previous experiences of exclusion, stigmatization, lack of accountability and injustice of different publics. Not in the least, this can translate into time and space given for both emotions and a multi-issue agenda in participation activities.

7.4. Future research

The four overarching insights or general patterns presented in 7.2 are at the same time the provisional answers to the first part of the main research question and the propositional building blocks of a new theoretical perspective on the legitimacy of transition expectations. A first preliminary elaboration of this theoretical

perspective was drafted up in Chapter 2 of this dissertation. It is a theoretical perspective that I and hopefully others will flesh out further in the coming years.

Amongst others, there is a need for more empirical research to further test the insights shared in this dissertation, especially because much of my results and proposed theoretical contributions were derived from exploratory case studies. Empirical research would necessarily have to focus on reproduction, perhaps even in different transitions to further test the generalisability of the insights in (energy) governance elsewhere. It could also be worthwhile to carry out quantitative studies (survey-based studies, co-occurrence analysis etc.) that could show whether there are statistically relevant relations between certain transition expectations and particular imagined publics.

Besides reproduction of research, there is room to further substantiate, refine and enrich insights on coproduction and the legitimacy of transition expectations through empirical and conceptual work. I would like to highlight four research themes that could potentially be worth exploring. These are themes that I encountered as possibly relevant during my research – or, at least, I found them intriguing – but to which I have not been able to pay sufficient attention within the contours and constraints of my PhD trajectory.

7.4.1 Including real-life publics in the study of legitimacy

In my research, I have concentrated on how decision-makers legitimise transition expectations. An aspect that has received relatively little attention in my work thus far is the evaluation of these expectations by real-life publics. To further expand and solidify the theory on legitimacy of transition expectations, there is a need for further exploration into how real-life publics consider and evaluate (the legitimacy of) expectations, particularly, how real-life publics reflect on the diverse imagined publics presented in and around these. To understand possible (il-)legitimacy of expectations, it is critical to empirically study the extent to which real-life publics feel represented by imagined publics, and even more, the extent to which they believe these imagined publics are representative for real-life societal diversity.

Another intriguing avenue for research could involve examining how citizens conceptualise other actors and their roles and responsibilities in governance. For instance, it could be worthwhile to explore the ‘imagined governments’ (or other

imagined governance actors) of different groups of people and analyse how these imaginaries influence people's understanding of the legitimacy of the expectations of these actors.

7.4.2 The objectification of publics

The second theme builds on what I previously referred to as the denial of publicness; future research could focus on a special form of denial that I would like to tentatively refer to here as the *objectification of publics*. I have seen such objectification taking place in governance settings in which there is a dominant project-based and techno-economic rationality. In these settings, the main concerns are with the technical and economic (im)possibilities in and of project development. Actors predominantly focus on the preconditions that must be met, the obstacles and barriers that must be removed, and the technical and financial risks that must be minimized. Generally, the kind of discussions that take place on these sorts of issues are highly specific, and filled with metrics, values, and not in the least, jargon. One can imagine that these techno-economic considerations, rationalities, and instruments can work to drive publics out of governance. After all, the presence of publics is (perceived as) neither necessary nor desirable when it comes to the kind of complicated discussions about complex risk models, scenarios, business cases or workings of technology. It is in this way that a techno-economic rationality in governance can go hand in hand with a *denial of publicness*. This is not always intentional – actors developing projects oftentimes simply cannot imagine that what is being discussed in this early stage of decision making is relevant to or understandable for people.

Nevertheless, governance settings dominated by techno-economic rationalities are rarely completely void of publics. Instead, what struck me in at least some of these settings is that publics are unconsciously *hidden* or even *objectified*. For example, in discussions on rolling out low-temperature heating grids in the built environment it is not uncommon to talk about potential future users as *connections*, or, in more negative terms, as a *demand risk*[46], instead of talking

[46] In Dutch, the term used to describe the risk that less consumers would contract the heat company than anticipated is *vollooprisico*.

about possible residents' motivations for wanting to be connected to a heating network or not. Both terms say something about the people, oftentimes household users, that are supposed to become a part of the heating system. That is, ideally these households are to be connected and in such numbers that heating grids become worthwhile to invest in. Especially the term 'demand risk' also says something about the possible evaluation of the heating network by households – namely, that they would possibly not favour it – but it does so in the most depersonalised terms imaginable. Households are not considered agents in what is done and proposed. In other words, they are not envisioned an active legitimizing audience, at least not in this early stage of project development, but instead become seen as a somewhat passive object. To me this seems potentially dangerous, not only because it seems to happen so unconsciously and automatically, but also because it works to deny publicness and politics in this stage of project development. With some overgeneralisation, it could be argued that this is particularly problematic in the context of heating grids, precisely because households have limited agency at later stages as well: once they are connected to a heating grid, they generally have little choice in and control over their own heat provision. Considering these potential ramifications, I would applaud more research into what exactly such early-stage objectification of publics would mean for legitimacy.

7.4.3 The legitimacy of public participation

The third theme that I would like to highlight for potentially interesting further research is the legitimacy of expectations of public participation. This theme is somewhat of an underexposed thread in my work: while it returns in one form or the other in almost every chapter, I have not considered it in full detail.

The Dutch energy transition is characterised, I would say, by a broad belief in the legitimacy of participation and the expectations associated with it. This belief hinges upon several claims – not in the least that participation could help prevent societal resistance against proposed energy projects and plans, that it would give people a say in decision making or even an opportunity to benefit economically in and from this transition, and that it would be more democratic than for example, top-down decisions in this transition. My work shows that these are not universal

truths. They are subjective, conditional, and contemporary legitimacy claims and as such not beyond contest.

More critical research into the subjectivity of these legitimacy claims for participation, and the imagined publics upon which they rest, would be highly valuable. Fortunately, increasing attention is being devoted to this area. This includes studies exploring the perceived legitimacy of participation (Nederhand & Edelenbos, 2023; Van Dijk, Turkenburg, & Pow, 2023; Kunseler, Tuinstra, Vasileiadou, & Petersen, 2015), as well as into the imagined publics that emerge before, during, and after participation (Ryghaug, Skjølsvold, & Heidenreich, 2018; Chilvers & Longhurst, 2016; Felt & Fochler, 2010). Some of the more recent studies, for example, critically test prevailing assumptions of people's willingness and motives to participate at various stages of energy planning and development (Perlaviciute & Squintani, 2023), and of the extent to which participation actually fosters public acceptability (Liu, Bouman, Perlaviciute, & Steg, 2021). This kind of research is essential to gain insight into the extent of (in)accuracy of common, even dominant, assumptions and driving expectations surrounding participation in transitions, and can therefore make an important contribution to strengthening the legitimacy of transitions.

7.4.4 Methodologies for facilitating openness and reflection in governance and research

The fourth and final future research direction comes forth from the slight irritation that I have started to feel with (my own) calls for more openness to, and reflection on imagined publics and their legitimizing effects in transition governance. I am very well aware that it is a somewhat obvious and repetitive call: other, more distinguished scholars have long called for exactly those things (Voß & Bornemann, 2011; Kemp & Loorbach, 2006; Hendriks & Grin, 2013; Stirling, 2014), and I too have recommended it in earlier publications (Rodhouse et al., 2023 & 2024). At the very least, I think it has become somewhat of a cliché and by no means the high note on which I would have liked to end this conclusion.

Nevertheless, despite the many times that openness and reflection on (imagined) publics and their legitimizing effects have been recommended, it seems *incredibility difficult* to translate and implement these ideals in practice. This is especially true when such (imagined) publics are not in support of or in conflict

with one's favoured causes, established procedures, or personal assumptions. In such instances, opening up and introspection might mean that fears must be faced, uncertainties accepted, perceptions scrutinized, and wrongs admitted. This is not only incredibly difficult, but it can also be somewhat painful. In light of this, I find it particularly encouraging to have seen ongoing attempts for the acceptance and inclusion of more and diverse understandings of society and its values. Amongst others, I saw policymakers at all levels of government experimenting with citizen participation, hoping to no longer shape the voices of citizens, but instead make these voices explicitly heard in decision making (Rodhouse, Mouter & Cuppen, unpublished work). I saw employees of fossil fuel companies struggling with their social license, looking for external feedback on whether they still had a socially relevant role in the system of the future (Rodhouse et al., 2023; Rodhouse et al, under review). I saw these same companies working together with various public and social parties with the explicit aim to learn how to work with society rather than for society in the future (ibid.). I observed municipalities trying to overcome their own municipal scope and interests, to find ways to collaborate both with each other and with others – including citizens, cooperatives, and other market parties – to get a broader understanding of the normative diversity involved in complex, regional energy infrastructure development (Ruiten, et al., 2023; Rodhouse & Correljé, 2024; Toering et al., under review). Not all of these attempts were fully successful. Mistakes were made. Expectational conflicts were not always resolved in favour of more diverse understandings of public engagement. Follow up and adoption of the lessons learned within the broader organisation at times fell short, meaning that dominant imagined publics were not always meaningfully challenged or changed. Nevertheless, attempts were and continue to be made in this direction.

At the same time, I sometimes feel as if we – that is, researchers studying energy-society relations– are not always equally following suit in reflecting on our own biases and assumptions and how these shape our work. I increasingly hear scholars attribute the slow progress in energy transitions to bad intentions of powerful actors. They seem to almost automatically assume that incumbent actors will resist change (and hence, its drivers: openness and reflection), or seem to overly romanticise the potential of transitions to empower communities without critically examining underlying assumptions about the disempowerment of people

in traditional energy systems and about local and community organisation being inherently better than other forms of organisation in transitions.

I say *we* here, because by no means do I exclude myself from this critique: I too have been called out for "*Shell-shaming",* and particularly early in my PhD, I saw a "NIMBY thinker" in every project developer complaining about local resistance. Over the years I too have had to confront and reflect on my own biases – and I am still learning how to do this more proactively. My sense is that energy-society research would benefit from more reflexivity on its own biases and, coupled with my struggles to recognise and reflect on my own presumptions, I now feel slightly irritated when calling for more openness and introspection in practitioners.

However, as one of my mentors regularly reminds me, this irritation is not necessarily a bad thing as it often points to new research needs. I see two such needs. Firstly, if we recognise that opening up, introspection and reflection are prerequisite for legitimacy yet incredibly difficult, a need arises to generate more insights on the 'how to' question underlying these processes, including what sort of methodologies could facilitate them. Secondly, we need to ask ourselves more regularly how we could use our own research insights to stimulate reflexivity on researcher biases and presumptions in energy transition governance scholarship.

7.5 Contributions of research

Throughout this research, I aimed to have both a societal and a scientific impact. The societal significance of my work lies in explication and in that sense explanation of the often unconscious yet deeply ingrained assumptions that scope thinking and collaboration as early as the initial stages of transition governance. My research reveals how these assumptions are already present in governance during imagining, aspiring, and proposing, and that such assumptions effectively filter, steer, and lock in towards certain outcomes from the beginning of transition. By unveiling these assumptions, particularly those about society in its many forms, and examining how these become performed in and through technologies, infrastructures, policies, projects, etcetera, I hope to offer guidance for introspection and learning.

My scientific contribution lies, in part, in that I was able to fruitfully synthesise insights and ideas from various disciplines to establish a conceptual advancement in our understanding of the role of expectations in transitions. I have hereby demonstrated that interdisciplinary research can be conducive to generating new and relevant knowledge and ways of thinking about complex socio-political trends and dynamics in transitions. In my opinion, the insights generated through the research in this dissertation are highly relevant to a broad spectrum of disciplines. Amongst others, the interdisciplinary perspective adopted has provided significant contributions to the fields of Energy Research and Social Science, with a specific focus on energy justice scholarship. The emphasis on the co-production of injustices, coupled with the empirical and theoretical exploration of recognition justice through the concept of imagined publics, offers valuable tools for further empirical research and academic investigation.

A second contribution is the way in which I have managed to bring together, in a meaningful way, on the one hand, rich and detailed empirical insights from the concrete practice of energy transition governance, and on the other hand, rather abstract knowledge and concepts. While it was not without struggle, I think I have succeeded in making relatively abstract concepts such as legitimacy and imagined publics empirically tangible in a wonderfully rich fashion, and also have been able to show how such abstract concepts are made sense of and given meaning in the practice of transition governance.

7.6 Personal reflections: long live the uncomfortable researcher!

Exploratory research is highly uncomfortable. As an explorative and qualitative researcher interested in energy governance, one moves with great uncertainty through a world full of determined, mission-driven and often quite experienced and knowledgeable people. Contrary to them, the exploratory researcher only has some basic knowledge of that world, and apart from feeling that there is something interesting and important to discover, she is oftentimes quite uncertain as to why she is there. She being me, I often felt that I had to justify my presence in that world by relying on my role and authority as a 'scientific researcher' – however, when asked what it was exactly that I was studying, I generally found myself somewhat in

search of the right words. The honest answer was that I did not know yet, and that I was just trying to absorb everything for the moment. That I wanted to observe and listen and learn until it would become apparent what I was doing there. That answer, of course, neither sounds very authoritative nor instils much confidence.

At first, this sense of unease and insecurity, which I now consider innate to exploratory research, was quite difficult for me. Only over time, as my first results trickled in and proved full of new insights, did I come to appreciate that sense of discomfort. In fact, now that I have arrived at the end of this research trajectory, I can finally see its true nature: all this time, discomfort was but an ugly cover for *freedom*. It is so unique and simultaneously wonderful that I did not have to limit myself to only a few variables, relationships, or theories. No one asked me to discard the richness and complexity of the context in which I had embedded myself. I did not have to consider much of what was happening in that context as noise to be ignored. Indeed, it is absolute freedom to be given the confidence that your research will yield something interesting and relevant – even if it is unclear what that something is exactly, and even if you yourself lack confidence in your own research at times.

Therefore, fellow exploratory researchers, you might best embrace this particular discomfort and trust that all will be well at the end. Of course, there are other discomforts of being an exploratory researcher that are less easy to accept. Not in the least, there is the increasing empathy that one feels when observing groups of actors trying to accomplish something; and then there is the guilt that comes with being given so much access by these people while feeling as if one can promise or give back so little in return. This is particularly true for research in on-going governance processes; even sharing your growing knowledge and insights as a form of advice is potentially an intervention and thus, could negatively impact your research. The fact is that researchers have goals and obligations other than contributing to the success of a project, trajectory, policy or governance process. For me, being a researcher thus meant that I had to somehow find a balance between unavoidable attachment and necessary distance, and between understandable gratitude and the limits of my scientific role. I struggled with this, and honestly, I think I only got it right somewhat due to luck: I got pregnant, had a child, and chose to participate in other research projects. As a result, there were

months in which I did not look at my data or had contact with actors in the field. While after such periods it always took me some time to refamiliarize myself with my research, I do think these pauses in involvement gave me the necessary distance as well as a fresh perspective.

If people ask me now what my research is about, I no longer hesitate. I can talk about it for hours – with only the tiniest hint of insecurity. Clearly, I feel far too comfortable as an exploratory researcher now. That must mean that I am finished and ready to move on to new and yet again uncomfortable waters.

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APPENDICES

Appendix A

A.1 Q sample and factor arrays

Statements		Factor arrays				
		F1	F2	F3	F 4	F 5
1	Acceptance of new energy landscapes comes with time, as soon as people are used to their changed living environment.	2	2	0	1	1
2	If you a project to remain unexecuted, add as condition societal support.	0	-3D	-1	-2	0
3	Inhabitants have yet too much the expectation, that the municipality will take responsibility for the heat transition.	2	-1	0	1	0
4	Citizens understand that the costs of phasing out natural gas cannot be borne only by the government, and that they themselves will have to wage in too.	1	0	-2	-1	1
5	Citizens are convinced that natural gas will remain available for a while longer.	0	0	-2D	-1	2D*
6	Consumers want to choose and generate their own energy, and, in time, trade it with their neighbours.	-3	0	-2	0	-3
7	The most important stakeholder in the energy transition is the public.	1	3	0	-1D*	4
8	We ought to close the gas tap for a couple of weeks. That would make for a lot less people screaming and shouting for the phase out of natural gas.	-4	-4	2D*	-2	-3
9	The average person will not be able to understand the complexity of the energy transition.	0	-1	2	0	2

10	The whole transition becomes potentially delayed by a small group of protestors at the local level.	-2	-3D	-1	1D*	-1
11	The urgency of the energy transition is broadly felt within society.	0	-1	-3	-3	1
12	Societal support for the heat transition is determined by its impact on people's wallet.	-1	0	4	3	1
13	Ownership of energy sources and infrastructures should lie with citizens.	-3	1	-4	-4	0
14	There is a large, vulnerable group that cannot participate in the heat transition.	0	2	0	4D*	-2D*
15	There is sufficient societal capital amongst Dutch citizens (relationships, networks, norms and values, commitment to the community, et cetera) to make the local heat transition a success.	1	2D*	-2	0	-1
16	There are limits to participation – there are some things, on which citizens simply cannot co-decide.	2	-1D*	1	2	3
17	There are many energetic, participating inhabitants that like to co-decide.	0	2D*	-1	-1	-1
18	Provide citizens with control over budgets and let them handle things themselves.	-2	3D*	-2	-3	-1
19	The collective interest of all Dutch citizens is more important than the interests of local groups in the energy transition.	2	0	0	3D	0
20	It is not the responsibility of citizens to find an alternative for natural gas. If the government closes the gas tap, it should also take care of alternative sources.	1	-2	0	0	-4D*

21	It is not fair, that the majority of the transition bill is to be paid by households.	0	2	-3D*	3	0
22	The Dutch public does no longer trust and believe the gas sector, and this cannot be restored anymore.	-1	0	0	0	-2
23	The 'not-in-my-backyard' label for involved inhabitants around energy projects is obsolete.	-2	0D	-3D	-2	-2
24	"The public" does not exist. There is a large diversity of groups in society who all have different interests and ideas.	4D	1	1	2	2
25	People are presented with a considerably distorted and negative image of the fossil industry by the media.	-1	-2	1D*	-3	-3
26	The sooner the environment becomes involved with plans or projects, the better.	3	3	1	-2D*	0
27	Inhabitants mainly want sufficient and clear information. If you explain well what is going to happen, you can prevent resistance.	3D*	1	1	-2	-1
28	People do not have a strong opinion about natural gas. It is so deeply ingrained in our culture, we are so addicted to it, that it has become taken-for-granted.	-2	-1	-1	0	2D*
29	People might not want it, but large-scale energy generation must be developed irrespective of the consequences for our landscape.	-2	-2	0	2D*	-2
30	People mostly want to be taken care of and be supplied with easy and affordable energy.	2	1	3	2	3
31	To make the transition a success, you need to stimulate something like	1	4D*	1	1	1

	local collective pride for the own sustainable energy provision.					
32	People living around energy projects base their opinion of these projects on emotions and mostly irrational arguments.	-1	-2	2	0	0
33	Protesting against continued gas extraction is allowed, but you should not spread lies about het risks, or the necessity, of natural gas.	3	0	3	-1	-1
34	Nowadays, a lot of people feel suspicious towards the government and do not trust the decisions that it makes for them in relation to energy.	-1D*	1	2	2	3
35	There are many people who don't want to take part in a meaningful dialogue – attempts at that only end in a shouting match.	-3	-3	-1	-1	-2
36	Safety should be dominant in considerations for energy extraction; however, a difference must be made between real safety risks and safety perceptions of local inhabitants.	1	-1	3	0	2
37	For those living around energy project, financial gain – i.e., have a share in the profits – is important.	-1	1	2	1	0
38	It is completely unknown, who the broader public is to whom we ought to listen. She keeps quiet.	0	-2	-1	1	1

A.2 Participant List and Significant factor loadings

#	SFL on	Involved in	Organisation type
P1	1	Storage & distribution	Publicly owned grid operator
P2	1	End-use in built environment	Private advisory company
P3	2	Production (natural gas)	Citizen activist group
P4	2	End-use in built environment	Government (municipality)
P5	2, 5 (no flag)	Storage & distribution	Industry association
P6	3	Multiple	Research institute
P7	3	Production (natural gas)	Independent advisory board
P8	-	Marketing & sales (natural gas)	Public-private gas trader
P9	3	Production (natural gas)	Industry association
P10	1	End-use in built environment	Consumer organisation
P11	3, 5 (no flag)	Storage & distribution	Publicly owned grid operator
P12	3	Storage & distribution	Publicly owned grid operator
P13	4	End-use in built environment	Private heat alternatives provider
P14	5	Multiple	Regulatory body
P15	2, 4 (no flag)	End-use in built environment	Private advisory company
P16	5	End-use in built environment	Environmental not-for-profit organisation
P17	3	Multiple	Government (Province)
P18	1	Multiple	Industry association
P19	1, 2 (no flag)	End-use industry & built environment	Industry association
P20	-	Storage & distribution	Publicly owned grid operator
P21	2	Multiple	Environmental not-for-profit organisation
P22	1	End-use in built environment	Public-private collaboration initiative
P23	1	Storage & distribution	Publicly owned grid operator
P24	5	Multiple	Government
P25	3	Production (natural gas & geothermal)	Gas extractives company
P26	4, 5 (no flag)	Production (alternative gases)	Public-private collaboration initiative

P27	3	Storage & distribution	Industry association
P28	-	End-use in built environment	Government (national)
P29	1	Production (natural gas & geothermal)	State-owned extractives company
P30	1	Production (heat)	Publicly owned heat producer & distributer
P31	4	End-use in built environment	Housing corporation
P32	3	Production (natural gas)	Citizen activist organisation
P33	3	End-use in built environment	Government (national)
P34	4	End-use in built environment	Government (municipality)
P35	3	Multiple (alternative gases)	Research institute
P36	3	Multiple	Government (national)
P37	2	End-use in built environment	Environmental not-for-profit organisation

A.3 Factor loadings

Participant	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
P1	X 0,6933	0,1935	-0,1457	0,0408	0,0316
P2	X 0,5855	-0,1365	0,2266	0,2886	0,2179
P3	0,2015	X 0,6846	-0,231	0,1212	-0,0081
P4	0,3751	X 0,6229	0,2368	-0,0284	0,173
P5	-0,1562	0,4632	0,1366	-0,2507	0,5268
P6	0,1841	0,2164	X 0,4553	0,1239	0,0982
P7	0,3952	0,1336	X 0,5331	0,2846	0,0751
P8	0,382	0,2822	0,2252	-0,4014	0,1222
P9	0,4753	0,1324	X 0,5538	-0,042	-0,0479
P10	X 0,7043	-0,0773	0,0879	0,1697	-0,0198
P11	-0,2558	0,2409	0,5636	0,1131	0,4625
P12	0,2808	0,2348	X 0,6674	-0,2339	-0,0542
P13	0,0811	-0,1741	0,0502	X 0,6079	0,3811
P14	0,0821	-0,0459	0,0218	0,0514	X 0,6778
P15	0,1663	0,434	0,3177	0,4775	-0,4128
P16	0,2244	0,4212	0,2951	-0,1365	X 0,5797
P17	0,1112	-0,2019	X 0,5747	0,296	-0,2173
P18	X 0,6753	0,2681	0,0768	-0,0633	0,1306
P19	0,5293	0,4618	0,1273	0,1315	0,1758
P20	0,2994	-0,0329	0,4065	0,3356	0,0511
P21	0,3742	X 0,6077	0,012	0,3552	-0,1859
P22	X 0,7025	-0,0454	0,2486	-0,1391	0,0763
P23	X 0,4306	0,0238	0,2532	0,0332	-0,0612
P24	0,2892	-0,0673	0,0378	0,285	X 0,6567
P25	0,0068	-0,2727	X 0,8232	0,0731	0,1497
P26	0,2895	0,181	0,2632	0,4306	0,4241
P27	-0,0006	-0,2078	X 0,7349	-0,0256	-0,0339
P28	0,1413	0,2821	0,3598	0,2594	0,0289
P29	X 0,5074	0,3116	0,1583	0,3543	0,2388
P30	X 0,5524	-0,0835	0,2841	0,2541	0,1754
P31	0,0568	0,0865	0,2489	X 0,6639	0,1405
P32	0,0971	X 0,6449	-0,0664	-0,0592	0,0867
P33	0,3549	X 0,5576	-0,0808	-0,0357	0,4107
P34	0,0868	0,0918	0,0875	X 0,6767	-0,0776
P35	0,1558	0,0879	X 0,6956	0,2219	0,1602
P36	0,3268	-0,1802	X 0,5929	0,3871	0,1882
P37	0,2207	X 0,6814	0,1102	0,1353	0,1892
% explained variance	14	11	14	9	8

Appendix B

B.1 Document Sample

Year	Published by	Type	Title
2017	DNVGL	Consultancy research report	Verkenning waterstofinfrastructuur
2017	Noordelijke Innovation Board	Research/Lobbying & position paper	De groene waterstofeconomie in Noord-Nederland
2018	Berenschot	Consultancy research report	Elektronen en/of moleculen. Twee transitiepaden voor een CO_2-neutrale toekomst
2018	CE Delft	Consultancy research report	Waterstofroutes Nederland: Blauw, groen en import
2018	CE Delft	Consultancy research report	Werk door groene waterstof: eerste verkenning naar behoud van werkgelegenheid en creëren van nieuwe banen door grootschalige uitrol groene waterstof in Nederland
2018	Netbeheer Nederland & KIWA	Research report	Toekomstbestendige gasdistributienetten
2018	Topsector Energie – TKI Nieuw Gas	Roadmap	Routekaart Waterstof
2018	Waterstof Coalitie	Lobbying & position paper	Manifest Waterstof Coalitie: Waterstof essentiële bouwsteen energietransitie
2019	Clingendael International Energy Programme	Research report	Van onzichtbare naar meer zichtbare hand? Waterstof en elektriciteit: naar een nieuwe ruggengraat van het energiesysteem
2019	FME	Research/Lobbying & position paper	Waterstof: Kansen voor de Nederlandse industrie
2019	Gasunie & TenneT	Research report	Infrastructure Outlook 2050
2019	*Multiple authors*	Lobbying & position paper	Investeringsagenda waterstof Noord-Nederland

2019	*Multiple authors*	Policy document	Klimaatakkoord Achtergrondnotitie Waterstof
2019	New Energy Coalition	Research report	The Dutch Hydrogen Economy in 2050. An exploratory study on the socio-economic impact of introducing hydrogen into the energy system of the Netherlands
2020	Ministerie van Economische Zaken & Klimaat	Governmental vision for hydrogen	Kamerbrief kabinetsvisie Waterstof
2020	NVDE	Lobbying & position paper	Waterstofvisie 2020
2020	Provincie Limburg	Governmental vision for hydrogen	Limburgse Waterstofagenda 2020: “van willen naar kunnen”
2020	Provincie Zuid-Holland	Governmental vision for hydrogen	Waterstofvisie en strategie: de rol van waterstof in de energie- en grondstoffentransitie in Zuid-Holland 2030-(2050)
2020	Stedin	Research report	Waterstof in de gebouwde omgeving
2020	TNO	Research report	Waterstof als optie voor een klimaat neutrale warmtevoorziening in de bestaande bouw
2020	Topsector Energie – TKI Nieuw Gas	Research programme outline	Programmatische Aanpak Waterstof

B.2 Overview of interviewees

Interviewee #	Organisational background interviewee	Date of interview
1	Gasunie & Hanzehogeschool Groningen	March 8, 2019
2	Gasunie	June 17, 2019
3	Stedin	April 3, 2019
4	FME	March 27, 2019
5	New Energy Coalition & TKI Gas	December 17, 2018
6	TNO	February 12, 2019 (interrupted) February 28, 2019 (continued)
7	Ministry of Economic Affairs & Climate	April 11, 2019
8	Clingendael International Energy Programme	July 23, 2019
9	Nexstep	January 31, 2019
10	Netbeheer Nederland	March 13, 2019

Appendix C

C.1 Document Sample

Organisation	Background	Time involved	Working groups
NAM	Oil & gas extraction in the Netherlands, a joint venture of Shell and Exxon.	Pre-2017 (GZI) - present	Solar (working group lead), hydrogen (working group lead in early project initiation phases), and bio-digestion
EBN	State-participant in oil, gas & geothermal extraction in the Netherlands, 100% state-owned	Pre-2017 (GZI) - present	Bio-digestion (JV partner in later project development phases)
Municipality of Emmen	Local government	2017-present	Bio-digestion
Province of Drenthe	Provincial government	2017-present	
New Energy Coalition	Network organisation involved in training, business development support, and lobbying for the energy transition in the Northern Netherlands	2017-present	Bio-digestion (working group lead in early project initiation phases) and hydrogen
Gasunie Transport Services	National transmission system operator for gas and part of Gasunie N.V.	2017-present	Bio-digestion
Gasunie New Energy	Business developer, part of Gasunie N.V.	2017-present	Bio-digestion and hydrogen
Emmtec / GETEC Park.Emmen	(energy) Services and infrastructure provider for the large multi-client (chemical) industrial site in Emmen	2017-present	Hydrogen

Engie	Dutch branch of a multinational corporation for oil, gas, and low-carbon energy production and supply	2017-present	Bio-digestion (project executor, JV partner)
Shell	Multinational oil and gas corporation with a growing renewable energy production and retail portfolio. One of the mother companies of NAM.	2018-present	Solar (project executor), Bio-digestion (project executor, JV partner) and Hydrogen
NOM	Regional investment and development corporation (publicly owned) in the Northern Netherlands	2017	
Rika biofuel developments	Biogas plant developer	2017-2018	Bio-digestion (executor)
Ludan Energy Overseas	Internationally operating business developer, amongst others in waste-to-energy solutions.	2017-2018	Bio-digestion (executor)

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As with many of life's challenges, pursuing a PhD requires having people around you who can save you from yourself at times. In the last few years, I have been very fortunate to have been surrounded by a remarkable group of individuals who have stood by my side unwaveringly. Whenever I was battling my own inner critic and more than occasional stubbornness, they were there, by my side, battling with me. And we won. Together we have beaten me!

My fellow fighters, I doubt you fully realise the influence you have had on me. Sometimes, the smallest gestures made the biggest difference. Other times, it was just you being you – your authentic, beautiful, intelligent, and kind selves – that inspired me to push past my own unproductive perfectionist struggles. Precisely because the support that has mattered most to me over the last few years was given so naturally, to the point that I often wondered whether it was even done consciously, I want to take this opportunity to highlight how much you have touched me during this journey.

Let me begin with my incredible team of champions: the kindest and most inspiring group of supervisors a PhD researcher could hope for. **Eefje,** you are my greatest role model, mentor, fellow perfectionist (although you definitely are the productive kind), and the scientific matriarch of our RESPONSE family. Your natural and unique quality is validating people and their ideas, recognising and valuing the contributions of their work even when they do not see these themselves yet. I cannot count the number of times that I walked into your office feeling uninspired, stuck, or overwhelmed. Yet, no matter how hopeless it all felt, I always walked out an hour later feeling confident, happy and inspired, knowing what to do next. Truly, my sparring sessions with you always proved far more productive than months of hard, solitary work. My apologies for my stubbornness in this regard (as well as in other regards) and for continuing to try doing it on my own for weeks before asking for your help.

Over the years, you have taught me not only how to conduct rigorous research, but also what it means to be a good researcher. One of my most memorable and formative moments with you occurred years ago, almost at the beginning of my PhD journey. I had made what, in my mind, was a colossal mistake. I remember feeling nervous – terrified, even – about having to discuss it with you. I sat in your office, literally trembling, as I explained what had happened. To my surprise, you started laughing. By doing so, you chased away my fears and irrational thoughts. We then sat together, reviewed the documents, and concluded that all was fine. We never spoke of it again, and I never got to tell you how significant a moment that was for me. In that half-hour or so, I not only learned that making mistakes was not the end of the world (or of my PhD, in this case), but also, and more importantly, I learned that mistakes

can often be fixed together and that you would always be there for me throughout this PhD journey. Over the years, you've shown to have my back on countless other occasions. Eefje, I hope you recognise the massive influence that you've had on my thinking when reading this dissertation. Please know that your mentorship, intellectual guidance, and unwavering belief in me has meant everything to me – thank you!

When speaking of unwavering support, of course I should also mention **Aad**. Aad, you're my old school supervisor, by which I mean that to me, it always felt as if you thought the role of PhD supervisor encompassed so much more than mere supervision. Just like in the old days, it was as if you considered my broader intellectual development your personal responsibility. I cherish the many conversations we've had in your office, online after the interviews that we did together during COVID, or by telephone after toddler rush hour and the evening news. Our conversations regularly stretched hours and topics could be anything that life and work brought our way: from the liberalisation of the natural gas market in the Netherlands to baking cakes at the Bijenkorf; from commemorating institutional economic thinkers to spouses, children, and in your case even grandchildren; from the complex development of collective heating systems to our own home renovations; and from burned archives near Groningen to cats and dogs; you were an enthusiastic speaker on all of it. Luckily, I was just as enthusiastic a listener.

Aad, I can say without a doubt that I was only able to develop my current understanding of and perspective on the workings of energy systems because of you. Please know that I was deeply honored and found it incredibly special when you asked me to consider becoming your successor. Although things do not always go as expected, I very much look forward to our continued friendship and collaboration on all things related to the energy transition in the years to come. And who knows, perhaps we'll pick up the study of *"gedoe"* and *"bloemkolen"* in nature conservation in two years' time.

The third member of my supervisory team deserves as much praise as the first two, even though he has often remarked that I was *"an easy one"* for him to supervise. **Udo** is the pragmatic copromotor that you'd wish for every PhD candidate to have in her or his committee. He's wonderful, not only because of his sharp mind and uncanny ability to provide excellent feedback within a day after sending draft work, but also because of his kindness and his self-proclaimed awe of this generation of PhD researchers. He'll make you believe you're someone with valuable ideas, even when you're still working on your go-no-go document and generally feel like you're a scientific nobody at that stage.

Udo, you gave me a confidence boost at the moments I needed it the most. I remember one time in particular. It was during the COVID pandemic, and I was struggling. I was pregnant, sleep-deprived, and felt very isolated and disconnected from the university and my

research. Nothing seemed to be going smoothly. With my hormones all over the place, I found myself questioning whether I was made out for this PhD-thing. I was seriously entertaining the thought of giving up and moving back into corporate life after my maternity leave. When I finally voiced these doubts in an online call, you were the first to respond, and said with certainty in your voice: "*No. We won't let you do that. You are good at this, you can absolutely do this, and we're here to help you"*. These words truly have helped me through more than one difficult time during this PhD journey. Thank you for making me believe in myself!

Finally, **Ernst**, my first-year-only supervisor. It's been quite a while, but whenever I think back of that year in which you were my promotor, I remember how impressed I was by you – so much so, that I often was at a loss of words in your presence. I vividly recall one of our one-on-one conversations in which you apparently had enough of my awkwardness. You asked me, quite directly, if I was afraid of you. To my surprise – and yours – I had to admit that I was. I've since often wondered why. Was it your years of experience, your intellect, your directness, the fact that you were my 'promotor', or perhaps your 'professorial stardom' that made me impressed to the point of becoming a mumbling idiot? Whatever the reason, that one conversation has stayed with me over the years. You'll be pleased to know that I've since realised that even the smartest professors are just like normal people, and so I've decided to no longer let myself be dazzled by them nor to allow myself to put them on such high pedestals. That said, I think I'll always make an exception for you. Thank you!

I have been equally fortunate with my RESPONSE colleagues: Elisabeth, Shannon, and Behnam. **Elisabeth**, if anyone deserves the title *fellow fighter*, it's you. We've shared so many of the same struggles, from dissertation stress to home renovation woes and even partners recovering from concussions on our sofas. Through it all, you never lost your sense of humour, which made our writing sessions and cocktail nights a blast (note for other readers: these were separate activities, though I firmly believe that if anyone could pull off a productive *writing-and-cocktail session,* it's us). Thank you, my dear friend, co-RESPONSER, and Cardiff Castle princess!

Shannon, my unapologetically smart and funny philosopher turned entrepreneur. As a fellow researcher by day, mummy by night you've always been an important sounding board to me on all things related to a scientific/non-scientific career, breastfeeding, sleep deprivation, butlers, and more. Your greatest influence on me was your encouragement to not take myself or my PhD too seriously. I remember that one time when we were sharing a couple glasses of wine in our old 'hood', when you compared academic publishing to scattering buckshot: as researchers, we just throw out ideas, most of which go unnoticed by the scientific crowd. Occasionally, however, and often unexpectedly, one of these ideas gets noticed, resonates with fellow-researchers, and is picked up. While some early-career

researchers might find that outlook disheartening, considering all the work that they have to put into writing articles, I found the idea of most of these articles being only buckshot a huge relief.

And then **Behnam**, always there with words of wisdom and a comforting smile. Despite that you're a very impressive scholar with an equally impressive, busy schedule, you always make time to talk to, advocate for, and empower early-career researchers, which I think is just amazing. I hope you know you're a big example to us, showing us not only how to be tactical about our research and career choices but also, and arguably much more important, that being successful in science can go hand in hand with being kind, funny, and approachable. Thank you, Behnam, for your friendship and advice over the years. I should especially thank you for the times that you were showing me tough love, amongst others by telling me to stop trying to pursue perfection with this dissertation. You were right, and I should have listened sooner.

Niek, if you ask me, you're a *'lekker gewoon gebleven'* scientific superstar – although you'd probably prefer the term scientific star player / coach. I have so enjoyed being on your team! Working with you was eye-opening, not in the least because of our many differences that made for great learnings. You are strategic and economical in all that you undertake, and are always mindful of where your time and efforts can create the greatest value, whereas I regularly find myself at risk of spending half of my time trying to improve something that is already good enough. You're seemingly fearless and born with a sense of assertiveness, whereas I generally can be way too self-conscious, careful and scared to piss people off. I love that you are learning me how to become more bad-ass and strategic through both example and mentorship!

One thing that I will never forget is how you were there for me in the challenging final months of my dissertation writing process. During these months, our meetings became a rare highlight in my otherwise empty schedule. Our conversations often had little to do with the intended purpose of these meetings, and generally evolved into broad reflections and discussions about the relevance – or irrelevance – of scientific research for policy and society. We were simultaneously philosophising, critiquing, and aspiring to improve. From those conversations, I gained many new ideas, some of which I can't wait to execute in my new role. Niek, you have been a true coach, guide, and lifeline in tough times, thank you!

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who constantly amazes me with her strong passions and great dreams, her generosity, and her attempts to better the world and everyone in it. And **Daniël**, who inspires me with his determination to keep challenging himself and to live the life of adventure that he deserves. **Oma**, who has been such a role model for me over the years, particularly in how to conduct oneself as a strong woman not to be messed with. Oma, you've told me a couple of times how you would have loved to pursue higher education, which unfortunately was never possible for you. Hence, both during my studies and my PhD, I've felt as if I was not only living my dream but also yours. I know I have made you proud and hope that you have enjoyed the ride as much as I did. I will never take for granted all that you've done for me. **Mama**, who made sure that, no matter our circumstances, there were always books and libraries to escape to. Truly, that has saved me at difficult times, and has made me into who I am today. Mama, please know that I am proud of you for choosing to do what makes you happy. **Papa**, dank dat je mijn papa wilde zijn. Ik blijf voor altijd jouw kliene wichtke. **Peter and Marja**, who not only raised me a wonderful man, but also embraced me as if I were their own daughter. I am so grateful for how much you have sympathized with me over the last few years. In fact, I am quite sure I wasn't nearly as emotional as you two when we finally received the news that my dissertation was approved. And my in-laws, **Roel, Bart, Lisa, Thijs and Maartje,** who will undoubtedly seize the absence of a personal message as fuel for an extra witty Sinterklaas poem next year.

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To my colleagues, and especially to my fellow PhD-researchers who fought their own battles over the years: thank you for all your companionship, kindness, support, and inspiration. Not in the least, thank you **Kees, Maria, Eva, Femke, Fabio, Fernando, Javanshir, Mathew, Xander, Bernardus, Nynke, Lieke, Sander dJ, Annemiek, Sander tC, Arnoud, Floris, Amit, Coby, Pier, Igno, Wouter, Jorrit, Laurens, Ragnhild, Toril, Hans-Kristian, Steve, Jessika, and Helen.** A particularly big shout out to all my colleagues of the **O&G section**, you are truly wonderful and I could not be more happy to be officially re-joining the group! **Mark**, considering all that you've done for me, you deserve a much larger mention on these pages. You've been an incredibly compassionate and supportive colleague and section leader, going above and

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The great risk of writing acknowledgements after seven years of doing a PhD research is that you meet so many fellow fighters that it is almost impossible to do justice to all of them. Some may unintentionally go unmentioned, and others may have received only a brief mention despite their very significant emotional and intellectual impact on me. For this, I offer my apologies. Please know that I admire and appreciate each of you and consider you all to be blessings in my life.

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Toyah has a research master's degree from the Faculty of Spatial Sciences of the University of Groningen (cum laude), and a bachelor's degree in International Relations and International Organisation from that same university.

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